Assessment of infants and children with dysphagia (swallowing problems) and feeding disorders involves significantly more considerations than a clinical observation of a feeding. In addition to the status of feeding in the child, considerations include health status, broad environment, parent-child interactions, and parental concerns. Interdisciplinary team approaches allow for coordinated global assessment and management decisions. Underlying etiologies or diagnoses must be delineated to every extent possible because treatment will vary according to history and current status in light of all factors that are often interrelated in complex ways. A holistic approach to evaluation is stressed with a primary goal for every child to receive adequate nutrition and hydration without health complications and with no stress to child or to caregiver. Instrumental swallow examinations that aid in defining physiological swallowing status are needed for some children. Successful oral feeding must be measured in quality of meal time experiences with best possible oral sensorimotor skills and safe swallowing while not jeopardizing a child’s functional health status or the parent-child relationship.

Key Words: infant; child; swallowing; feeding; assessment; evaluation

INTRODUCTION

Comprehensive assessment of infants and children with dysphagia and feeding disorders involves considerations of the broad environment, parent-child interactions, parental concerns, and health status of the child. All of those factors must be taken into account by professionals in order to make optimal management decisions for every child to assure that nutrition and hydration needs are met for adequate growth. It is not enough to determine the levels of oral sensorimotor skills and safety of swallowing in isolation.

Professionals involved in assessment and management of infants and children with swallowing and feeding problems must have adequate knowledge and skills about associated health conditions and specific feeding/swallowing issues. Improper diagnoses and management decisions increase risk for poor nutrition and health outcomes. In contrast, thorough problem solving and interdisciplinary management can enhance the lives of children and their caregivers. Children and families are better served by an interdisciplinary team than by a single discipline in isolation [Arvedson et al., 2002].

INTERDISCIPLINARY FEEDING/SWALLOWING TEAM APPROACH

An interdisciplinary approach allows for coordinated consultation with focus on the whole child (and caregivers) who may have multiple interrelated health and developmental issues. Individuals involved in the problem solving have opportunities to provide patient care and case coordination that is difficult to obtain when professionals function independently. Of course, not all disciplines are needed for all children, and as children change over time, primary team players may change as well. These kinds of teams demonstrate several important characteristics that include (1) a shared group philosophy related to diagnostic approaches and management protocols, (2) team leadership with organization for evaluation and sharing information, (3) collegial interaction among varied specialists, and (4) time commitment for the labor intensive nature of this kind of work [Brodsky and Arvedson, 2002].

Interdisciplinary teams may be in medical settings or in school-based settings [ASHA, 2007]. School-based team members work closely with medical team colleagues so that findings from all evaluations or assessments can be incorporated into appropriate coordinated recommendations. Physician input is of utmost importance in the development of management plans and for monitoring the health status of children. Treatment options vary by history, physical examination, findings during clinical feeding evaluations, and instrumental swallowing evaluations. To set the stage for evaluating infants and young children with feeding and swallowing disorders, a few operational definitions are in order.

Operational Definitions

- **Feeding disorders**: Problems in a broad range of eating activities that may or may not be accompanied by a
difficulty with swallowing food and liquid. Feeding disorders may be characterized by food refusal, disruptive mealtime behavior, rigid food preferences, less than optimal growth, and failure to master self-feeding skills expected for developmental levels.

- **Swallowing disorders (dysphagia):** Problems in one or more phases of the swallow that include (1) oral phase: (a) bolus formation (from time food or liquid enters the mouth until it begins to move over the tongue in the oral cavity), and (b) oral (transit of bolus posteriorly over the tongue ending with initiation (trigger) of the pharyngeal swallow); (2) initiation of the swallow (under voluntary neural control); (3) pharyngeal phase (involuntary neural control) from the initiation of the swallow to end when the bolus moves through the cricopharyngeal juncture into the esophagus); and (4) esophageal phase (begins with opening of the upper esophageal sphincter through the lower esophageal sphincter). Particular concern relates to timing and coordination deficits that may result in aspiration.

- **Aspiration:** Passage of any material (e.g., food, liquid, saliva) below the level of the true vocal folds into the trachea.

