



**Holland Bloorview**

Kids Rehabilitation Hospital

# OPTIMIZING FEEDING AND SWALLOWING

IN CHILDREN WITH PHYSICAL  
AND DEVELOPMENTAL DISABILITIES

A Practical Guide for Clinicians



**Part 1: Guiding your practice**

Using a feeding and swallowing framework

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## Introduction

Optimizing a child's feeding and swallowing function is an important part of their overall care. However, doing so can be a complex process for clinicians and an emotional journey for caregivers. As clinicians working in a hospital-based clinic with caregivers and their children who have feeding and swallowing issues, we are frequently contacted by other clinicians to consult and collaborate on these complex issues. In response to those questions, this handbook was designed to both **highlight key considerations** and help **guide clinical decision making** during clinical evaluation and management of feeding and swallowing issues in children with physical and developmental disabilities. While it is beyond the scope of this handbook to address all aspects of pediatric feeding and swallowing, we hope we have compiled a valuable tool with links to important references and evidence for clinicians to access and further their knowledge as they feel is appropriate.

– The Feeding and Swallowing Team, Holland Bloorview Kids Rehabilitation Hospital



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The information in this Feeding and Swallowing handbook is informed by:

- The best available evidence through clinical practice guidelines, position statements, systematic reviews, primary literature, textbooks and expert opinion.
- Clinicians experienced in evaluating and managing feeding and swallowing issues in children with physical and developmental disabilities from the [Feeding and Swallowing Clinic at Holland Bloorview Kids Rehabilitation Hospital](#).
- External stakeholders who provided valuable input and feedback based on their clinical experience working in the field of pediatric feeding and swallowing.

## Who will find this handbook most useful

The following disciplines may find this handbook useful: occupational therapists, dietitians, speech-language pathologists, physicians, physiotherapists, psychologists, nurses and other clinicians who work with children in the community with physical and developmental disabilities.

*Note:* Issues related to feeding in the neonatal intensive care unit (NICU), food selectivity, sensory-based feeding challenges, behavioural concerns, interventions specific to a diagnosis or weaning from enteral tube feeding will not be addressed as they are beyond the scope of this handbook.

### DEFINITIONS

#### Distinguishing feeding and swallowing issues from dysphagia

For the purpose of this handbook, the following definitions will be used:

- 1) **Feeding and swallowing issues** - refer to a broad range of feeding and swallowing concerns such as difficulties with eating and/or drinking that may or may not be accompanied by dysphagia. These may include skill development and nutritional concerns (Arvedson, 2008).
- 2) **Dysphagia** - describes an assessed or diagnosed problem in any of the swallowing phases (Morgan, Dodrill, & Ward, 2012):
  - **Oral preparatory phase** - chewing and preparing the food
  - **Oral phase** - moving the bolus through the oral cavity towards the back of the throat
  - **Pharyngeal phase** - moving the bolus through the pharynx to the esophagus (swallowing)
  - **Esophageal phase** - moving the bolus from the esophagus into the stomach

### CLINICAL PRACTICE RESOURCE



#### Clinical practice guidelines (CPGs)

CPGs provide evidence-based recommendations for clinical care. Two CPGs were used to inform the content of the handbook:

- 1) Cichero, J., Baldac, S., Ledger, M., Wilson, C., Kaatzke-Mcdonald, M., Agius, E., ... Vertigan, A. (2012). Clinical Guideline: Dysphagia: Melbourne (Australia). The Speech Pathology Associated of Australia Limited.
- 2) Taylor-Goh, S. (2005). Royal college of speech & language therapists clinical guidelines: 5.8 Disorders of feeding, eating, drinking & swallowing (dysphagia). Bicester (United Kingdom): Royal College of Speech & Language Therapists [RCSLT].

### CLINICAL PRACTICE RESOURCE



#### Pediatrics feeding and swallowing practice in Canada

Information on pediatric service provision, practice models and assessment tools used within Canadian feeding and swallowing assessment and management can be found in the CADTH environmental scan report:

Mason, J., & Ford, C. (2017). *Feeding and swallowing assessment services for pediatric populations in Canada: Service provision, practice models, and assessment tools*. Ottawa, ON: CADTH. Available from: <https://www.cadth.ca/feeding-and-swallowingassessment-services-pediatric-populationscanada-service-provision-practice>

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**Using a feeding and swallowing framework ..... 4**

An integrated framework developed by clinicians at Holland Bloorview to help guide feeding and swallowing assessment and management is outlined.

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**Clinical evaluation ..... 6**

The clinical evaluation process is discussed in detail and includes:

- Feeding and swallowing history
- Feeding observation

This section integrates the medical, nutrition and hydration components of the feeding and swallowing framework.

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**Medical ..... 25**

The importance of consulting with a physician if there are medical concerns is emphasized and discussed.

**Nutrition and hydration ..... 26**

Common nutrition and hydration concerns along with recommendations to address them are identified in this section. The importance of consulting with a dietitian if there are nutrition and hydration concerns is emphasized.

**Swallowing safety ..... 29**

This section outlines key considerations for the evaluation and management of swallowing:

- Clinical evaluation of swallowing
- Instrumental assessment

**Positioning ..... 41**

Key application principles for positioning are highlighted and include:

- Selecting positioning equipment to support feeding and swallowing needs
- Suboptimal positioning: Understanding the “why”

**Skill development ..... 47**

Approaches and strategies for addressing common priorities for skill development are provided and include:

- Prioritizing skill development goals
- Feeding according to developmental level
- Texture progression and chewing
- Self-feeding
- Cup, bottle and straw drinking

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A detailed description of how the handbook was developed is provided:

- Evidence gathering
- Handbook contributors
- References

Key recommendations from clinical practice guidelines that align with handbook content are also identified.

## PART 1: GUIDING YOUR PRACTICE

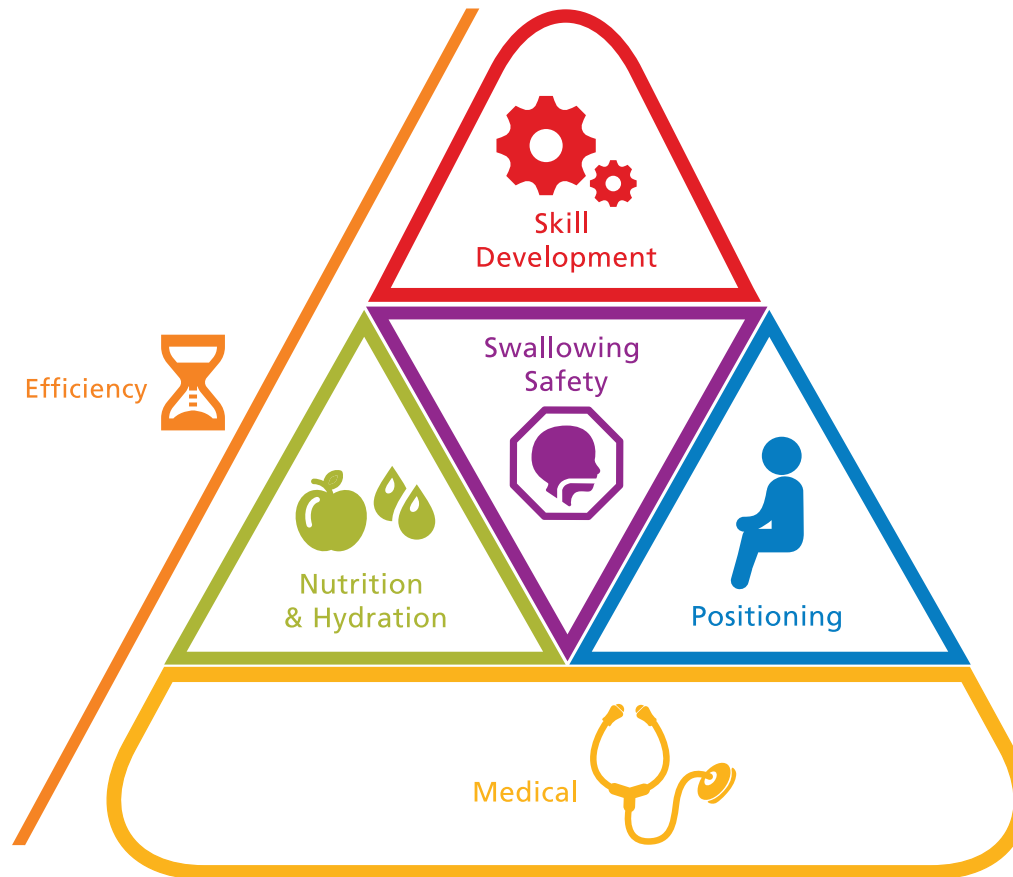


Figure 1: Feeding and swallowing framework

## Using a feeding and swallowing framework

- The Holland Bloorview Feeding and Swallowing team has developed a structured framework that provides a hierarchal and integrated approach to guiding clinical practice.
- This triangle ([Figure 1](#)) illustrates a framework for addressing feeding and swallowing issues. While issues related to skill development are often the presenting concern, clinicians must first ensure that foundational components are in place including management of medical issues, swallowing safety, nutrition, hydration and positioning before skill development can be addressed. Efficiency must be considered throughout the navigation of the framework.
- The content and structure of this handbook are aligned with the components of the feeding and swallowing framework which are represented by the designated icons.

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**Medical** concerns include: overall medical stability and medical issues impacting the aerodigestive system (e.g. respirology, gastroenterology and otolaryngology). Additional key areas may include cardiac and neurologic issues, among others. Medical management is the foundation of the framework. This icon is used to highlight areas which address medical issues and serves as a reminder that making a change in one area of the feeding framework may impact the child's overall medical stability.



**Nutrition** and **hydration** refer to the amount of food and liquid required to meet a child's daily needs. Once medical stability is established, nutrition and hydration, swallowing safety and positioning are on the same level of the framework. These components are critical to the child's health and well-being. This icon is used to highlight areas which address nutrition and hydration and to serve as a reminder that making a change in one area of the feeding framework may impact the child's overall nutrition or hydration status.



**Swallowing safety** refers to a child's risk of aspiration and/or choking and is equally as important as nutrition and hydration and positioning. This icon is used to highlight areas where swallowing safety is addressed and to serve as a reminder that making a change in one area of the feeding framework may impact the child's swallowing safety.



**Integrated framework:** This icon is used to indicate when all components of the framework are being addressed within a section.



**Positioning** is represented on the same level of the framework as swallowing safety, nutrition and hydration. Optimal positioning for a child during feeding is critical to their swallowing safety and skill development. It may improve feeding efficiency, which can improve nutrition and hydration status. This icon is used to highlight areas where positioning is addressed and to serve as a reminder that making changes to the child's position during feeding may impact all other areas of the framework.



**Skill development** includes: self-feeding, texture progression and chewing and cup drinking. This component is at the top of the framework, as issues of skill development should only be considered once all other areas of the framework have been addressed. This icon is used to highlight areas which address various aspects of skill development and to serve as a reminder that making a change in one area of the framework may impact the child's feeding skill development.



**Efficiency** refers to the amount of food or liquid a child can consume in a given amount of time. Assess if the length and frequency of meals and snacks is acceptable to the child and caregiver. Efficiency is represented as a line along the side of the framework to illustrate that changes made at any level of the framework may impact overall feeding efficiency.



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PART 2: CLINICALLY EVALUATING FEEDING AND SWALLOWING

## Clinical evaluation

A comprehensive clinical evaluation should be completed if a child is suspected to have a feeding and swallowing issue or dysphagia. The clinical evaluation forms the foundation for clinical decision making regarding diagnosis, the need for [instrumental assessment](#) and development of a management plan (Arvedson, 2008; Logemann, 1998). The clinical evaluation has two components: [feeding and swallowing history](#) and [feeding observation](#) (Arvedson, 2008).

### EVIDENCE REVIEW

#### Pediatric clinical evaluations of feeding and swallowing difficulties

The evidence-base regarding pediatric clinical evaluations of feeding and swallowing difficulties is growing. For more information on the state of the evidence and for a comprehensive list of published assessments, consult the following reviews and evidence summaries:

- 1) Heckathorn, D., Speyer, R., Taylor, J., & Cordier, R. (2016). Systematic Review: Non-instrumental swallowing and feeding assessments in pediatrics. *Dysphagia*, 31(1), 1-23.
- 2) Benfer, K., Weir, K., & Boyd, R. (2012). Clinimetrics of measures of oropharyngeal dysphagia for preschool children with cerebral palsy and neurodevelopmental disabilities: A systematic review. *Developmental Medicine & Child Neurology*, 54(4), 784-795.
- 3) Mann, E. (2017). Dysphagia (children): *Evaluation of feeding and swallowing difficulties* [Evidence summaries]. Retrieved from The Joanna Briggs Institute.
- 4) Joanna Briggs Institute. (2017). *Feeding and swallowing (children): Screening and outcome measurement* [Recommended practices]. Retrieved from The Joanna Briggs Institute.



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## Feeding and swallowing history

A thorough history provides insight into the nature and context of the child's feeding and swallowing issues (Cichero et al., 2012; Arvedson, 2008; Taylor-Goh, 2005). The information collected can help guide the feeding observation. While taking the history, it is important to consider the reason for the referral as well as the concerns identified by the caregiver and child, as these priorities may be different.



The [feeding and swallowing history guide](#) has been informed by multiple sources including CPGs, foundational textbooks and key papers (e.g. Kleinert, 2017; Arvedson, 2013; Cichero et al., 2012; Taylor-Goh, 2005; Arvedson & Lefton-Grief, 1998). It can serve as a guide for completing the feeding and swallowing history and details how this information can be used.

### EVIDENCE REVIEW

#### The importance of a collaborative approach in feeding and swallowing evaluation and management:



Children with developmental and physical disabilities may have physical, sensory and other concerns that influence their feeding and swallowing abilities (Sheppard, 2008). Engaging clinicians from various disciplines brings together a wide range of knowledge and skills which can help ensure that the care provided is timely, efficient and considers many aspects of feeding and swallowing (Joanna Briggs Institute, 2009; Taylor-Goh, 2005; Miller et al., 2001).

According to Cichero et al. (2012) working within a collaborative team for dysphagia management can:

- Provide support for children and their caregivers
- Reduce the risk of aspiration
- Lessen feeding difficulties
- Reduce the risk of mortality
- Ensure that service needs are met (e.g. referral to another clinician or instrumental follow-up assessment)
- Improve nutrition
- Foster the development of coordinated assessment protocols, joint goals, timely intervention and an agreed common approach to the involvement of clients and caregivers



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## Feeding and swallowing history guide

### GENERAL HISTORY AND IDENTIFICATION OF CONCERNS

#### ○ Diagnosis/concerns

- Does the child's primary diagnosis predispose them to feeding and swallowing issues (e.g. *Cerebral Palsy, Down Syndrome, Muscular Dystrophy*)?
- Does the child have any medical or developmental conditions that may impact their feeding and swallowing (e.g. *asthma, gastro-esophageal reflux disease [GERD], constipation, developmental delay, hypotonia, weakness*)?
- Has the identified feeding and swallowing issue been a longstanding stable developmental issue versus a progressive decline; versus an acute change (e.g. feeding refusal following a choking episode or illness)?

#### ○ Development

- Gather information to determine the child's [overall level of development](#) by asking about gross and fine motor, communication, cognitive and adaptive skills to assist with goal setting.

#### ○ Medications

- What medications have been trialled to help manage medical issues?
- Do any of the medications have potential side effects that may impact feeding and swallowing (e.g. drowsiness or decreased appetite)?

#### ○ Previous tests and investigations

- Has the child had any imaging tests that may relate to feeding and swallowing (e.g. chest x-rays, CT scans, neuro-imaging, nasoendoscopy, videofluoroscopic swallow studies)?
- Has the child had any ER visits and/or inpatient hospital admissions? If so, how many and for what reasons?

Sources: Wilmott et al. (2012); Kliegman, Behram, Jenson, & Stanton (2007).

### CLINICAL PRACTICE RESOURCE



#### Development

For a detailed overview of a child's overall development and an explanation of developmental milestones, consult the following resource:

Andrews, D., & Dosman, C. (2015). *Developmental Milestones*. Available from: <http://pedscases.com/developmentalmilestones>

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REVIEW OF MEDICAL SYSTEMS 

The following is a list of some of the medical systems that commonly impact feeding and swallowing. The issues described are not exhaustive.



○ **Neurology**

- Ask if the child has seizures, as seizures increase the risk of aspiration acutely during the seizure itself or as a result of decreased level of consciousness/fatigue following a seizure.
- Ask about other neurologic conditions that may predispose a child to dysphagia and aspiration (e.g. stroke(s), increased intracranial pressure, hydrocephalus, encephalopathy).

○ **Ears, nose, throat (ENT)**

- Ask if there is a history of sialorrhea, vocal cord paralysis, presence of a tracheostomy, all of which may increase risk of aspiration.

○ **Cardiac**

- Ask if the child has any cardiac issues, as these may be associated with tachypnea (increased work of breathing), which can make coordinating breathing and swallowing more difficult and may predispose a child to aspiration.

○ **Gastrointestinal (GI)**

- Ask about the presence of GERD and constipation, which left untreated can lead to discomfort, feeding aversion, increased risk of aspiration and decreased appetite.

○ **Dental health**

- Ask about oral health (e.g. tooth brushing, oral care, dental visits) as poor oral hygiene and gingivitis can increase risk of infection when oral secretions are aspirated. In addition, if dental caries are left untreated, they can lead to significant inflammation, pain and eventual feeding aversion.



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Review of Medical Systems (cont'd)

**Respiratory**

- Check for signs and symptoms of [acute and/or chronic aspiration \(Figure 2\)](#)
- Identify if there is a history of tachypnea or increased work of breathing (e.g. asthma, cardiac issues or acute viral infection) or invasive/non-invasive respiratory support
- [Assess the pattern of illness](#)

Aspiration may present in a number of subtle ways which are outlined in [Table 1](#). Although any of these conditions/symptoms can be indicative of aspiration, they may not be indicative in isolation. When a child presents with a grouping of these conditions/symptoms, without another identified etiology that adequately explains the symptoms, then further clinical investigation into aspiration is warranted.

**Table 1: Possible signs and symptoms of aspiration on history and on physical examination**

Adapted from Mikita & Callahan (2014). Sources: Wilmott et al. (2012); Kliegman et al. (2007); Arvedson & Lefton-Grief (1998).

**History**

- Lung inflammation (e.g. asthma, bronchiolitis, interstitial lung disease)
- Choking, gagging, coughing or spitting during feeds
- Noisy breathing (e.g. wheezing, stridor, congestion)
- Apnea, bradycardia, cyanotic episodes
- Symptoms of GERD (e.g. recurrent vomiting, hoarseness, sore throat, throat clearing, throat irritation, chronic cough, sinusitis, laryngitis, otitis media, globus sensation, hiccups)
- Chest pain
- Recurrent fever
- Night time symptoms (unexplained nocturnal fevers, night sweats, wheezing or cough)
- Excessive salivation/drooling
- Recurrent respiratory infections (e.g. bronchitis, pneumonia, purulent sputum)
- Findings on pulmonary imaging (e.g. abscess, fibrosis, bronchiectasis)
- Failure to thrive (secondary to calorie wasting)



**Physical Examination**

- Congenital malformations (e.g. cleft palate)
- Fever
- Adventitious breath sounds (e.g. wheezing, stridor, crackles, noisy breathing)
- Increased work of breathing (e.g. grunting, tachypnea, flaring, retractions)
- Cough (note characteristics, timeframe, triggers)
- Chronic nasal and/or chest congestion
- Low oxygen saturation (e.g. clubbing, hypoxemia, cyanosis)
- Wet voice or breathing, hoarse voice or cry
- Failure to thrive
- Irritability
- Excess drooling
- Oropharyngeal signs of GERD (e.g. dental erosions)



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Review of Medical Systems (cont'd)

**Acute aspiration**

- Coughing
- Wheezing
- Tachypnea and/or respiratory distress
- Fever
- Pneumonia
- Pneumonitis
- Fever
- Respiratory distress
- Low oxygen
- Choking or gagging episode

**Chronic aspiration**

- Chronic cough
- Recurrent wheezing
- Intermittent fever
- Chronic chest congestion or wet breathing
- Recurrent chest infections (e.g. pneumonia)
- Apnea
- Failure to thrive
- Choking or gagging with feeds

**Figure 2: Acute aspiration versus chronic aspiration**

Adapted from Kliegman et al. (2007).

*Note:* It is important to remember that silent aspiration either acute or chronic may have no overt signs or symptoms.



**DEFINITIONS**

**Aspiration:** The passage of material below the level of the true vocal folds into the trachea (Arvedson, 2008, p. 119)

**Penetration:** The entrance of materials into the laryngeal vestibule without passage below the level of the true vocal folds (Logemann, 1993)

**Acute aspiration:** Sudden aspiration event in relative isolation (Mikita & Callahan, 2014)

**Chronic aspiration:** Recurrent aspiration of gastric, nasal or oral contents (e.g. saliva, food, liquids) (Mikita & Callahan, 2014)

**Silent Aspiration:** No coughing, choking or other signs of problems when food or liquid enters the trachea (Arvedson, 2008, p. 119)

**CLINICAL PRACTICE TIP**



Assessing the pattern of illness

A sudden recurrent fever (every few weeks to months) with no presence of a clear trigger may be more suggestive of chronic aspiration, compared to recurrent fevers preceded by viral symptoms (e.g. runny nose, coughing, sneezing) which are less suggestive of aspiration.

Recurrent infections occurring in winter months only is more suggestive of a recurrent viral cause whereas fevers throughout the year may point to aspiration.

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**NUTRITION AND HYDRATION**



Obtain the child's overall nutrition history, including anthropometric measurements, dietary intake and/or enteral feeding regimen. This information will help to identify the child's current nutritional status.



○ **Anthropometric measurements**

- Obtain the child's weight, height/length and skinfold measurement history if available.
- Consider using alternative stature measurement methods (e.g. segmental, ulna, knee height) if the child has a spinal curvature, as this will affect the interpretation of nutritional status.
- When measuring current weight and height, attempt to use the same methods of measurement that have been used previously for a comparison.
- Consider measuring the child's triceps skinfold to address concerns related to malnutrition by estimating child's body fat stores and muscle mass.

○ **Interpretation of anthropometric measurements**

- Use appropriate [growth charts](#) for plotting weight and height to monitor the child's growth.
  - It is recommended that diagnosis specific growth charts be used **in conjunction** with standard growth charts from the [World Health Organization \(WHO\)](#) or [Centre for Disease Control and Prevention \(CDC\)](#) when evaluating a child's nutritional status.
- Monitor if the child is following their own growth curve for:
  - Weight-for-length or Body Mass Index (BMI)
  - Weight-for-age
  - Height/length/stature-for-age
- Identify and evaluate the child's recent rate of weight gain and height growth.
- Determine the percentage of ideal body weight to identify the risk of malnutrition.
- Consult with a physician and/or dietitian if the child's growth trend is crossing percentiles over time.

**CLINICAL PRACTICE RESOURCE**



Growth charts

Growth charts are available for children with specific diagnoses:

Waisman Centre. (2010). *Special needs growth charts*. Available from: <https://www.waisman.wisc.edu/wic/pdf/08-charts.pdf>

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Nutrition and hydration (cont'd)

○ **Diet recall**

- Complete a **diet recall** to help identify the:
  - **Types** of food and liquid typically consumed
  - **Amount** of food and liquid intake per day
  - **Timing and duration** of meals and snacks (including both food and liquid)
  - How food is prepared and cooked if homemade (e.g. add spices, steam, serving temperature)
  - Dietary preferences, restrictions and food intolerances (e.g. culturally relevant food, gluten allergy, lactose intolerance)
- Obtain a complete enteral feeding schedule (e.g. water flushes, feeding rate, formula volume) if the child is on enteral nutrition support.

○ **Interpretation of the diet recall**

- Evaluate caloric and nutrient intake:
  - Compare the child's current daily intake to their estimated requirement, including calories, macronutrients (e.g. protein, fat, carbohydrate) and micronutrients (e.g. calcium, iron)
  - Evaluate if the portion size offered to the child is age appropriate
- Evaluate fluid intake:
  - Compare the child's current daily fluid intake to their estimated requirement, including the water content in beverages and foods (e.g. purees, fruits) that the child consumes
  - Ask about the child's urine output: Number of wet diapers that the child has per day? Is the urine concentrated (i.e. strong odor and darker colour)?
  - How many bowel movements does the child have per day?

*Note:* Consider excluding the amount of undigested food/formula fed if child has frequent emesis when evaluating caloric intake.

**CLINICAL PRACTICE TIP**



Growth curves

Monitoring the child's growth trend over time on a growth chart provides a greater understanding of nutritional status than when looking at a single point on the chart.

In practice, the relative proportion of weight to length/height is more important than a weight or height value alone (Penagini et al., 2015).

**CLINICAL PRACTICE RESOURCE**



Fluid content

Adequate hydration is paramount in supporting medical and nutritional stability. Solid foods, purees and beverages may all contribute differently to the child's daily fluid intake. Keep this in mind when making recommendations.

The water contents of commonly consumed foods and beverages can be found here:

Dahl, W. (2016). *Pureed foods, thickened beverages, and water needs*. Food Science and Human Nutrition Department, UF/IFAS Extension. Available from: <https://edis.ifas.ufl.edu/pdf/files/FS/FS21800.pdf>

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Nutrition and hydration (cont'd)

○ Evaluate efficiency:

- Assess the length and frequency of meals and snacks required to meet the child's nutrition and hydration needs. Determine if this is acceptable based on both the child and caregiver's perceived quality of life.
- The efficiency evaluation informs recommendations for caloric density, pacing and portion size of food/liquids required to meet child's daily nutrition and hydration requirements.



*Note:* A child's dietary intake may also become inadequate and inefficient as his/her nutritional requirements increase with age.

Sources: Scarpato et al. (2017); Penagini et al., (2015); Kuperminc et al. (2013); Samson-Fang (2014); Arvedson (2006); Taylor-Goh (2005).

*Note:* Discussion about G-tube initiation and weaning are outside the scope of this handbook. When supporting a child who is on enteral feeds, it is important to obtain the child's enteral feeding regimen to assist in the initiation or progression of oral intake. The enteral feeding regimen may need to be adjusted accordingly to support the nutrition and feeding care plan. Please consult with child's physician and/or a dietitian.

CLINICAL PRACTICE RESOURCE



Portion size

Interpretation of the diet recall requires consideration of portion sizes. There are several resources that outline recommended portion sizes relative to age:

- 1) NutriSTEP® (2012). *How to build a healthy toddler*. Available from: [http://www.nutristep.ca/en/pdfs/HealthyToddler\(E\)-June2012-final.pdf](http://www.nutristep.ca/en/pdfs/HealthyToddler(E)-June2012-final.pdf)
- 2) American Academy of Pediatrics, Committee on Nutrition (2016). *Serving sizes for toddlers*. Available from: <https://www.healthychildren.org/English/ages-stages/toddler/nutrition/Pages/Serving-Sizes-for-Toddlers.aspx>

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**FOOD TEXTURES AND LIQUID CONSISTENCIES**



○ **Food texture**

- Gather information on the textures that the child eats:
  - Does the child cough, choke or gag on any textures?
  - Does the child refuse any textures?
- Does the caregiver prepare the child's food differently from other family members (e.g. pureed, mashed, cut into small pieces, moistened with sauces)?
- Check if texture modification recommendations have already been made by another clinician and understand why.

○ **Liquid consistency**

- Gather information on the liquid consistencies the child consumes:
  - Does the child cough or choke on any consistency?
  - Does the child refuse any liquid consistency?
- Does the child prefer their fluids given in certain way (e.g. cold, carbonated, enhanced flavours)?
- Check if consistency modification recommendations have already been made by another clinician and understand why.

○ **Mixed or combined texture and consistency**

- Ask if the child consumes [mixed textures/consistencies of foods](#):
  - Mixed textures/consistencies are foods that contain two (or more) different textures/consistencies (e.g. chicken noodle soup, cereal with milk). Chunky purees are a prime example of mixed textures since they contain both a puree and soft solids.
- Does the child cough, choke or gag on or refuse mixed textures/consistencies?

Sources: Cichero et al. (2012); Arvedson (2006); Taylor-Goh (2005); Arvedson & Lefton-Grief (1998).