- **Silent aspiration:** No cough, choke, or other signs of problems when food or liquid enters the trachea.

**INCIDENCE AND PREVALENCE OF FEEDING/SWALLOWING DISORDERS**

Feeding-related concerns are among the most common issues in preschool children who are brought to primary health care professionals by parents. Given the range of diagnostic labels applied to these disorders by various specialists, it is not surprising that incidence figures vary considerably.[1999; Chatoor, 2002] Some children with feeding disorders have no swallowing related concerns. The broader context of family and society should be addressed as a preliminary step in the assessment prior to focusing on children's skills and safety for oral feeding.

Incidence of feeding disorders is estimated to be 25–45% of typically developing children and up to 80% of children with developmental disabilities.[Linscheid et al., 2003] The incidence of dysphagia (swallowing disorders) is unknown, although it seems clear that the incidence of swallowing dysfunction is increasing.[Burklow et al., 1998; Hawdon et al., 2000; Marlow, 2001; Newman et al., 2001; Ancel et al., 2006]. Improved survival rates of children with history of prematurity (birth at <37 weeks gestation), low birth weight, and complex medical conditions provide at least a partial explanation for the increasing incidence of swallowing disorders.[Martin et al., 2005; Hamilton et al., 2007]. Preterm births (<37 weeks gestation) accounted for 12.7% of 4.14 million births in the United States in 2004–2005, which represents an increase of 20% since 1990.[Hamilton et al., 2007]. The survival rate of preterm infants delivered at <1,000 g (extremely low birth weight) increased from 65 to 90% from 1987 to 2000. The survival rate of micropreemies (<600 g) increased from 30 to 55% in that same time period. Incidence of cerebral palsy (CP) is higher in infants born between 24 and 26 weeks (20%) than those delivered at 32 weeks gestation (4%) [Ancel et al., 2006].

Children with a wide range of disabilities who are seen by feeding and swallowing specialists frequently are classified as failure to thrive (slow weight gain). Children who are slow to gain weight are at particular risk for both feeding problems (60%) and developmental delays (55%) [Raynor and Rudolf, 1996; Wright and Birks, 2000]. Children with CP are at high risk for feeding and swallowing problems. Prevalence of feeding problems is less in children with hemiplegia and diplegia (25–30%) compared with children who have spastic quadriplegia or extrapyramidal CP (50–75%) [Stellings et al., 1993a,b; Dahl et al., 1996; Reilly et al., 1996]. Ongoing growth analysis and developmental assessments are important components of the process in identification of infants at high risk for feeding and swallowing disorders.

**FEEDING AND FEEDING DISORDERS IN THE CONTEXT OF FAMILY AND SOCIETY:**

**CASE FOR A RELATIONAL DISORDER BETWEEN PARENT AND CHILD**

A child with signs of a feeding disorder more prominent than a swallowing disorder will be served better with the family in the context of a multiaxial diagnosis rather than an initial focus on the child's status and needs [American Psychiatric Association (APA), 2000]. This kind of diagnosis includes the child (with medical, developmental, and behavioral characteristics), the parent, the parent–child relationship, and the social and nutritional context of feeding [Davies et al., 2006]. Davies et al. [2006] proposed diagnostic criteria for a “Feeding Disorder Between Parent and Child” that span a range of interactions, attitudes, and expectations that are not meant to be mutually exclusive or hierarchical. These criteria include:
• acknowledgement of contributions from both parent and child;
• reflection of interactive nature of the feeding relationship;
• management of diversity of feeding disorders and avoidance of subtyping with multiple eating eccentricities by setting up a single diagnosis and then differentiating through a multiaxial diagnosis;
• explicit use of multiaxial diagnosis to reflect the multidetermined nature of feeding disorders;
• distinguishing between a feeding problem possibly amenable to education and early problem solving and the established or entrenched feeding disorder requiring systematic diagnosis and treatment.