**CLINICAL PRACTICE RESOURCE**



Texture and consistency guidelines

Guidelines have been created that standardize the definitions of different textures and consistencies. These can be used to aid in clinical decision making. Two commonly used guidelines are the:

- 1) National Dysphagia Diet Task Force, American Dietetic Association [NDD] (2002). *National dysphagia diet: Standardization for optimal care*. Chicago, IL: American Dietetic Association.
- 2) The International Dysphagia Diet Standardization Initiative [IDDSI] (2016). *Complete IDDSI framework & descriptors*. Available from: <http://iddsi.org/framework/>

The following chart outlines how the terms used by the NDD and IDDSI are comparable:

	NDD	IDDSI
Liquid consistency	Thin	Thin
	Nectar-thick	Slightly thick
	Honey-thick	Mildly thick
	Pudding/spoon thick	Moderately thick
		Extremely thick
Food texture	Pureed	Liquidised
		Pureed
	Minced	Minced and moist
	Soft	Soft and bite-sized
	Regular	Regular



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FEEDING CONTEXT



Typical feeding position(s) and feeders

- Identify the following:
  - Locations where the child is fed by a caregiver (i.e. home, school, grandparents' home)
  - Where the family typically eats (e.g. floor, table, couch)
  - How the child is positioned when eating/drinking (e.g. sitting, standing, reclined)
  - Positioning equipment that is used to assist with feeding (e.g. wheelchair, stroller, highchair)
  - If the feeding position is the same across environments (e.g. home versus school)
  - Who feeds the child or if they feed independently
  - If feeding performance changes with different feeders

Feeding method

- Identify the following:
  - How the child is fed solids (e.g. spoon, fork, by hand)
  - How the child takes liquid (e.g. bottle, cup, sippy cup, straw, spoon)
  - The need for distractions in order to eat (e.g. TV, tablet, music)
  - If the mealtime routine is structured or unstructured (e.g. seated at a table versus walking around while eating or grazing)
  - If the child is fed asleep

Other clinicians

- Clarify if there are other health professionals already involved in the child's care that should be consulted.
- Determine what recommendations have been made and if they have been implemented and helpful.

Sources: Cichero et al. (2012); Clark, Avery-Smith, Wold, Anthony, & Holm (2007); Arvedson (2006); Taylor-Goh (2005); Arvedson & Lefton-Grief (1998).

CLINICAL PRACTICE TIP



Cultural considerations

Be aware that cultural values, beliefs and practices can significantly influence feeding (e.g. the family may eat with their hands, may sit on the floor to eat, may provide culturally relevant foods) (Philipps, Reinhart, Rohde, Virgil, & Moser, 2012).

CLINICAL PRACTICE RESOURCE



Clinical evaluation

The following resources provide further information for completing a feeding and swallowing history:

- 1) American Speech-Language-Hearing Association. (2017). *Pediatric dysphagia: Resources*. Available from: <http://www.asha.org/PRPSpecificTopic.aspx?folderid=8589934965&section=Resources>
- 2) Arvedson, J., & Lefton-Greif, M. (1998) *Pediatric videofluoroscopic swallow studies: A professional manual with caregiver guidelines*. Texas, SA: Communication Skill Builders.
- 3) Arvedson, J., & Brodsky, L. (2002). *Pediatric swallowing and feedings: Assessment and management* (Ed.). Albany: Singular Publishing Group.
- 4) Shaker, R., Easterling, C., Belafsky, P., & Postma, G. (2013). *Manual of diagnostic and therapeutic techniques for disorders of deglutition*. (Eds). New York: Springer.

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## Feeding observation

After gathering the child's [feeding and swallowing history](#), the next step is observing how the child is typically fed, as what is observed may be different than what is reported in the feeding and swallowing history (Arvedson, 2008). The purpose of the feeding observation is to assess how the child's motor, sensory and cognitive skills, as well as the physical environment impact feeding and swallowing (Taylor-Goh, 2005). Attention needs to be paid to the child-caregiver interaction since the caregiver often plays an essential role in supporting the child's feeding (Arvedson, 2008; Schuberth, Amirault, & Case-Smith, 2010). For the feeding observation, ask caregivers to bring a wide range of food textures and liquid consistencies that the child has in a typical day. Start with the texture and consistency that the caregiver reports the child is most comfortable with from the [diet recall](#) (Cichero et al., 2012).



### CLINICAL PRACTICE TIP

#### Completing the feeding observation

- 1) Recommendations should be provided only after a feeding observation has been completed. If the child is too agitated or distressed to participate in a feeding observation, try observing from another room (e.g. through a one-way mirror) or ask the caregiver for a video of a typical meal.
- 2) It is difficult for one person to observe all aspects of a feeding observation at once. Therefore, working with a team can be helpful. If working with a team is not possible, try focusing on one aspect of the observation at a time.



### CLINICAL PRACTICE RESOURCE



#### Feeding observation

Feeding observations should be based on the information obtained in the [feeding and swallowing history](#). The following are resources that can be consulted for more information:

- 1) Arvedson, J., & Lefton-Greif, M. (1998). *Pediatric videofluoroscopic swallow studies: A professional manual with caregiver guidelines*. Texas, SA: Communication Skill Builders.
- 2) Arvedson, J. (2008). Assessment of pediatric dysphagia and feeding disorders: Clinical and instrumental approaches. *Developmental Disabilities Research Reviews* 14(2), 118-127.
- 3) Schuberth, L, Amirault, L., & Case-Smith, J. (2010). Feeding intervention. In J. Case-Smith and J. O'Brien (Eds.) *Occupational therapy for children (6th ed.)* (pp. 446-473). Maryland Heights, MO: Mosby-Elsevier.

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## Feeding observation guide

The feeding observation guide has been informed by multiple sources. Choose the elements that are appropriate to the child.

### Before the feeding

Areas of observation	What to observe	Impact on feeding and swallowing function
<b>Positioning</b>	<p>Observe the child's current feeding position:</p> <ul style="list-style-type: none"> <li>• Are they having difficulty maintaining their postural stability (e.g. leaning to the side or having trouble staying upright)?</li> <li>• Are they lying down, reclined or eating with their neck in extension?</li> <li>• How is the positioning of the feeder affecting the child?</li> </ul>	<p>Poor <a href="#">positioning</a> during feeding can result in swallowing safety issues. It can also lead to suboptimal oral motor functioning and self-feeding skills.</p>
<b>Baseline neurological state</b>	<p>Be aware of the child's state at the start of the meal:</p> <ul style="list-style-type: none"> <li>• Is the child awake, alert, content, sleepy, irritable?</li> <li>• Are there persistent reflexes, posturing or dystonia that impact positioning?</li> </ul>	<p>The child's state before feeding can impact all aspects of their feeding and swallowing performance (e.g. a child fed while sleepy or crying may be at higher risk of aspiration) (Oxford &amp; Findlay, 2015).</p>
<b>Baseline respiratory status</b>	<p>Listen to the child's breathing and note:</p> <ul style="list-style-type: none"> <li>• Coughing frequency</li> <li>• Breathing rate (within normal limits versus rapid)</li> <li>• Presence of wet sounds or stridor</li> <li>• Voice quality (normal, breathy, hoarse, wet)</li> </ul>	<p>Noting the child's baseline respiratory sounds before feeding will allow for comparisons to be made during and after feeding to see if there is a change.</p>
<b>Caregiver-child interaction</b>	<p>Observe how the caregiver prepares the child for feeding:</p> <ul style="list-style-type: none"> <li>• Is the child able to explore the food first?</li> <li>• Is the child encouraged to participate?</li> </ul>	<p>How the caregiver prepares the child for the meal can indicate how the caregiver is reading the child's cues and how ready the child is for the meal.</p>

Feeding observation guide (cont'd)

**During the feeding**

**Areas of Observation**

**What to observe**

**Impact on feeding and swallowing function**

**Food textures**

Note the food textures and liquid consistencies fed to the child:

- Thin liquid, nectar liquid, honey liquid
- Thin, medium, thick puree (smooth, textured or lumpy)
- Mashed, minced, soft solids, "crunchy dissolvables", harder solids, mixed consistencies

*Note:* Terms used for both IDDSI and NDD textures and consistencies are described [here](#).

Determine if there is a match between the food and liquid consistencies given and the child's current [developmental feeding level](#). Mixed textures can negatively impact safety because:

- 1) The puree component elicits a suckle-swallow pattern (Stolovitz & Gisel, 1991), causing the puree and soft solid components to be quickly transported to the back of the child's throat, which may increase the risk of choking.
- 2) Managing both a solid and liquid at the same time may pose an aspiration risk (Steele et al., 2015; Kang, Kim, Seo, & Seo, 2011).

**Feeding method**

Observe the pace (feeding rate):

- Is the child being fed too quickly or too slowly?
- Is the child ready for the next bite/sip at the same time the feeder presents it?
- Does feeding continue despite indications from the child that a break may be needed?

An appropriate feeding pace can facilitate eating and drinking. However, a pace that is too fast or too slow can impact feeding safety, efficiency and make feeding more challenging for the child.

Observe the volume (how much) the child is given at once:

- Is the bite/sip too large or small for the child to manage?
- Is the portion size offered to the child appropriate?

An appropriate sized bite or sip can facilitate eating and drinking. Volumes that are too large can cause coughing/choking or result in significant oral loss. This can impact feeding safety, efficiency and negatively impact the feeding experience.

Observe if the feeding equipment (e.g. cups, spoons) is appropriate for the child:

- Is the spoon too big or too small?
- Can the child get liquid from the cup/bottle?
- Does the liquid come out of the cup/bottle too quickly?
- Are the cups and utensils appropriate for the child's developmental level?

Using cups or utensils that do not match the child's size and developmental level may result in issues that appear to be skill related (e.g. difficulty closing lips on the spoon if the spoon is too big or can't target bringing the spoon to mouth if the handle is too long). The child may possess the needed skills if given the appropriate equipment.

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Feeding observation guide (cont'd)

During the feeding

Areas of observation

What to observe

Impact on feeding and swallowing function

Feeding Method

(cont'd)

Observe the techniques used by the caregiver to feed the child:

- Placement of food/spoon/straw in the mouth
- Use of stabilization techniques (e.g. jaw, head, trunk)
- Method to remove food from spoon (i.e., dump, scrape against teeth, prompt lip closure with physical cueing)

Assess if the techniques currently being used by the caregivers are enabling the child's optimal feeding performance.

Evaluation of oral-motor structure and function

Evaluate oral structures as well as oral coordination. Note their function with different food and liquid consistencies and different feeding methods (e.g. spoon/cup/bottle). Pay attention to:

Mouth structure

- Presence of high arched palate, cleft palate, malocclusion of teeth or jaw

While it is helpful to look in their mouth before eating, this information can be gathered during the observation if the child won't allow oral examination.

Tongue

- Tongue size (e.g. macroglossia)
- Tongue position at rest (e.g. inside mouth or protruding, symmetrical, flat, bunched)
- Tongue movement while eating (e.g. forward/backward sucking motion only, protrusion while eating, lateral movement to one side/both sides, able to elevate tongue, tongue moves independently of jaw)
- Presence of suck reflex (appropriate or inappropriate)
- Protrusion of food from mouth with tongue (i.e. pushed out)

The presence of a suck reflex impacts [texture progression](#) and [cup selection](#). Difficulties or delays in tongue coordination significantly affect texture progression and learning to chew. For example, a forward-backward tongue movement is a more immature tongue movement, while [tongue lateralization](#) is a more mature motion which allows the tongue to move food to the molar surfaces for chewing.

Lips

- Lip position at rest (e.g. closed, open, symmetry)
- Lip movement while eating (e.g. adequate/weak/no lip closure on spoon or during sucking/chewing, equal contribution of both upper and lower lip)
- Oral loss of food or liquid while eating/drinking

Poor lip closure can impact anterior oral loss, spoon feeding efficiency, as well as the development of [self-feeding](#) skills.

Feeding observation guide (cont'd)

**During the feeding**

**Areas of observation**

**What to observe**

**Impact on feeding and swallowing function**

**Evaluation of oral-motor structure and function**  
(cont'd)

**Jaw**

- Jaw position at rest (e.g. open, closed, symmetrical)
- Jaw movement while eating (symmetrical, graded jaw opening and closing)
- Ability to sustain a bite or presence of tonic bite reflex

The inability to sustain a bite may explain challenges managing solid foods. Tonic bite reflex may also impact choice of foods that can be provided safely, [spoon selection](#) and feeding methods (i.e. not pulling on spoon when biting on it).

**Oral residue**

- Amount of residue on tongue after swallowing
- Pocketing of food on sides of mouth or on palate
- Number of swallows to clear food from mouth

Residue in the mouth may indicate decreased tongue coordination or oral sensation.

**Drooling**

- At rest
- During feeding

Drooling may be within normal limits until five years of age (Arvedson & Brodsky, 2002) but may negatively impact feeding because of excessive secretions.

**Food refusal**

- Textures/consistencies that the child refuses
- Textures/consistencies that cause the child to gag or cough

Determining the properties of refused foods or foods that are associated with gagging or coughing may help clarify why it is occurring.

**Swallowing foods whole/mouth stuffing**

- Solid textures that the child swallows whole
- Solid textures that the child never swallows whole
- The amount of food the child places in their mouth (e.g. placing too much food in mouth or taking more food while mouth is still full)

Swallowing food whole or mouth stuffing likely indicates a [sensation concern](#). Hard consistencies (e.g. cookies) provide increased sensory feedback whereas soft textures (e.g. pasta) may not be adequately sensed. If a child swallows soft textures whole but not hard textures, it may indicate that they do not sense that the softer consistency needs to be chewed. This puts the child at increased risk of choking.

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Feeding observation guide (cont'd)

**During the feeding**

**Areas of observation**

**What to observe**

**Impact on feeding and swallowing function**

**Evaluation of swallowing**

- To clinically assess swallowing watch or listen for:
- Timing of swallow (e.g. whether swallow seems prompt or delayed)
  - Number of swallows after each bite/sip
  - Sounds consistent with pharyngeal residue (wet voice sounds, gurgling)
  - Sounds consistent with aspiration (coughing, squeaks)
  - Assess respiratory status

Look for [clinical signs of aspiration](#) during swallowing of foods and liquids. Concerns noted on observation should be combined with concerns noted during the [feeding and swallowing history](#). It is with this full picture that [hypotheses](#) can be generated and potentially tested using an [instrumental swallowing assessment](#) (when appropriate).

**Clinical signs of GERD**

- Note any potential signs of GERD during feeding:
- Gagging, vomiting, rumination
  - Arching, chest pain/discomfort, grimacing
  - Burping, hiccupping
  - Throat clearing or coughing

Read about the implications of GERD on feeding in the [feeding and swallowing history](#) section.

**Self-feeding**

- Gather an initial impression of the child's current self-feeding skills and the level of assistance required to:
- Finger feed and/or use utensils
  - Use a bottle, sippy cup, open cup, straw
- Evaluate if the:
- Utensil size is appropriate for child
  - Child is motivated to feed them-self
  - Caregiver allows the child to feed or attempt to feed them self

More details are provided in the [self-feeding](#) section.

**Caregiver-child interactions**

- The position of the caregiver when feeding the child
- The caregiver's responsiveness to the child's cues
- If the caregiver engages in excessive face and hand wiping
- Whether the caregiver or child seems anxious during the feeding

Caregiver-child interactions may be an indication of caregiver readiness. Be sure to further explore these with the caregiver.