This proposal specifies that a diagnosis of a feeding disorder between parent and child must show established or entrenched problems that emerged prior to the child’s developmental age of 6 years. Problems must have lasted for at least 1 month. No exclusionary criteria are involved. Deficits that are acknowledged as having an impact on the feeding include medical, psychosocial, developmental (e.g., gross and fine motor skills, oral sensorimotor skills, cognitive and language levels of function), economic, and other systemic problems [Davies et al., 2006]. Attention to multiple influences is essential in order for successful diagnosis and treatment of children with feeding disorders. Awareness of these children and their families may arise from various sources to include primary care physicians, educators, and other medical and educational professionals. Referrals are then made to specialists with the appropriate knowledge and experience to delineate the complex issues and make management plans with parents and other primary caregivers as integral team members.

WHO NEEDS A FEEDING/SWALLOWING EVALUATION?

Physicians, nurses, and other professionals who do not carry out comprehensive clinical feeding and swallowing assessments may find the following questions helpful to determine whether a child has signs of a feeding or swallowing problem that should be followed up by a specialist(s). This list of questions provides some examples and is not intended to be inclusive. The answers to these questions do not define the problem, but they can help identify infants and children in need of a comprehensive evaluation and they may also provide useful information in the history part of an assessment [e.g., Arvedson and Rogers, 1993, 1997]:

• Has the child slowed or stopped gaining weight in the previous 2–3 months? Particularly in the first 2 years of life, steady and appropriate weight gain is expected and critical for brain development along with overall growth. Lack of weight gain in a young child is like a weight loss in older children or adults.
• Are there any signs of respiratory distress? For example, a child may become increasingly “congested” as a meal progresses. There may be a gurgly voice quality. Rapid or “catch up” (panting) breathing may be seen in an infant taking a nipple feeding. Respiratory issues can be related to aspiration with oral feedings in some instances.
• Are mealtimes stressful? Meal times? Irritability may signal GI issues. Lethargy or sleepiness may result from fatigue, sedating medications (e.g., anticonvulsants, muscle relaxants), or recurrent seizures.

ASSESSMENT PROCESS: INFANTS AND CHILDREN WITH FEEDING AND SWALLOWING DISORDERS

Assessment of infants and young children with signs and symptoms of feeding and/or swallowing disorders is likely to encompass multiple dimensions that include, but may not be limited to: (a) review of family, medical, developmental, and feeding history; (b) physical ex-
Table 1. Assessments of Infant Oral Sensorimotor Function for Feeding

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preterm Infant Breast-feeding Behavior Scale (PIBBS) [Noyvet et al., 1996]</td>
<td>Diary by mother: rooting, amount of breast in mouth, latching, sucking, sucking bursts, swallowing, state, letdown, and time.</td>
</tr>
<tr>
<td>Breastfeeding evaluation [Tobin, 1996]—for term infant</td>
<td>Purpose: identify when a mother would benefit from lactation support. List of expectations for feedings.</td>
</tr>
<tr>
<td>Bottle feeding: Feeding flow sheet [Vandenberg, 1990]</td>
<td>Observations for state, respiratory rate, heart rate, nipple, form of nutrition, position, coordination, support quantity, and duration changes over time.</td>
</tr>
<tr>
<td>Infant feeding evaluation [Swigert, 1998]</td>
<td>Not standardized evaluation: means of documenting a variety of observations, including infant responses to attempted interventions. Devised for birth to 4 months, components for preterm or ill infant not specified.</td>
</tr>
</tbody>
</table>

Regardless of age and feeding expectations, the observer notes “at rest” posture and position, with the realization that underlying tone and strength are particularly important factors in consideration of oral feeding safety. Prefeeding observations are made to note deviations from normal expectations and include [Arvedson and Rogers, 1993]:

- child and parent interactions;
- posture, position, and movement patterns (head, neck and trunk focus);
- respiratory patterns (e.g., breathing rate, effort, nose/mouth);
- overall responsiveness, temperament, affect;
- alertness and ability to sustain attention to tasks;
- response to sensory stimulation to include tactile, visual, auditory, smell;
- self-regulation and self-calming abilities.