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Feeding observation guide (cont'd)

During the feeding

Areas of observation

Neurological state during the meal

What to observe

Observe the child's state during the meal and be aware of any changes that occur throughout the feeding in:

- Energy
- Attention/alertness
- Participation

Impact on feeding and swallowing function

If there are changes in the child's state during a meal, observe if this has an impact on the child's feeding performance.

Example: A child may be swallowing safely at the start of the meal but show signs of fatigue as the meal progresses, putting them at risk for aspiration. Testing for fatigue may be done on [instrumental swallowing assessment](#).

After the feeding

Areas of observation

Caregiver-child interaction

What to observe

Observe if the caregiver reads the child's satiety cues and stops the feeding appropriately.

Impact on feeding and swallowing function

Misinterpretation of satiety cues can lead to GERD when the child is overfed or frustrated if underfed.

Respiratory status and clinical signs of aspiration after feeding

Listen to the child's breathing after feeding to determine if there are any [changes from baseline sounds](#). Observe if there is a delayed cough/throat clearing.

A comparison between baseline and post-feeding sounds can give information about swallowing safety. It may help in [hypotheses generation](#) to test on [instrumental swallowing assessment](#).

Clinical signs of GERD

Note any potential signs of GERD:

- Gagging, vomiting, rumination
- Arching, chest pain/discomfort, grimacing
- Burping, hiccupping
- Throat clearing or coughing
- Hoarseness

See possible implications of GERD on feeding in the [feeding and swallowing history](#).

Sources: Cichero et al., (2012), Taylor-Goh, (2005), Arvedson (2008), Arvedson & Lefton-Grief (1998).



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## Feeding observation: Cervical auscultation

Cervical auscultation (stethoscope over lateral lamina of thyroid cartilage) is an assessment that can be used as an adjunct to the clinical evaluation (Cichero et al., 2012). Since this method may enhance your ability to hear the child's breathing and swallowing sounds, it may provide additional information on clinical assessment about a child's risk of aspiration (Frakking et al., 2016a). Examples of indicators identified by Arvedson and Lefton-Grief (1998) that can be heard during cervical auscultation are:

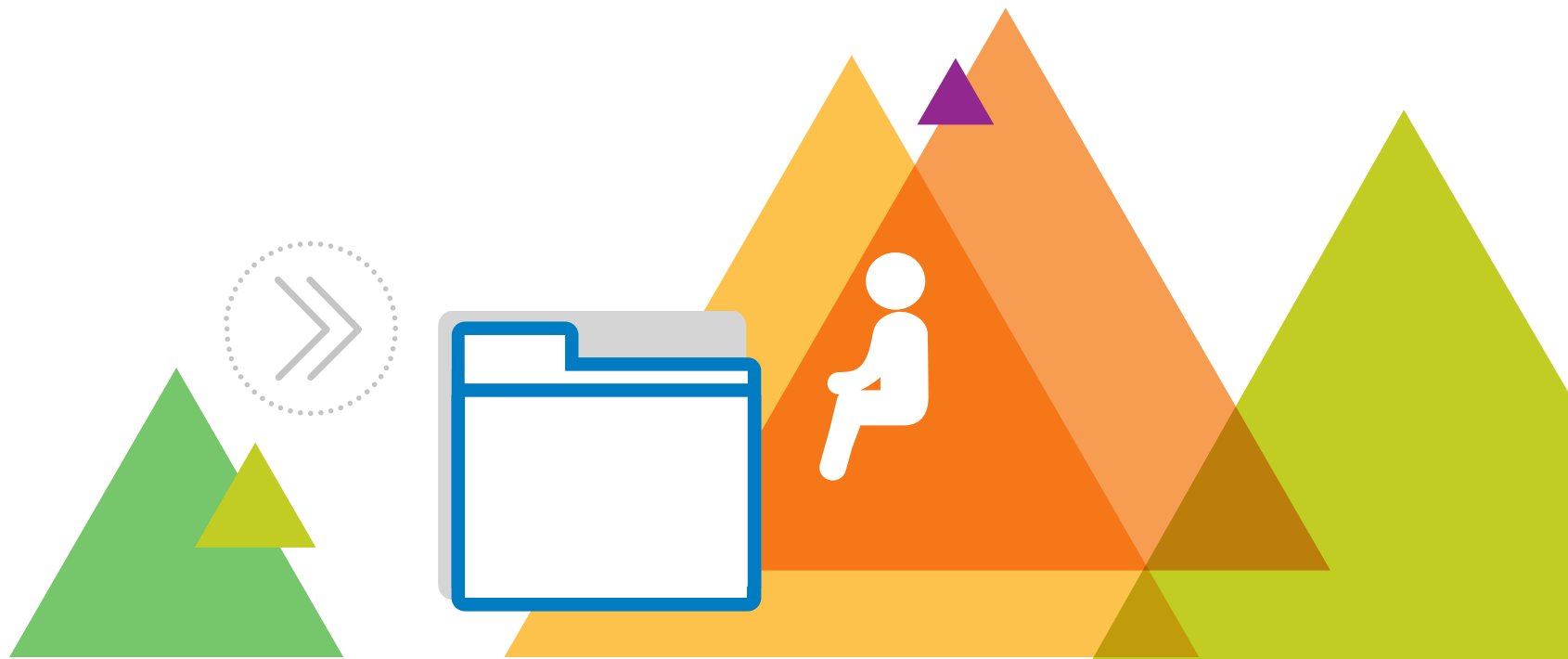
- Timing of the swallow
- Bolus transit
- Sounds consistent with aspiration (e.g. squeaks, stridor)
- Strength of swallow
- Sounds and timing of respiration
- Throat clear, cough and vocalizations
- Secretion management

### EVIDENCE REVIEW

#### The role of cervical auscultation



Evidence regarding cervical auscultation is inconsistent. However, recent pediatric research suggests that cervical auscultation can be helpful in predicting aspiration when combined with clinical evaluation (Frakking et al., 2016a; Frakking, Chang, O'Grady, David, Weir., 2016b). The aim of cervical auscultation is to support the clinical evaluation process, not to diagnose aspiration or replace instrumental assessment (Arvedson & Lefton-Grief, 2017).



## PART 3: ADDRESSING THE FEEDING AND SWALLOWING FRAMEWORK COMPONENTS

### Introduction

Once the clinical evaluation has been completed, the next step is to determine whether the child requires further evaluation and management of the foundational components of the feeding and swallowing framework prior to proceeding with management of skill development (Arvedson, 2006). The next sections of the handbook address how to proceed if the child requires further assessment and management of the following foundational components:

- [Medical](#)
- [Nutrition and hydration](#)
- [Swallowing safety](#)
- [Positioning](#)

If there are no concerns with the foundational components of the feeding and swallowing framework, move to the [skill development](#) section of the handbook.

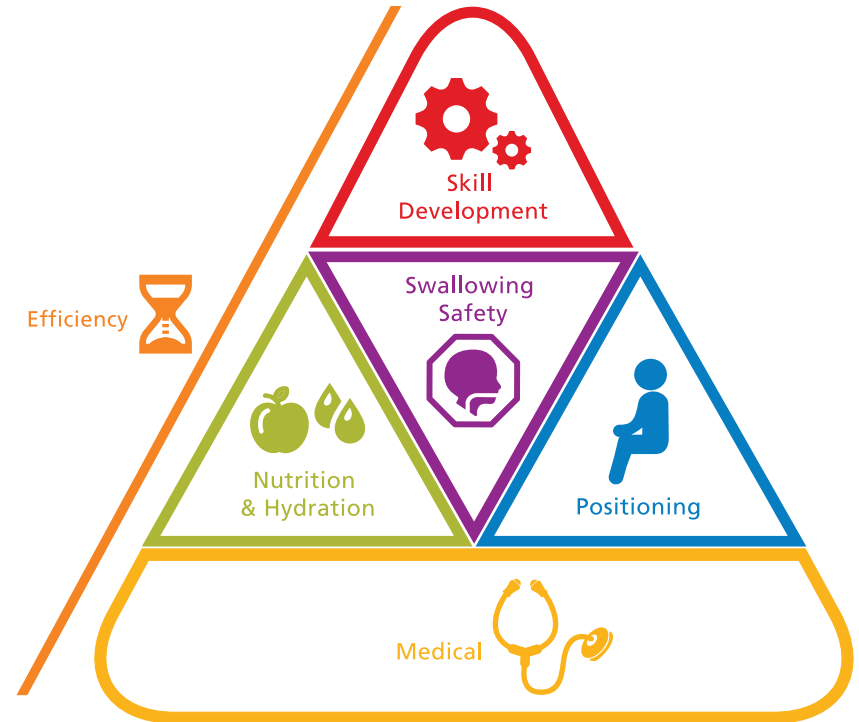


Figure 1: Feeding and swallowing framework

### Medical



Management of medical issues is outside of the scope of this handbook. If you are concerned that medical issues identified on your [clinical evaluation](#) are contributing to feeding and swallowing issues, ask the caregiver to follow up with the most appropriate physician. If you are unsure who is most appropriate, ask the caregiver to follow up with their pediatrician or family physician for further guidance. Don't hesitate to contact the physician's office directly to discuss your concerns.



# Nutrition and hydration



If nutrition and hydration issues have been identified following your [clinical evaluation](#), follow up with a physician or dietitian. Sometimes caregivers may continue to be concerned even after a clinical evaluation has revealed no issues from a nutrition and hydration status perspective. In both situations, management

of nutrition and hydration issues usually requires education and training. Some common caregiver nutrition and hydration concerns and accompanying strategies that may be helpful in addressing these concerns are presented in [Table 2](#):

**Table 2: Strategies to address common caregiver nutrition and hydration concerns**

FLUID INTAKE					
<p><b>Common concerns</b></p> <p>The caregiver is concerned that the child is not drinking enough</p>	<p><b>Ideas for strategies</b></p> <ul style="list-style-type: none"> <li>Revisit the <a href="#">diet recall</a>.</li> <li>Educate caregivers that a child's fluid requirement can be met through a variety of means. Discuss the <a href="#">fluid content</a> in foods (e.g. purees, soups) and beverages.</li> <li>Review strategies to optimize water retention (e.g. changing the method of cooking and food preparation, such as steaming rather than grilling).</li> </ul>				
<p>The caregiver is reluctant to use a commercial thickener (for a child who requires thickening for safety)</p>	<ul style="list-style-type: none"> <li>Provide education on the <a href="#">impact of commercial thickening agents</a> on the bioavailability of water.</li> <li>Discuss with caregivers how thickening agents may impact the amount of food/liquid a child consumes (Cichero, 2013) and provide strategies to mitigate.</li> </ul> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 10px;"> <table border="0"> <tr> <td>Thickening may prolong feelings of satiety and decreases thirst</td> <td>▶ Recommend frequent small volumes of thickened liquids throughout the day.</td> </tr> <tr> <td>Thickening may change the taste of food and beverages</td> <td>▶ Add natural flavours to food/beverages to enhance taste (e.g. lemon)</td> </tr> </table> </div> <ul style="list-style-type: none"> <li>Check individual thickening products for compatibility with breastmilk (Cichero, Nicholson, &amp; September, 2013).</li> <li>Provide education on alternative thickening options that use natural food ingredients (e.g. yogurt added to milk; applesauce added to apple juice) (Bell &amp; Alper, 2007).</li> </ul>	Thickening may prolong feelings of satiety and decreases thirst	▶ Recommend frequent small volumes of thickened liquids throughout the day.	Thickening may change the taste of food and beverages	▶ Add natural flavours to food/beverages to enhance taste (e.g. lemon)
Thickening may prolong feelings of satiety and decreases thirst	▶ Recommend frequent small volumes of thickened liquids throughout the day.				
Thickening may change the taste of food and beverages	▶ Add natural flavours to food/beverages to enhance taste (e.g. lemon)				

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Table 2: Strategies to address common caregiver nutrition and hydration concerns (cont'd)

**CALORIE INTAKE**

**Common concerns**

The caregiver is concerned the child is not eating enough

The child has too much anterior oral loss

**Ideas for strategies**

- Recommend changes to volume/portion sizes and [pacing](#). One common approach is to suggest 6 small frequent meals instead of three large meals a day. This recommendation can be helpful for children who take a long time to eat due to fatigue (Bell & Alper, 2007).
- Provide the caregiver with a list of nutrient-dense foods and beverages that will help the child meet their nutritional needs. Nutritional supplementation (e.g. formulas) and nutrient-dense foods/beverages (e.g. smoothies, stews) may be recommended to increase the child's overall calorie and fluid intake (Andrew, Parr, & Sullivan, 2012).
  - Make sure that the recommended options are safe textures/consistencies according to your assessment.
  - Consult with a dietitian for appropriate formula recommendations.
- Consider changing the texture or thickening to help decrease anterior oral loss.
- [Modify positioning](#)
- [Put less food on the spoon or use a smaller spoon](#)
  - Consider the impact on efficiency



**WEIGHT AND HEIGHT**

**Common concerns**

The caregiver is concerned about the:

- 1) Child's size (weight and height) in comparison to other children in the same age group
- 2) Child's percentile on the growth chart

**Ideas for strategies**

- If the child is following his/her growth curves, provide the caregiver with education on how to [interpret the growth curve and trend](#).
- Discuss the child's rate of weight gain and height growth from the clinical evaluation.
- Discuss how the child's primary condition may impact stature where appropriate.

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**CLINICAL PRACTICE RESOURCE**

Health Canada



To learn more about the dietary reference intake for various macronutrients, vitamins and minerals, refer to Health Canada's food and nutrition section:

Health Canada. (2010). *Food and Nutrition: Dietary reference intakes tables*. Available from: <http://www.hc-sc.gc.ca/fn-an/nutrition/reference/table/index-eng.php>

**CLINICAL PRACTICE TIP**

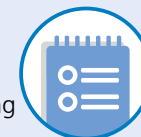
Consult a dietitian



Changing pacing and volume to improve the child's safety impacts nutrition and hydration recommendations. Work with the dietitian to make sure the child is meeting their nutritional requirements.

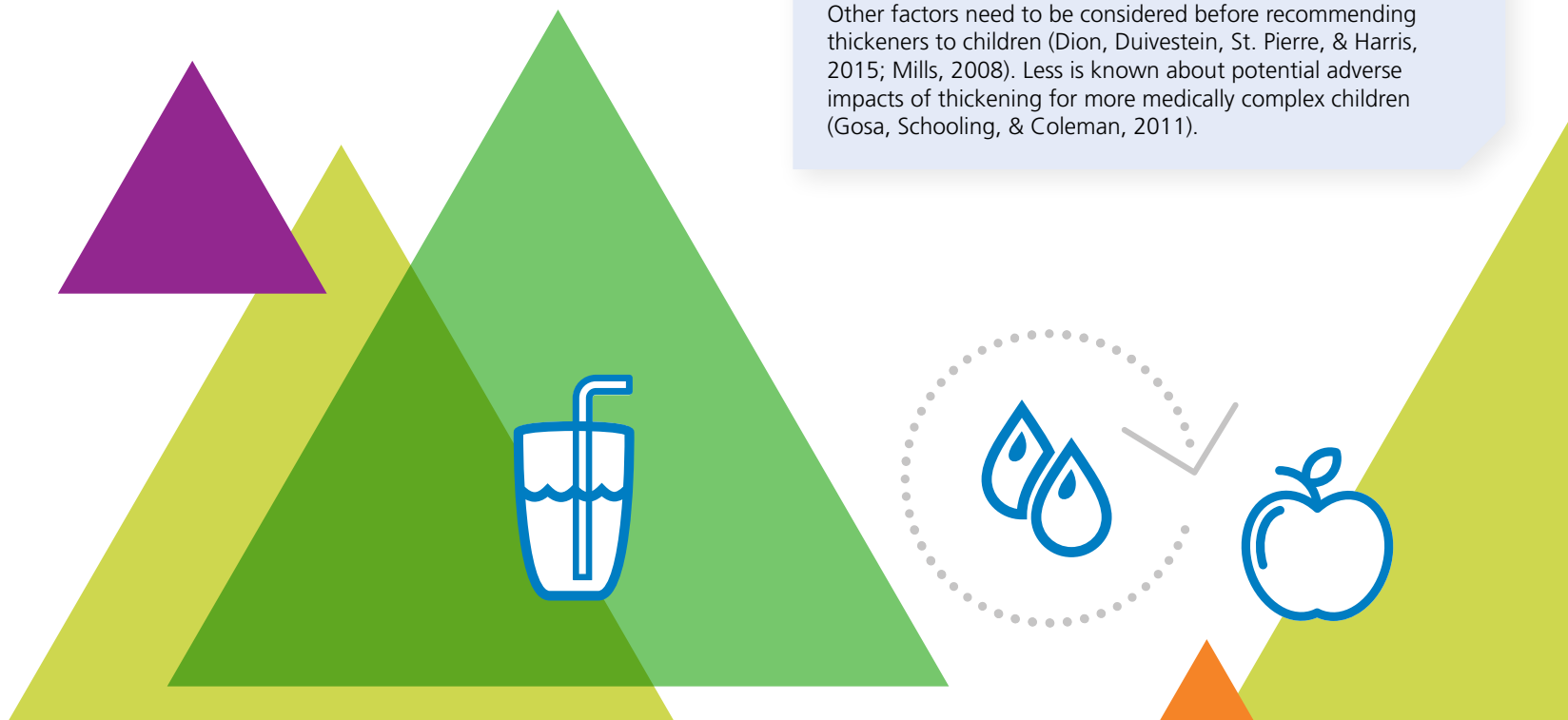
**EVIDENCE REVIEW**

Thickeners



Current evidence shows that commercial thickening agents do not impact the bioavailability of water in thickened liquids (Cichero, 2013). This holds true for various types of thickening agents (e.g. gum-based thickeners).

Other factors need to be considered before recommending thickeners to children (Dion, Duivesteyn, St. Pierre, & Harris, 2015; Mills, 2008). Less is known about potential adverse impacts of thickening for more medically complex children (Gosa, Schooling, & Coleman, 2011).



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# Swallowing safety

## Swallowing evaluation

If dysphagia concerns have been identified during the [feeding and swallowing history](#) and/or the [feeding observation](#), further evaluation of the child’s swallowing is needed (Kliegman et al., 2007). Dysphagia evaluation is completed using a **clinical assessment of swallowing** and may involve **instrumental assessment of swallowing**.

## Clinical assessment of swallowing

A clinical swallowing assessment may be required for different reasons at different times during the process of evaluating and managing pediatric dysphagia. A clinical swallowing assessment provides an opportunity to use information gathered during the feeding observation to generate hypotheses with respect to the child’s swallowing concerns, to trial and test the effectiveness of dysphagia management strategies and to guide decision-making as to whether further swallow evaluation via instrumental assessment is required (Arvedson & Lefton-Greif, 1998).

### CLINICAL ASSESSMENT OF SWALLOWING PROCESS

Regardless of the reason why the clinical swallowing assessment is being conducted, the following steps ([Figure 3](#)) may still be used to guide the process:



Figure 3: Clinical assessment of swallowing process

Sources: Arvedson & Lefton-Greif (1998); Logemann (1998).



### CLINICAL PRACTICE TIP

#### Swallowing evaluation

Controversy exists regarding the role of clinical evaluation in swallowing assessment and intervention. The clinical evaluation alone cannot confirm or rule out aspiration or determine abnormal swallowing physiology (Calvo, Conway, Henriques, & Walshe, 2010). A thorough clinical evaluation does provide valuable information necessary to make appropriate intervention recommendations (Beecher & Alexander, 2004) including the need for instrumental evaluation.



### CLINICAL PRACTICE RESOURCE

#### Common clinical presentations of dysphagia

More information on the clinical presentations of dysphagia can be found in:

Table 3.1 in Arvedson, J., & Lefton-Greif, M. (1998). *Pediatric videofluoroscopic swallow studies: A professional manual with caregiver guidelines*. San Antonio, TX: Communication Skill Builders.

Table 4.10 and 5.1 in Logemann, J. (1998). *Evaluation and treatment of swallowing disorders*. (2nd ed.). Austin, TX: PRO-ED, Inc.

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1) Dysphagia hypothesis generation

Review the information gathered from the [feeding and swallowing history](#) and the [feeding observation](#) to establish hypotheses to be tested on the clinical swallowing evaluation. [Figure 4](#) shows the two phases of dysphagia hypothesis development:

Phase 1: Clinical evaluation

Based on a combination of risk factors (including diagnosis, medical concerns, history, and clinical observations) an overall clinical picture of the swallowing safety concern(s) can be determined.

Risk of dysphagia related to diagnosis or medical concerns may include:

- Recurrent pneumonia, fevers, asthma
- Vocal fold damage
- Symptomatic cardiac issues
- Low or high muscle tone
- Seizures, change in level of consciousness
- Degenerative diagnoses

Risk of dysphagia based on symptoms identified during feeding observation may include:

- Coughing
- Wet voice sounds/squeaks associated with eating and drinking
- Watering eyes
- Multiple swallows
- Delayed swallows

Phase 2: Hypothesis generation

Dysphagia risks identified on history and/or observation

Sounds and symptoms indicative of aspiration (e.g. coughing, squeaks, wet voice sounds) and suspected **delayed** swallow

Sounds and symptoms indicative of aspiration (e.g. coughing, squeaks, wet voice sounds) despite suspected **prompt** swallow

Sounds and symptoms indicative of **pharyngeal residue** (wet voice sounds, gurgling, coughing, multiple swallows generated)

Report of overall developmental progress and/or decrease in signs/symptoms indicative of aspiration **but** there was silent aspiration noted on previous instrumental assessment

Potential hypothesis

- Suspect delay triggering pharyngeal swallow
- Suspect aspiration occurring before the swallow

- Suspect reduced vocal fold closure and/or reduced laryngeal elevation
- Suspect aspiration occurring during the swallow

- Suspect reduced tongue base movement, reduced pharyngeal wall contraction
- Suspect decreased sensory awareness of the bolus in the oral cavity or pharynx
- Suspect aspiration of residue after the swallow

- Since aspiration was silent on previous instrumental assessment, instrumental re-assessment will provide most reliable information when modifying recommendations

Figure 4: Dysphagia hypothesis generation

Adapted from Arvedson (2013); Wilmott et al. (2012); Kliegman et al. (2007); Arvedson & Lefton-Grief (1998); Logemann (1998).

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**2) Identify and test dysphagia management strategies**


Based on concerns noted during the [feeding and swallowing history](#), [feeding observation](#), and hypotheses generated, compensatory management strategies aimed at increasing the safety of the swallow should be trialed. Strategies that aim to change the characteristics or presentation of the bolus are categorized as compensatory strategies ([Table 3](#)) since they are used to compensate for oral-motor impairments without permanently changing swallowing physiology (O’Donoghue & Nottingham, 2017; Miller & Willging, 2013; Logemann, 1998).

When identifying and testing management strategies, keep the following in mind (Arvedson & Lefton-Grief, 1998; Logemann, 1998):

- 1) Choose to implement strategies that may make an immediate impact on swallowing safety.
- 2) Test strategies with the child and caregiver to determine if they are helpful in improving overall swallowing safety.
- 3) Look for changes in symptoms noted during the feeding and swallowing assessment.
- 4) Ensure the child and caregiver understand the intent of the strategies and that they are willing and able to implement them.

**Table 3: Compensatory strategies**

**Postural techniques**

Strategy	Rationale	What to look for	Considerations
<p><u>Positioning:</u></p> <ul style="list-style-type: none"> <li>• Try positioning the child more upright</li> <li>• Place their head in neutral position, not extended back</li> <li>• Use more supportive seating</li> </ul> 	<ul style="list-style-type: none"> <li>• Aims to decrease bolus flow and provide more control of bolus</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased symptoms of aspiration (e.g. coughing, squeaks, wet voice sounds, watery eyes)</li> <li>• Changes in the oral management of food/liquid presented</li> </ul>	<ul style="list-style-type: none"> <li>• Determine why the child was previously positioned differently</li> <li>• Recognize that other concerns (e.g. oral loss, drooling, lack of supportive seating) may need to be addressed</li> </ul>

Sources: Snider, Majnemer, & Darsaklis (2011); Redstone & West (2004); Arvedson & Lefton-Grief (1998); Logemann (1998).

**CLINICAL PRACTICE TIP**




What about active dysphagia therapy (e.g. manoeuvre, e-stimulation, biofeedback, exercise)?

While active dysphagia therapy is commonly used with adults, it can be challenging to implement these therapies with children depending on their ability to follow directions, self-monitor and their acceptance (Logemann, 2000). There continues to be limited evidence supporting their use in children (Christiaanse et al., 2011).



Table 3: Compensatory strategies (cont'd)

**Altering food texture or liquid consistency**

Strategy	Rationale	What to look for	Considerations
<ul style="list-style-type: none"> <li>Thicken purees or liquids</li> </ul>	<ul style="list-style-type: none"> <li>Aims to decrease bolus flow and increase control of bolus</li> <li>May decrease risk of aspiration due to delayed pharyngeal swallow and reduced laryngeal closure</li> </ul>	<ul style="list-style-type: none"> <li>Decreased symptoms of aspiration (e.g. coughing, squeaks, wet voice sounds, watery eyes)</li> <li>Increased control of bolus</li> <li>Possible decrease in oral loss of bolus</li> </ul>	<ul style="list-style-type: none"> <li>Use <a href="#">instrumental assessment</a> to determine if thickening in fact decreases aspiration risk; and the level of thickening required</li> <li>Consider if strategies other than thickening may also increase control of bolus and decrease aspiration risk</li> <li>Consider how thickening may impact other components such as <a href="#">nutrition and hydration</a></li> </ul> 
<ul style="list-style-type: none"> <li>Thin down purees or liquids</li> </ul>	<ul style="list-style-type: none"> <li>Aims to decrease the risk of aspiration due to pharyngeal residue</li> </ul>	<ul style="list-style-type: none"> <li>Less pharyngeal residue</li> <li>Fewer swallows required to clear each bolus</li> </ul>	<ul style="list-style-type: none"> <li>Use <a href="#">instrumental assessment</a> to determine if thinning in fact decreases residue</li> <li>Note that this strategy is used more often with children who have intact sensory awareness but decreased pharyngeal muscle strength to propel the bolus (e.g. spinal muscular atrophy)</li> </ul>

Sources: Arvedson (2013); Miller & Willging (2013); Gisel et al. (2003); Arvedson & Brodsky (2002); Arvedson & Lefton-Grief (1998); Logemann (1998).

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Table 3: Compensatory strategies (cont'd)

### Adjusting the bolus volume

Strategy	Rationale	What to look for	Considerations
<ul style="list-style-type: none"> <li>Decrease bolus size by:                             <ul style="list-style-type: none"> <li>taking a smaller sip or bite</li> <li>using a smaller spoon</li> <li>using a thinner straw</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Aims to reduce pharyngeal residue</li> </ul>	<ul style="list-style-type: none"> <li>Decreased number of swallows required to clear bolus</li> <li>Less oral loss</li> <li>Improved oral management of the bolus before swallowing</li> </ul>	<ul style="list-style-type: none"> <li>Use <a href="#">instrumental assessment</a> to determine if adjusting the bolus volume decreases aspiration risk</li> <li>Consider if a decrease in volume also decreases efficiency</li> </ul>
<ul style="list-style-type: none"> <li>Increase bolus size by:                             <ul style="list-style-type: none"> <li>taking a larger sip or bite</li> <li>using an open cup/straw</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Aims to heighten sensory awareness of bolus</li> </ul>	<ul style="list-style-type: none"> <li>Improved oral transit</li> <li>Appears to “lose” the bolus with small amounts but better control with larger amounts</li> </ul>	<ul style="list-style-type: none"> <li>Determine if this is an effective strategy to improve swallowing efficiency and safety</li> </ul>

Sources: Rizzo et al., (2016); Miller & Willging (2013); Peck & Rappaport (2013); Arvedson & Lefton-Grief (1998); Logemann (1998).


### Increasing sensory input of bolus

Strategy	Rationale	What to look for	Considerations
<ul style="list-style-type: none"> <li>Increase sensory input by making the bolus:                             <ul style="list-style-type: none"> <li>colder</li> <li>warmer</li> <li>carbonated</li> <li>more flavoured</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Aims to enhance sensory awareness</li> </ul>	<ul style="list-style-type: none"> <li>Improved oral transit</li> <li>More prompt trigger of the pharyngeal swallow</li> <li>Better clearance of residue</li> <li>Reduction in signs/symptoms consistent with pharyngeal residue</li> </ul>	<ul style="list-style-type: none"> <li>Determine if this is an effective strategy to improve swallowing efficiency and safety</li> </ul>

Sources: Lundine, Bates, & Yin (2015); Miller & Willging (2013); Logemann (2000); Arvedson & Lefton-Grief (1998); Logemann (1998).