**Oral Structure and Function Assessment**

Thorough examination of oral structures and function must be made before introducing liquid to an infant: observations are made regarding symmetry or asymmetry of facial features, lip and jaw position, palate shape and height, tongue position in the oral cavity and movement patterns, oral reflexes and nonnutritive sucking (NNS) in young infants, and laryngeal function as noted by voice quality. For example, breathy voice makes one suspicious of possible unilateral vocal fold paralysis/paresis. Weak or uncoordinated NNS would indicate lack of readiness for nipple feeding sufficient to meet nutrition needs. Drooling after the age of 5 years suggests a need for a comprehensive work-up [Brodsky and Arvedson, 2002,c]. Detailed descriptions of facili-
Feeding Observation

Newborn infants: Cardiorespiratory status must be stable. A calm alert state is desirable for anticipation of feeding with minimal stress to the infant. NNS is assessed, even though adequate NNS is not sufficient to predict adequacy of oral feeding abilities. If an infant does not demonstrate rhythmic and strong NNS, it is not likely that she will be ready to suck, swallow, and coordinate breathing to take enough breast milk or formula to meet nutrition and hydration needs. An infant who is anticipated to be an oral feeder should be observed for at least 15–20 min. Efficient feeding is accomplished in 15–20 min or maximum 30 min for most typical infants. Length of feeding times among preterm infants fed according to their cues and tolerance range from 10 to 30 min with some fed longer than 30 min [McCain, 2003]. Some infants may take a few minutes to “warm up.” If the feeding observation is stopped after 5 min, an erroneous impression might be made. On the other hand, an infant may start out well, become disorganized, and show signs of fatigue as the feeding progresses. This pattern is not uncommon in infants with cardiac abnormalities or neurogenic dysphagia. Management decisions would not likely be made in the infant’s best interests if the infant is observed for only the first few minutes of an oral feeding.

Older infants and children: The feeding observation is made with a familiar feeder holding an infant as typically as would be done at home, or with a child in a high chair or other seating system. These observations are attempts to simulate as closely as possible the regular feeding environment and routine as carried out at home. Observations are made about the parent and child interactions around feeding. The child is observed for specific aspects of oral sensorimotor function that can be related to function of cranial nerves V, VII, IX, X, and XII with a few examples in Table 2. Inferences are made regarding time to produce swallows and whether a child appears to make multiple swallows to clear a single bolus. Textures may be varied, usually starting with a texture or consistency that is familiar to the child and then offering a food that may be more difficult, according to parents. Other attributes of food and liquid that can be varied include taste and temperature. It is of interest that children who have not experienced typical development of oral feeding in the first year of life often require additional time to accept textured food and to make developmentally appropriate gains. They often prefer sour and tart flavors over bland food. They also may prefer finger foods that they handle independently, rather than have someone else spoon feed them. Children have shown that they are more likely to have feeding difficulties when lumps are introduced at or after 10 months of age than when lumps are introduced earlier than 10 months [e.g., Northstone et al., 2001]. Age estimates relate to critical and sensory periods that appear pertinent to readiness to accept new textures [e.g., Illingworth and Lister, 1964]. Children are likely to be ready for chewable food even when they have not mastered all gradations of pureed textures [Gisel, 1991; Green et al., 1997]. Expectations for chewing skills are made in relation to normal development, which reemphasizes the need for all feeding and swallowing specialists to know normal development exceedingly well. A child’s failure to close lips around a spoon, reduced tongue action to form a bolus, and delay in trigger or initiation of a pharyngeal swallow all may be indications of cranial nerve deficits. Observations provide information related to possible oral sensory versus oral motor disorders. Many children have both types, but may show a preponderance of one over the other (Table 3).

A fundamental question that must be answered by the end of the clinical feeding assessment is: Can this child eat and drink safely strictly orally? If the answer is “yes,” modifications may include, but are not limited to:

- posture and position alterations;
- taste, texture, and temperature changes of food or liquid;
- broader based sensory and motor interventions;
- scheduling of meal and snack times to facilitate hunger;
- structure and routines at meal times to improve parent–child interactions as well as behavioral responses of the child.

If the answer is “no” or if there are signs of concern regarding safety of swallowing that may include risks for aspiration, follow-up instrumental evaluation is warranted. One can only make inferences regarding pharyngeal and upper esophageal phases of swallowing by clinical examination/observation regardless of the experience, knowledge, and astuteness of a specific clinician.