Table 3: Compensatory strategies (cont'd)

### Adjusting pace of bolus presentation

Strategy	Rationale	What to look for	Considerations
<ul style="list-style-type: none"> <li>Slow down feeding by:                             <ul style="list-style-type: none"> <li>increasing the time interval between bites/sips</li> <li>using a slower flow cup/ slower flow nipple</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Aims to allow time for clearing and preparation for the next bolus</li> </ul>	<ul style="list-style-type: none"> <li>Increased clearance of mouth and/or pharynx</li> <li>Less oral loss</li> <li>Decrease in signs/symptoms of aspiration</li> <li>On <a href="#">instrumental assessment</a>, determine how many swallows and/or seconds it takes to clear residue</li> </ul>	<ul style="list-style-type: none"> <li>Use <a href="#">instrumental assessment</a> to determine if adjusting the pace decreases aspiration risk</li> <li>Consider whether slower feeding significantly increases meal length, resulting in decreased efficiency</li> </ul> 
<ul style="list-style-type: none"> <li>Coach the feeder on how to observe the child's cues (e.g. showing readiness for the next bite/sip)</li> </ul>	<ul style="list-style-type: none"> <li>Attending to the child's <a href="#">satiety cues</a> and providing appropriate volume/pacing is important for safety and a positive feeding experience</li> </ul>		
<ul style="list-style-type: none"> <li>Self-feeding</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Self-feeding</a> may slow down feeding and/or increase awareness of food approaching</li> </ul>		

Sources: Miller & Willging (2013); Peck & Rappaport (2013); Bailey & Angell (2008); Logemann (2000); Arvedson & Lefton-Grief (1998); Logemann (1998).

### 3) Make recommendations based on the results of the clinical swallowing assessment

Recommendations can include any one or combination of the following (Arvedson & Lefton-Grief, 1998):

- Positioning changes
- Alterations in bolus size, consistency, texture, sensory properties
- Utensil changes
- Changes in feeding schedule/pacing
- Oral stimulation program with food (taste stimulation) in addition to enteral nutrition support
- Non-nutritive oral motor stimulation program in addition to enteral feeding (for a child who is unsafe or not ready to eat by mouth)
- Discuss potential alternative methods of feeding such as enteral nutrition support

Consistently monitor and re-assess any modifications made to determine their impact on the child's swallowing and other components.

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**Instrumental assessment of swallowing**

After completing the [feeding and swallowing history](#), [feeding observation](#), [clinical swallowing assessment](#) and [implementing management strategies](#), it may then be appropriate to refer for an instrumental assessment of swallowing. As described by Arvedson and Lefton-Grief (1998), instrumental assessments are employed in conjunction with the clinical assessment and may be used to:

- 1) Examine the anatomy and physiology of the oral cavity and pharynx during swallowing.
- 2) Provide further information on the oral, pharyngeal and esophageal phases of swallowing to guide diagnosis of dysphagia and subsequent clinical decision making.
- 3) Evaluate the effectiveness of strategies on increasing swallowing safety and efficiency.

For the purposes of this handbook, Videofluoroscopic Swallow Study (VFSS) is discussed. This type of instrumental assessment is one of the most commonly used and available tools to evaluate pediatric dysphagia (Arvedson, 2008).

**WHEN SHOULD INSTRUMENTAL ASSESSMENT OF DYSPHAGIA BE CONSIDERED?**

Children with suspected oropharyngeal dysphagia on the basis of clinical presentation, underlying diagnosis and clinical evaluation may be a candidate for instrumental assessment of swallowing (Arvedson & Lefton-Grief, 2017). Instrumental assessment of swallowing investigates both the presence of and causes for swallowing safety concerns, including, but not limited to, silent aspiration. Instrumental assessment allows the clinician to test recommended strategies to determine if they help a child be a more safe and efficient feeder.

When completing instrumental assessment with children, it is important to determine their readiness and ability to participate in the evaluation (Taylor-Goh, 2005). It is also important to be clear on the reasons for completing instrumental assessment and what information we hope to learn ([Table 4](#)).

**CLINICAL PRACTICE RESOURCE**



**Phases of swallowing**

A detailed description of the swallowing phases is outlined in:

Arvedson, J., & Lefton-Greif, M. (1998). *Pediatric videofluoroscopic swallow studies: A professional manual with caregiver guidelines*. San Antonio, TX: Communication Skill Builders.

**CLINICAL PRACTICE RESOURCE**



**Learn more about instrumental assessment of dysphagia**

Although it is beyond the scope of this handbook, here are some resources that discuss the types of instrumental assessments and factors to consider when choosing one:

- 1) Arvedson, J., & Lefton-Greif, M. (1998). *Pediatric videofluoroscopic swallow studies: A professional manual with caregiver guidelines*. San Antonio, TX: Communication Skill Builders.
- 2) Langmore, S. (2001). *Endoscopic evaluation and treatment of swallowing disorders*. (2nd ed.). New York, NY: Thieme.
- 3) Logemann, J. (1998). *Evaluation and treatment of swallowing disorders*. (2nd ed.). Austin, TX: PRO-ED, Inc.
- 4) Logemann, J. (1993). *Manual for videofluorographic study of swallowing*. Austin, TX: PRO-ED, Inc.

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**Table 4: Considerations for instrumental assessment**

Sources: Cichero et al. (2012); Arvedson & Lefton-Grief (1998); Lefton-Grief & Loughlin (1996).

**Child considerations**

- Ensure medical stability
- Ability to maintain an alert state for the duration of the assessment
- Ability to sit in the seat required to complete assessment
- Ability/willingness to participate
- Ability to swallow consistently in response to food stimuli
- Ability to consume sufficient oral intake during the instrumental assessment
- Risk factors to the child

**Context considerations**

- Clinician expertise to complete the assessment, interpret findings and provide recommendations
- Access to instrumental assessment
- Side effects and risk factors of each type of instrumental assessment

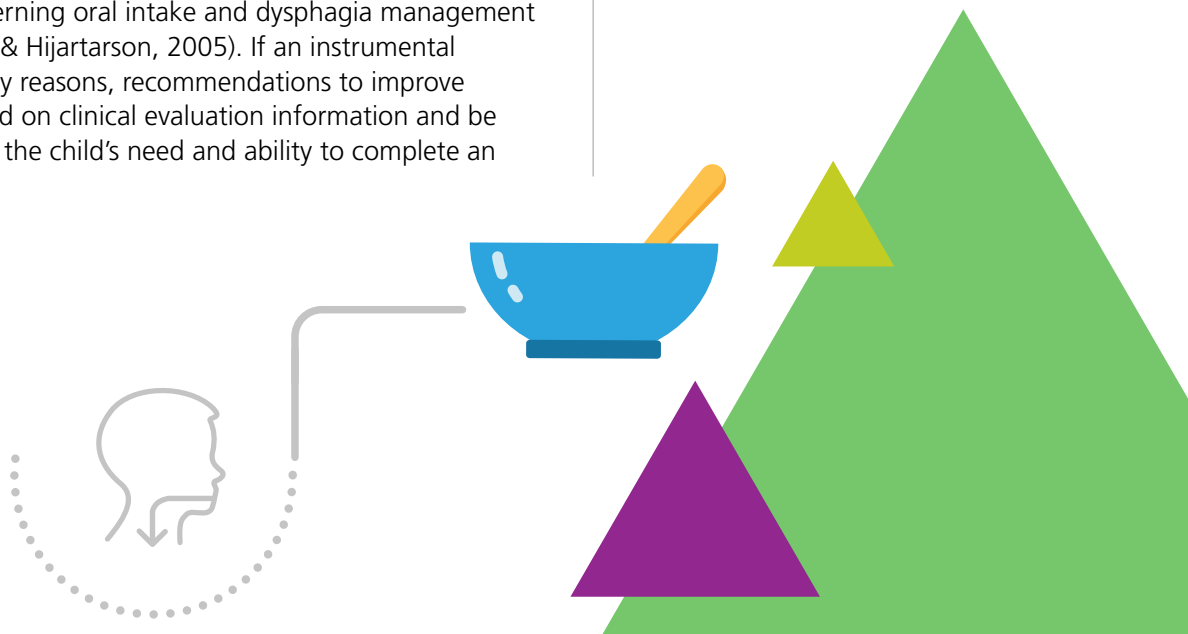
Instrumental assessments are not always available or suitable. While they help to inform decision making, results of instrumental assessments should not be used as the sole basis for decision making concerning oral intake and dysphagia management (Arvedson, 2008; DeMatteo, Matovich, & Hijartarson, 2005). If an instrumental assessment cannot be completed for any reasons, recommendations to improve swallowing safety should be made based on clinical evaluation information and be closely monitored. Continue to monitor the child’s need and ability to complete an instrumental swallowing assessment.

**CLINICAL PRACTICE TIP**



Keeping the purpose of instrumental assessment in mind

Instrumental assessment, particularly VFSS, is not used to define the oral preparatory phase of swallowing, since it can be viewed during clinical assessment (Arvedson & Lefton-Grief, 1998). Therefore, using instrumental assessment for the sole purpose of viewing chewing, lip closure and lip coordination is not warranted.



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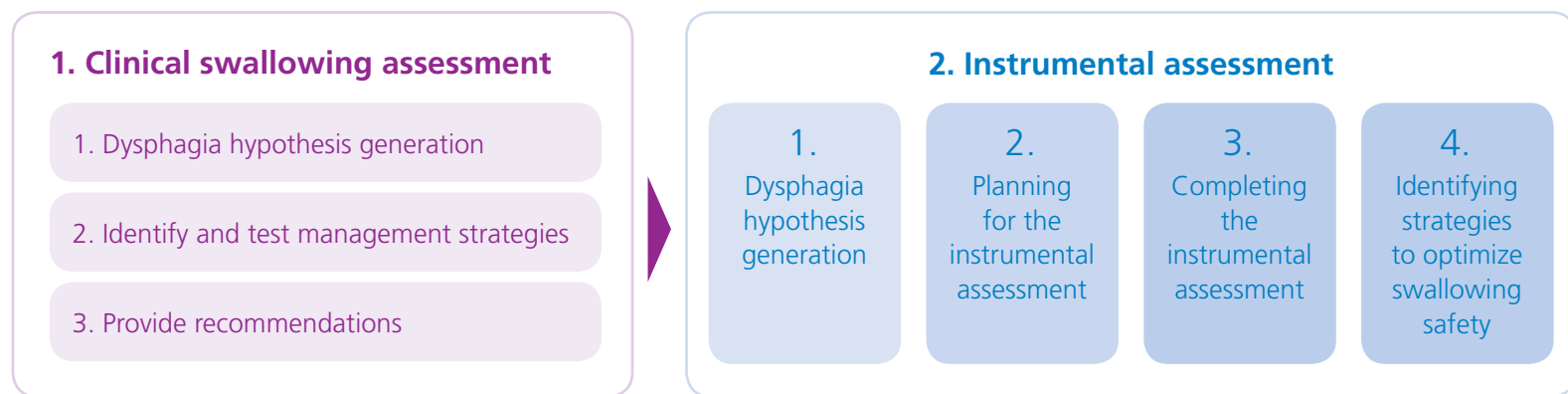
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**THE INSTRUMENTAL ASSESSMENT PROCESS**

The instrumental assessment is used for two main purposes (Arvedson & Lefton-Grief, 2017; Logemann, 2000):

- 1) Evaluate hypotheses related to the etiology of the child’s dysphagia
- 2) Test the effectiveness of strategies generated during the clinical assessment that are hypothesized to improve swallowing safety. **Figure 5** presents the series of steps that a clinician should take to carry out the instrumental assessment process:



**Figure 5: The instrumental assessment process**

Sources: Arvedson & Lefton-Grief (1998); Logemann (1998).



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**1) Dysphagia hypothesis development**

A clinical evaluation is always completed *before* an instrumental assessment. During the clinical swallowing assessment, hypotheses were generated and [compensatory strategies tested](#). While hypotheses can be tested clinically, instrumental assessment allows the clinician to physically view the effect the strategies have on the child’s physiology (Arvedson & Lefton-Grief, 1998). When instrumental assessment is possible, it should be used to assess the impact of strategies on swallowing, especially those that cannot be viewed during the clinical assessment. Some strategies used to address the hypothesized reason for dysphagia are most accurately tested using instrumental assessment ([Table 5](#)).

**Table 5: Strategies most accurately tested on instrumental assessment.**

**Postural techniques**

Postural techniques such as chin tuck, head tilt and head turn (Logemann, 1998; Logemann, 2000) aim to improve swallowing safety. It is important to confirm on instrumental assessment if they are in fact effective. If the strategies are successful, it is important to evaluate whether the caregiver can realistically implement the recommendation into mealtimes (Logemann et al. 2008; Robbins, Butler, Daniels, & Gross, 2008).



**Altering food texture or liquid consistency**

Recommending thickened liquids or discontinuing thickening should be tested using instrumental evaluation to determine if it is in fact effective and needed. Sometimes thickening will have no impact on swallowing safety and is not required. Thickening may also be detrimental to other systems (e.g. effect on [nutrition/hydration](#)) (Gosa et al., 2011). The clinical assessment alone is not sufficient to determine how thick a liquid should be to decrease the risk of aspiration (Logemann et al., 2008; Coyle et al., 2009). Instrumental assessment allows objective testing of multiple viscosities and allows the clinician to recommend only as much thickening as is required to improve swallowing safety. When silent aspiration has been previously observed, instrumental assessment is required to objectively test if thickening liquids or other pacing strategies are no longer required.



**Adjusting the bolus**

Instrumental assessment allows the effectiveness of other strategies to be trialed to determine if they are equally or more effective than thickening for improving swallowing safety (e.g. adjusting the bolus volume or adjusting the pace of bolus presentation) (Arvedson & Lefton-Grief, 1998; Logemann, 1998).

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**2) Planning for the instrumental assessment**

After the hypotheses have been generated, planning is required to carry out the instrumental assessment efficiently to increase the child's cooperation during the assessment and minimize radiation exposure (VFSS). The following check-list can aid in the planning for instrumental assessment (American Speech-Language-Hearing Association, 2017; Arvedson & Lefton-Grief, 1998):

**INSTRUMENTAL ASSESSMENT PLANNING CHECKLIST**



**Prepare caregivers:**

- Provide the caregiver with a checklist of items to bring including:
  - food and liquids
  - feeding utensils
  - items to increase child's comfort during assessment (e.g. music, books, videos)
- Provide recommendations to practice feeding in an appropriate feeding seat (i.e. not parent lap)

**Determine consistencies and textures**

- Determine which food and liquid consistencies to test
- Establish the order
- Identify foods or liquids that the child prefers that can be used to mask the barium if VFSS is selected

*Note:* A standard protocol may not be possible due to non-acceptance of particular textures or flavours or may not be optimal depending on hypotheses being tested (Palmer, 1993).

**3) Completing the instrumental assessment**

While it is beyond the scope of this handbook to provide detailed procedural information for different instrumental assessment methods, consider using the following checklist as an aid to complete the instrumental assessment (American Speech-Language-Hearing Association, 2017; Arvedson & Lefton-Grief, 1998):

**INSTRUMENTAL ASSESSMENT CHECKLIST**



**Select the texture(s)/consistency(ies) to be tested**

- Start with the child's "best texture", preferably the one that is considered safest
- Consider the order of consistencies to be tested

*Note:* Residue in the pharynx may be from swallows of previous consistencies. For example, swallows of a thicker consistency (e.g. puree) may impact your ability to interpret swallows of other consistencies (e.g. liquid) that come after.