**OTHER CONSIDERATIONS**

In addition to the clinical evaluation of feeding and swallowing, the clinician should focus on somatic growth patterns, neurodevelopmental status, orofacial structures, cardiopulmonary and other GI function.

**Somatic Growth**

Thorough nutrition assessment is critical with various methods available. Advances in nutrition assessment can be found in several recent excellent reviews [e.g., Kirby and Noel, 2007]. No single

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**Table 2. Examples of Observations That May Relate to Cranial Nerve (CN) Function During Feeding Assessment of Transitional Feeders or Older Children**

<table>
<thead>
<tr>
<th>CN</th>
<th>Stimulus</th>
<th>Typical Response</th>
<th>Deficit Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Food on tongue</td>
<td>Mastication</td>
<td>Bolus not formed</td>
</tr>
<tr>
<td>VII</td>
<td>Sucking</td>
<td>Lip pursing to latch on nipple</td>
<td>Lip seal not attained</td>
</tr>
<tr>
<td>IX, X</td>
<td>Food in posterior oral cavity</td>
<td>Swallow initiated &lt;2 sec</td>
<td>Delayed initiation of pharyngeal swallow</td>
</tr>
<tr>
<td>XII</td>
<td>Food on tongue</td>
<td>Tongue shaping with protruding and protruding</td>
<td>Tongue lacking elevation and atrophy</td>
</tr>
</tbody>
</table>

Source: Adapted from Arvedson et al. [2002].
measure fulfills all requirements for assessing nutrition status in infants and young children. Multiple measures may be needed. All children deserve adequate nourishment so that they can grow and develop fully to meet their potential in all functional domains.

Neurodevelopmental Examination

Each child’s neurodevelopmental status must be determined as feeding and swallowing intervention plans need to be tailored to a child’s developmental levels of function, not to chronologic age. Methods of evaluation and scales can be incorporated for cognitive and language levels, with healthcare providers being aware of strengths and weaknesses of various measures [Rossman et al., 1994; Macias et al., 1998; Voigt et al., 2003; Vincer et al., 2005]. Sensory and motor skills need to be evaluated with differentiation of primarily oral sensory deficits versus primarily oral motor deficits [Palmer and Heyman, 1993] (Table 3). Most children tend to demonstrate some aspects of both sensory and motor deficits, although it is not unusual for children to have a strong tendency to one or the other. Additional resources for these areas of assessment include the works of Blanche et al. [1995], Case-Smith and Humphrey [2000], and Morris and Klein [2000]. Risk factors in the development of behavioral food refusal and maintenance of maladaptive feeding behaviors after periods of illness include commun-
rated materials. The primary unanswered question prompts continued need for research: How much aspiration of what for how long can be tolerated by an individual before chronic lung disease is an issue? A variety of procedures can be used for delineating respiratory status and whether swallowing dysfunction is an underlying cause or whether the pulmonary dysfunction may underlie the dysphagia. Criteria for specific tests and descriptions of procedures can be found elsewhere. Again a team approach is stressed with professionals communicating across specialties and with parents.

GI Examination

GER, the passage of gastric contents into the esophagus, is common in normal infants with a frequency of regurgitation as high as 67% at 4 months of age [Nelson et al., 1997]. The etiology in infants is primarily anatomic and a function of a fluid diet, low esophageal capacitance, minimal length of subdiaphragmatic esophagus, and supine positioning [Kirby and Noel, 2007]. This benign infantile GER seldom results in esophagitis or airway irritation since the regurgitated breast milk or formula is nonacidic. However, infants and children with GER disease (GERD) may present with signs that result from pain, airway irritation, or feeding disorder. The North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASP-GHAN) [Rudolph et al. 2001] has published guidelines for evaluation and management of GERD. Eosinophilic esophagitis (EE or EoE), an inflammatory disease of the esophagus, may mimic the signs of GERD [Noel and Tipnis, 2006]. EE is often associated with food allergy and atopy [Noel et al., 2004], and unrelated to acid exposure. Diagnosis requires endoscopy and is made by histologic confirmation of mucosal changes [Gupta et al., 1997; Lim et al., 2004]. Treatments involve dietary changes and medications [Markowitz et al., 2003; Konikoff et al., 2006]. Overall, adequate management of GI tract disorders that may also result from the level of the true vocal folds. How- ever, the inability to visualize the entire dynamic swallowing sequence is a drawback of this evaluation. Advantages include: no radiation exposure, position of patient is flexible, observation of structures, sensory component, can be repeated frequently, and it is readily available in most medical settings.