**Position the child**

- Start with the child in their typical feeding position, even if it appears suboptimal
- Change the position if concerns are noted
- Test [positioning strategies](#) that have been tried clinically (e.g. more upright)



**Test compensatory strategies**

- [Test strategies](#) that aim to address swallowing safety concerns to determine if strategies improve swallowing safety, coordination and/or efficiency:
  - Altering food texture or liquid consistency (e.g. thicken liquid)
  - Adjusting the bolus volume or pace of bolus presentation
  - Increasing bolus sensory input to enhance sensory awareness
  - Postural techniques (e.g. chin tuck, head tilt)
- Note if the response to aspiration is active (i.e. coughing, throat clear) or if aspiration is silent (i.e. no symptoms)
  - Identify if their response to aspiration is immediate or delayed
  - Determine their ability to clear aspirated material from the airway (Arvedson, Rogers, Buck, Smart, & Msall, 1994)



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**4) Identifying strategies to optimize swallowing safety**

Based on results of the clinical assessment and instrumental assessment, recommendations (Arvedson & Lefton-Grief, 1998) may include:

- Position and posture changes
- Alterations in bolus size, consistency, texture and sensory properties
- Utensil changes
- Changes in feeding schedule/pacing
- Discuss potential alternative methods of feeding such as enteral feeding support
- Explore oral stimulation programs with food (taste stimulation)
- Explore non-nutritive oral motor stimulation programs for a child who is unsafe or not ready to eat by mouth

*Case example*

**Positioning and aspiration**

Ahmed is a 7 year old boy with a history of a traumatic brain injury after a fall at 1 year of age. He is a recent refugee and has received limited assessment services. Concerns were raised about his swallowing safety given a history of frequent fevers and chest infections. During the clinical feeding evaluation, Ahmed's parents demonstrated his typical reclined position. They expressed concern that he must be fed in recline, as he loses so much food and liquid from his open lips. Low oral tone was observed with an open mouth posture. Significant risk factors for aspiration were observed. On VFSS, Ahmed was initially positioned in recline, allowing the parents to demonstrate how he is typically fed. Silent aspiration was observed with his head and body in recline, but safe swallowing was observed in an upright position. Ahmed's parents were educated on the importance of feeding in an upright position and were also provided with strategies to decrease oral loss of food and liquid.

**CLINICAL PRACTICE TIP**



Oral stimulation with a child who is taking no food by mouth

While it would be preferable for every child to be able to take some food or liquid by mouth, this may not be possible due to medical issues or swallowing safety concerns. If a child has been made nil per os (NPO), it is important for them to have regular oral stimulation. Oral care/tooth brushing is essential to help keep their mouth and saliva clean. It also provides excellent stimulation to their tongue, lips, gums and teeth. Use of a pacifier or teething toys may allow a child to be in control of bringing items to their mouth. An oral stimulation program may also be recommended. A dry spoon can be used to encourage familiarity with the spoon and to practice lip closure, even without food. (Arvedson, 2006; Arvedson & Lefton-Grief, 1998).

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# Positioning

“The most basic, essential, and effective treatment for children with neurological disorders who have feeding/swallowing problems is positioning” (Redstone & West, 2004, p. 100).



Altering the position of the child is an example of a [compensatory strategy](#) that can help improve oral-motor and swallowing function, as well as mitigate swallowing safety issues (Cichero et al., 2012; Angsupaisal, Maathuis, & Hadders-Algra; 2015). Since maintaining good postural stability is second only to breathing in terms of the body’s top priorities, without adequate postural stability, more energy, effort and attention is needed to try to maintain a good position (Toomey, 2002). Therefore, optimizing a child’s position to help them achieve postural stability should be accomplished prior to beginning any other feeding or swallowing intervention.

Optimal positioning during feeding:

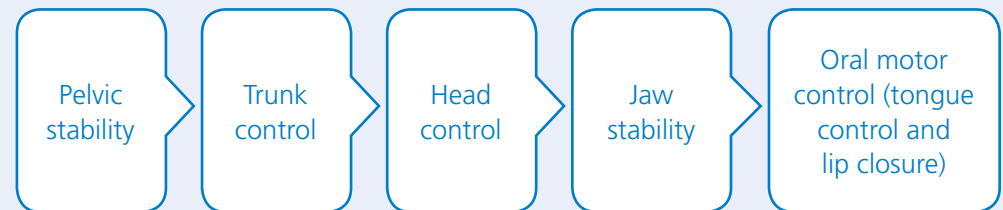
- Supports the child’s breathing (a flexed forward posture can lead to inefficient breathing) (Massery, 2012).
- Allows the child to use their energy and attention to focus on feeding rather than on maintaining postural stability.
- Optimizes the child’s oral-motor coordination, making chewing and swallowing easier (Redstone & West, 2004).
- Promotes digestive system efficiency (poor positioning can exacerbate GERD and constipation).

**CLINICAL PRACTICE TIP**

Addressing postural stability



When you are working with a child with feeding and swallowing issues, it is tempting to start at the mouth and look at the jaw, tongue and lips. However, Redstone and West (2004) conceptualize the relation between pelvic stability and oral motor control/skills as a causal sequence (i.e. domino effect). As outlined in [Figure 6](#), it is important to start with pelvic stability which will support trunk control and in the end influence head control, jaw stability and tongue/lip movement.



**Figure 6: Relation between pelvic stability and oral motor control**

Adapted from Redstone and West (2004, p. 97).

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## Selecting positioning equipment to support feeding and swallowing needs

While many textbooks suggest the “90-90-90 rule” of positioning as a universal optimal positioning goal (hips knees and ankles all flexed to 90 degrees), this rule is not always applicable (Costigan & Light, 2011; Morress, 2006). This type of positioning may not be achievable for some children based on their body’s structure and functioning. It is therefore important to evaluate each child’s individual positioning needs when attempting to optimize a child’s feeding and/or swallowing performance.

When making recommendations regarding positioning equipment, it is important to think about the amount of support a child needs (Gisel et al., 2003). **Figure 7** shows the types of feeding seats commonly recommended and the relative level of support they provide.



Figure 7: Feeding seats and positioning support

**CLINICAL PRACTICE TIP**



Using a client-centred approach

**Observe** how the child is typically fed first, as their current positioning may be adequate to meet their needs, even if it doesn’t appear optimal by “textbook” standards. If needed, consult with an occupational therapist or physiotherapist.

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## Suboptimal positioning: Understanding the “why”

Recommendations to optimize positioning for feeding and swallowing extend beyond simply providing suggestions regarding the best feeding seat. It is important to take a client-centered approach that uses the results from the [feeding and swallowing history](#) to explore why a child is being fed in a particular way if it appears unsafe and/or inefficient (Lefton-Grief & Arvedson, 2016). Understanding why a caregiver is feeding a child in a particular way can help with goal setting, providing appropriate caregiver education and recommending tailored positioning strategies to promote feeding safety, efficiency and skill development.

Clinical experience has led us to the understanding that there are common reasons why a child may be fed in a suboptimal feeding position. These common reasons along with possible strategies to address each are explored in the following section.



### CLINICAL PRACTICE TIP



#### Optimizing position

The following is a list of positioning goals and potential strategies to reach those goals:

Goal	Strategies
Feet flat on a surface while sitting	Use a footrest, stool or box if the child’s feet cannot reach the floor
Knees bent comfortably over the edge of the seat	Add a cushion behind the child to bring them forward
Hips rested all the way to the back of the seat	Use a wedge, lap belt orommel
Midline position maintained in the seat	Add foam rolls, cut pool noodles, rolled towels or laterals
Neck and head positioned upright	Use foam rolls, shaped pillows or a specialized headrest
Elbows at table height	Adjust the chair, table or tray height

Sources: Bailey & Angell (2008); Redstone & West (2004).

*Note:* While changing a child’s feeding position can improve their swallowing safety, suddenly altering their typical feeding position can also put them at increased risk for aspiration (Bailey & Angell, 2008).

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**1** The child continues to be fed in a reclined position past infancy despite anatomical changes

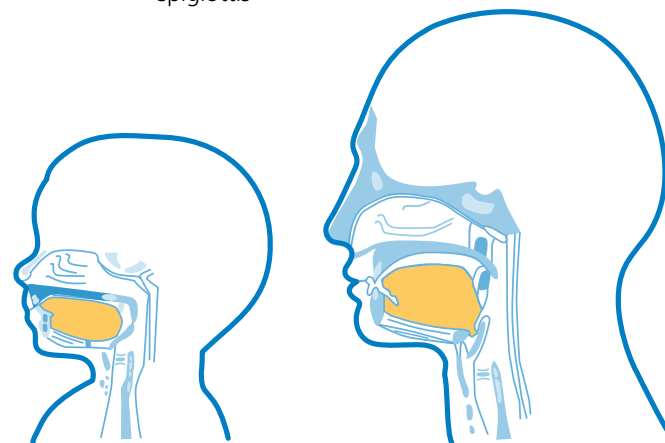
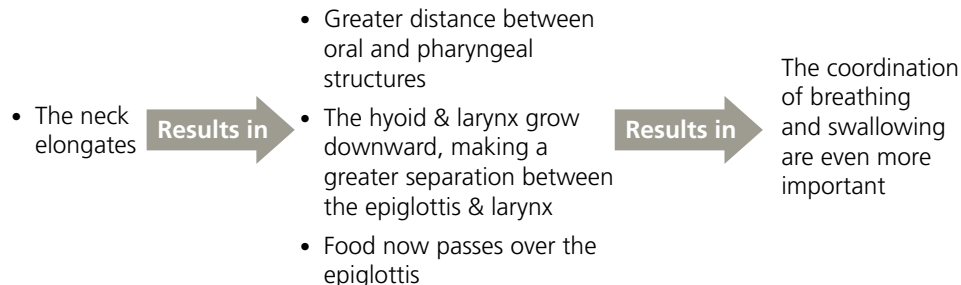
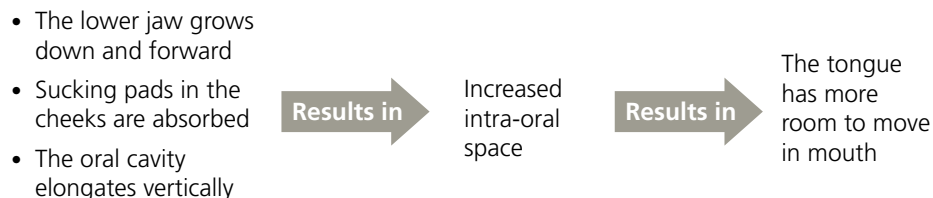
**Here’s why**

- Some caregivers continue to feed the child in a reclined position past infancy because the child may have delays in their development necessitating continued bottle feeding. However, while a child’s feeding skills remain at a developmental level that is lower than their age, anatomical changes in the intra-oral space and neck occur as the child grows (Figure 8) that require the child to be fed more upright (Redstone & West, 2004). Continuing to feed an older child in a reclined position can put them at increased risk of aspiration (Korth & Rendell, 2015). Therefore, the older infant or child should be fed in a more upright position even if they continue to be bottle fed.



**What you can do**

- Educate caregivers about the anatomical changes that have occurred and why feeding in a reclined position may no longer be safe.
- Work with caregivers to develop a plan to slowly begin feeding in a more upright position and/or transitioning from a caregiver’s lap into a supportive feeding seat.



**Figure 8: Age-related anatomical changes and the impact on feeding and swallowing**

Adapted from Matsu & Palmer (2008); Arvedson (2006).

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Assessing appropriate positioning equipment

Here’s why

Young children are often not positioned in an optimal way during feeding because they do not have an appropriate seat to meet their current feeding needs.

What you can do

- For some children, a commercially available highchair or booster seat will be adequate to meet their feeding needs. Other children may need simple modifications (i.e. adding rolled towels). However, some children will require seating systems that provide [greater support](#).
- In cases where a child needs more support than can be achieved with a regular high chair or booster seat, a wheelchair or specialized stroller is often the best option as it can be customized to meet the child’s individual needs (Schuberth et al., 2010). While there are specialized feeding seats available, they may not be practical to recommend as young children grow quickly and these seats may not be able to be customized to meet their needs as they grow (Redstone & West, 2004).
- Explore with caregivers their views on adaptive seating. You can use feeding as a conversation starter to introduce the idea of how specialized seating can provide optimal support (Miller & Willging, 2013).
- As the child grows and their needs change, caregivers will continue to require support in deciding which feeding seat is appropriate. (e.g. transitioning from a high chair to a larger supportive seat).
- Provide a referral to seating clinic when appropriate.

CLINICAL PRACTICE TIP



Addressing adaptive seating

Some young children may benefit from the increased support offered by a wheelchair or specialized stroller. These seating systems are often only recognized as mobility devices and therefore may not have been prescribed to the child.

These seating systems often carry with them a negative stigma and a caregiver may not be ready to accept that their child could benefit from a wheelchair.

Introducing caregivers to the benefits of using a specialized stroller or wheelchair as a feeding seat may be a helpful first step in this process of acceptance.

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Gravity is often used as a strategy to increase the volume of food and liquid the child consumes

Here’s why

- Many caregivers report that they feed their child laying down, reclined or they hold the child’s head back while feeding to help minimize anterior oral loss of food or liquid. However, using gravity by feeding in neck extension (tipping the child’s head back) or laying the child down can 1) cause food/liquid to fall back in the mouth too quickly and 2) open the child’s airway. Both of these can result in an increased risk of choking or aspiration (Orenstein, 2006).



What you can do

- Explain to caregivers the safety risks involved in trying to use gravity to meet nutrition and hydration goals. Remember, safety is the first priority (Joanna Briggs Institute, 2009).
- Acknowledge the potential for increased [anterior oral loss](#) when the child is fed more upright and work with the family to explore other strategies to decrease oral loss (skill development) and improve [feeding efficiency](#).

4

Recommendations for positioning during feeding may appear to conflict with other goals

Here’s why

- Children with feeding and swallowing issues often have other therapy goals developed with other clinicians that may seem to conflict. Caregivers may feel that the goal of increasing postural control by having the child work to keep themselves upright conflicts with feeding goals that suggest providing full support. As a result, the child may not be given enough support for feeding.

What you can do

- Acknowledge other goals and help caregivers understand that without adequate support during feeding, the child’s attention will be focused more on postural stability than on feeding thus potentially compromising swallowing safety and skill development.
- Identify other opportunities for the child to work on postural stability that are separate from feeding times.
- Demonstrate to caregivers the benefits of good positioning by having the child be fed first typically and then in an optimal feeding position.