Videofluoroscopic Swallow Study

The VFSS is the primary instrumental examination to provide dynamic imaging of oral, pharyngeal, and upper esophageal phases of swallowing. The lateral view is standard. The anterior view is used in some instances, particularly when asymmetry is noted and for view of palatine tonsils. The esophagus is scanned only for transit of a bolus. If a comprehensive examination of esophageal structure and function is needed, an esophagram or in some instances an upper GI study is completed.

For purposes of the radiographic examination of swallowing, it must be remembered that this examination captures only a brief window in time and it does not simulate a real meal. The primary purpose is to define the pharyngeal phase of swallowing, not just to determine whether a child aspirates [Arvedson and Lefton-Greif, 1998]. Oral tongue propulsion of boluses into the pharynx has an impact on pharyngeal function. This examination provides structural and functional findings that can be related to varied swallowing disorders (Table 4). When aspiration is observed, the clinician must note whether the aspiration occurred before, during, or after swallows and on what texture(s) or consistencies. The findings must be related to possible swallow problems or disorders, since management decisions are based on the problems that are identified. Details regarding criteria for referral for VFSS, preparation of infants and children, pro-
tedoral issues, reading and interpreting the X-ray findings, and management considerations can be found in other sources [e.g., Arvedson and Lefton-Greif, 1998; Arvedson and Brodsky, 2002; Brodky and Arvedson, 2002]. Findings should be interpreted and integrated with information from history, other diagnostic tests, and data obtained across multiple dimensions that contribute to the current status of each child and family. Decisions about oral versus tube feeding, adjustments of textures/consistencies, and sensorimotor intervention must take into account underlying medical and developmental factors, nutrition status, and parent-child interactions in addition to specific oral sensorimotor and swallowing deficits.

**SUMMARY**

Evaluation of infants and children with dysphagia and feeding problems involves a multifactorial approach. Children with complex swallowing and feeding problems with their families are served best through an interdisciplinary team approach with considerations to include the WHO identification of the ICF as a potential framework for coding functional status and for standardizing language to describe health and health-related domains. Consideration of feeding problems in young children as a parent-child relational disorder provides a basis for incorporating those concepts into a comprehensive management plan. Evaluation has been discussed in a holistic framework that has the potential to facilitate the best possible safety and function of feeding for all children whether it be with a goal for total oral feeding or a goal that includes supplemental tube feedings to assure that nutrition and hydration needs are met, while facilitating oral feeding in ways that will not jeopardize a child’s health. Every child deserves to receive adequate nutrition and hydration without stress to child or to caregiver. Successful oral feeding must be measured in quality of meal time experiences with best possible skills while not jeopardizing a child’s functional health status or the parent-child relationship.

**REFERENCES**


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**Table 4. Selected Videofluoroscopic Swallow Study Findings and Common Swallow Disorders**

<table>
<thead>
<tr>
<th>Radiographic Finding (Sign)</th>
<th>Possible Common Swallowing Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharyngeal phase</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Nasopharyngeal backflow/reflux</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Penetration to undersides of upper part of epiglottis</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Penetration into airway entrance</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Residue after swallows in valleculae</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Residue in pyriform sinuses</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Aspiration before swallow</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Aspiration during swallow</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Aspiration after swallow</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Residue in pharyngeal recesses</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Residue cleared with next swallow</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Residue not cleared</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Upper esophageal phase</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Slow bolus passage through UES</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Residual on/in UES</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Retrograde bolus movement from esophagus to pharynx</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
<tr>
<td>Retrograde bolus movement from lower esophagus to upper esophagus</td>
<td>UES AP opening diameter, reduced pharyngeal pressures may contribute</td>
</tr>
</tbody>
</table>

Adapted from Arvedson and Lefton-Greif [1998], p 253.

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<ref>Dev Disabil Res Rev • Assessment of Pediatric Dysphagia • Arvedson</ref>