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## Skill development

When moving forward with skill development, remember changes that you make to improve skill development may impact [safety](#), [nutrition](#), [hydration](#) and [efficiency](#) (Arvedson, 2013).



The skill development section of this handbook addresses the following areas:

- 1) Prioritizing skill development goals
- 2) Feeding according to developmental level
- 3) Chewing
- 4) Self-feeding
- 5) Cup, bottle and straw drinking

### 1) Prioritizing skill development goals

Skill development goals are often a priority to caregivers since skill development is commonly identified as a challenge. Goal setting requires integrating the information from the [clinical evaluation](#) and [instrumental assessment](#) (if applicable). Based on clinical experience, goal setting can be guided by the following principles ([Figure 9](#)):

Choose goals that do not compromise the safety, nutrition, hydration or efficiency components of feeding and swallowing

Optimize the child's postural stability before implementing other intervention strategies

Consider the child's developmental readiness and match the goal to the child's developmental level and skill

Consider the functionality of the goal by incorporating the values and perspectives of the child and caregiver(s)

Consider the child's chronological age and social appropriateness only after other factors have been considered

### 2) Feeding according to developmental level

For children with physical and developmental challenges, age is less relevant than developmental level when looking at their feeding abilities (Arvedson, 2008). Caregivers are often aware that their child(ren) have delays in gross motor, fine motor skills and communication but are often not prepared for delays in feeding and swallowing. Feeding and swallowing involves the coordination and strength of many muscles often affected by the child's physical and developmental disabilities (i.e. low or high tone and global developmental delays) (Sheppard, 2008).

Typically, information on feeding skills is organized by age. However, it may be more helpful to look at feeding and skill development according to the child's developmental level (Taylor-Goh, 2005). For example, a two year old child whose overall development is at the level of a six month old would be expected to eat foods appropriate for a six month old rather than a two year old. Moving forward, children will likely achieve feeding milestones at a rate that is unique to them. Although many people feel that there is a critical period in which feeding skills need to be established, clinical experience indicates that a child will continue to make feeding related gains as they progress in other areas of their development. [Table 6](#) outlines each developmental stage, which can also act as a framework for chewing skill development.

**Figure 9: Goal setting principles**

Sources: Bell & Alper (2007); Redstone & West (2004); Rogers (2004).



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**Table 6: Feeding according to developmental level**

Adapted from Morris & Klein (2000); Arvedson & Lefton-Grief (1998); Klein & Delaney (1994); Wolf & Glass (1992).

Chewing pattern	Developmental stages	Typical age	Oral-motor skills	Appropriate food texture and liquid consistency
Suckle/suck	1	Before 4 months	<ul style="list-style-type: none"> <li>Uses a suckling/sucking pattern</li> <li>Tongue thrust is still present                             <ul style="list-style-type: none"> <li>Child will push thick liquids/purees or solid food out of their mouth with their tongue</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Liquids (e.g. milk or formula) by breast or bottle</li> </ul>
	2	4-6 months	<ul style="list-style-type: none"> <li>Uses a sucking pattern</li> <li>Tongue thrust reflex starts to disappear</li> <li>Mouth opens when spoon approaches</li> <li>Begins to transfer from the front of their tongue to the back to swallow</li> </ul>	<ul style="list-style-type: none"> <li>Smooth pureed foods (e.g. applesauce, yogurt, pudding)</li> </ul>
Suck/munch	3	7-9 months	<ul style="list-style-type: none"> <li>Up and down munching pattern for chewing emerges</li> <li>Tongue thrust reflex starts to disappear</li> <li>Begins to use lateral tongue movement to control the position of the bolus in the mouth</li> </ul>	<ul style="list-style-type: none"> <li>Gradually thicker and thicker smooth purees (without introducing chunks)</li> <li>Begin using crunchy dissolvable solids to develop chewing skills (e.g. rice rusk)</li> <li>Begin using well mashed table foods of a single consistency (e.g. mashed banana)</li> </ul>
	4	12-14 months	<ul style="list-style-type: none"> <li>Uses a munching pattern for chewing but a rotary chewing pattern (diagonal movement of the jaw) emerges</li> <li>Lateralizes tongue well to position food in the mouth for chewing</li> <li>Lips are open and active during chewing which may cause the child to lose some food/liquid</li> </ul>	<ul style="list-style-type: none"> <li>Begins to eat finely chopped food and small pieces of soft table food</li> <li>Continues to develop chewing skills using dissolvable solids (e.g. cereal rings, crackers, digestive cookies, toast)</li> </ul>
Munch chew	5	14-18 months	<ul style="list-style-type: none"> <li>Rotary chewing pattern continues to develop</li> <li>Able to take a bite of food and use the tongue to move the bolus to:                             <ul style="list-style-type: none"> <li>both sides of the mouth</li> <li>the centre of the mouth</li> </ul> </li> <li>Better able to keep lips closed while chewing but there is still some loss of food/liquid</li> </ul>	<ul style="list-style-type: none"> <li>Eats bite-sized pieces of soft foods such as:                             <ul style="list-style-type: none"> <li>easily chewed meats, soft vegetables and fruits, soft pasta</li> </ul> </li> <li>Difficulty with combinations of textures (e.g. cereal with milk, soup with noodles)</li> <li>The child may swallow the solid portion whole and/or lose liquid from the mouth</li> </ul>
	6	18-24 months	<ul style="list-style-type: none"> <li>Rotary chewing pattern is well established</li> <li>Good lip closure while chewing and swallowing (there is no loss of food/liquid from the mouth)</li> <li>Can grade jaw opening when biting foods of different thicknesses</li> </ul>	<ul style="list-style-type: none"> <li>Chews and swallows table foods, most meats, raw fruits and vegetables, breads, rice</li> <li>Able to manage combinations of texture</li> </ul>

Prioritizing skill development goals

Feeding according to developmental level

**Texture progression and chewing**

Self-feeding

Cup, bottle and straw drinking

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**A note about mixed textures**

For a child who has difficulty with oral motor control, chunky baby food (a mixed texture) should be avoided in the early stages of texture progression (Schuberth et al., 2010). Advanced motor skills are needed to manage mixed textures safely and without these skills, a child may be at risk of choking. In [Table 6](#), mixed textures are not introduced until stage 5. Safer ways to work on texture progression are outlined in the section below.



**3) Text progression and chewing**

Though a child may be successfully eating a wide variety of pureed or mashed foods that match their skills developmentally, many caregivers want to know how to develop their child’s chewing skills to progress to eating solid foods. A child who is “not chewing” may be doing so for a variety of reasons. Oral motor and/or sensory challenges may have been noted during the feeding observation, suggesting that the child does not yet have the skills to chew (Arslan, Demir, & Karaduman, 2016).

As highlighted in the [feeding observation](#) section, it is particularly important to examine tongue function and coordination when evaluating chewing (Logemann, 2014) since oral motor skill development is supported by advances in tongue movement (Manno, Fox, Eicher, & Kerwin, 2005; Morris & Klein 2000). The tongue is made up of muscles and for children with physical and developmental challenges (e.g. low tone, cerebral palsy), the muscles of their tongue may be affected in the same ways as the muscles in the rest of their body (Logemann, 2014). For some children, this means that they will benefit from targeted intervention, preferably with food, to target tongue coordination (Sigan et al., 2013; Gisel, 1994). For other children, tongue coordination for chewing may be encouraged during eating activities geared to more gradually develop their overall oral motor abilities, described in the guides below.

As described in [Table 6](#), chewing skills typically progress from suckle/suck, suck/munch to munch chew to rotary chewing. In order to proceed with working on chewing skills, it is first important to determine a child’s readiness for chewing using information gathered during the [feeding observation](#). A child who is currently sucking and swallowing all their purees (i.e. obligatory suck) and refusing all other foods will benefit from a different approach than a child who is showing some emerging control of their oral management (i.e. some up and down munching pattern observed). The **two** texture progression and chewing guides provide information on how to work on texture progression and chewing based on the child’s current developmental stage and skills.

**CLINICAL PRACTICE RESOURCE**



Sensory properties of food

Suzanne Evans Morris describes the 8 sensory properties of food that must be considered when working on texture progression. More information can be found on Morris’ website: Morris, S. (2011). *Food progressions for biting and chewing*. Available at: <http://www.new-vis.com/fym/papers/p-feed18.htm>



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**Texture progression and chewing skills guide: Children with an obligatory suck pattern**

**Approach**

**Texture progression** or **texture fading**: Thicken the consistency of smooth puree without introducing chunks and lumps. The goal is to make the purees gradually thicker and thicker, helping the child progress towards very soft solid foods (e.g. soft cheese, soft fruit, steamed vegetables, scrambled egg).

**Rationale**

Due to the obligatory suck pattern, solid food will be sucked back through the mouth to the throat, causing gagging and potentially choking (Stolovitz & Gisel, 1991; Gisel, 1994). Solids cannot be used safely or comfortably to work on chewing at this time.

The thickened smooth purees will stay in the mouth longer than more runny purees, more similar to the feeling and oral management required with soft solid foods. Thicker purees increase the oral management required to work towards chewing, without introducing a solid consistency which may cause gagging.

**Considerations**

Texture progression needs to be done slowly (i.e. over weeks or months) to avoid the child refusing the thicker texture.

Purees can be thickened using foods such as baby cereal, corn starch, mashed potatoes or food thickener.

Sources: Eckman, Williams, Riegel, & Paul (2008); Gisel, Applegate-Ferrante, Benson & Bosma (1995); Gisel (1994).

*Case example*

**Texture progression**

Brianne is a 3 year old girl with a history of microcephaly and global developmental delays. She just started to walk and has a few words. Coughing and choking were reported on solid foods, but she accepts a wide variety of pureed and fork mashed foods. Her parents were concerned about providing purees, worried that they were not encouraging her to eat age-appropriate textures. They offered pieces of soft solid foods, but Brianne was increasingly refusing these solids and mealtimes were becoming a battle. We discussed that Brianne is likely feeding according to her developmental level rather than her chronological age. We encouraged them to provide fork mashed foods for main meals and practice chewing using crunchy dissolvable solids at snack time. It is important to offer but not force very soft solids such as steamed vegetables and scrambled eggs when others are eating them.

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**Texture progression and chewing skills guide:**  
**Children who no longer have an obligatory suck pattern**

Does the child chew solid foods?

No

**Approach:**

Help the child develop biting and chewing skills using crunchy dissolvable solids:

**Step 1:** Start with solid foods that are most readily dissolvable (e.g. rice rusks)

**Step 2:** Work towards foods that are less readily dissolvable (e.g. harder toddler biscuits, o-cereal)

**Step 3:** Work on single texture soft solid foods

**Rationale:**

This approach allows the child to work on biting and tongue lateralization without having to manage the subsequent bolus. Crunchy dissolvable solids are a harder texture which does not increase the child's risk of choking.

Taking a bite is an important first step. It is important that the child learn to bite through a solid independently. Avoid breaking off a piece of solid and placing it in the child's mouth. Encourage the child to alternate biting on both sides to promote tongue lateralization.

Yes

**Approach:**

Continue to progress through the stages described in **Table 6**. Progressing through the stages involves modeling and practicing rotary chewing.

Monitor the child's ability to handle harder textures and mixed consistency foods according to where the child is developmentally and physically.

Sources: Homer & Carbajal (2015); Eckman et al. (2008); Gisel (1996).

*Note:* While working on skill development, the child's main meals should continue to consist of food textures and liquid consistencies that are appropriate for their developmental level regardless of their chronological age.

**EVIDENCE REVIEW**

The state of evidence for oral motor interventions



Published reviews have examined the efficacy of oral motor interventions on oral motor physiology in children (Morgan et al., 2012; Arvedson, Clark, Lazarus, Schooling, & Frymark, 2010). There is not enough evidence to definitively determine whether a particular oral motor intervention is effective. Given the state of the evidence, use clinical reasoning to integrate available literature and applicable frameworks (e.g. motor learning, developmental, etc.) to guide intervention (Arvedson et al., 2010).

**EVIDENCE REVIEW**

What about the "non-edible chewy?"



Using non-food stimuli (e.g. chewing tubes/non-edible chewy) in chewing skill development is controversial, as its ability to lead to skill transferability is questioned. Use food when working on chewing because:

- It is in alignment with motor learning principles (e.g. task specificity) (Sheppard, 2008)
- Research reports that food stimuli elicits a natural eating reaction (Gisel, 1994)

Non-food stimuli may be considered to teach chewing when integrated into a **functional treatment approach that uses food** (Arslan et al., 2016; Sheppard, 2008).

Prioritizing skill development goals

Feeding according to developmental level

Texture progression and chewing

**Self-feeding**

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**CLINICAL PRACTICE TIP**

Is it sensory or is it developmental?

When a child is not accepting age appropriate food, effective management depends on understanding why. Although a child may appear to be hypersensitive to certain food textures, the feeding issue may actually be due to a mismatch between the properties of the food they are being given and their current level of oral motor functions (Morris & Klein, 2000). A mismatch between a child's developmental level and the food textures/liquid consistencies they receive can lead to the following behaviours (Arvedson, 2013):

- Food non-acceptance
- Non-acceptance of particular textures
- Coughing/choking
- Gagging/vomiting
- Swallowing foods whole
- Chewing on non-food items but not chewing food
- Placing foods in their mouth and then spitting/pulling them out

These behaviours can also occur if there is a mismatch between the child and the pace/volume of their feeding.



**4) Self-feeding**

Like other areas of development, self-feeding skills follow a predictable developmental sequence. As children gain motor, cognitive and communication skills over the first few years of their life, their interest and ability to feed themselves grows. The more opportunities the child has to participate in feeding themselves, the more independent and efficient they become as self-feeders (Schuberth et al., 2010). However, for many children with physical and/or developmental disabilities, the natural progression of self-feeding is interrupted or delayed (Sheppard, 2008). Many of these children have limited opportunities to develop their self-feeding skills in the early years due to medical complications, swallowing safety concerns or challenges with meeting their nutrition and hydration needs (Harding & Cockerill, 2015).

As the feeding framework suggests, it is imperative to ensure that a child's [medical stability](#), [swallowing safety](#), [positioning](#) and [nutrition/hydration](#) status have been addressed prior to working on improving a child's self-feeding skills. As children are developing their self-feeding skills, it is also important to consider the impact that working on self-feeding skills will have on a child's overall feeding efficiency. Self-feeding may affect the length of meals and the volume of food and liquid the child intakes, which may impact nutrition and hydration. Self-feeding can also lead to increased energy expenditure, causing the child to burn more calories than taken in (Marchand, Motil, & NASPGHAN Committee on Nutrition, 2006).



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**Self-feeding framework: Where to begin?**

The following self-feeding framework is based on [several foundational theories](#) and [frames of reference](#).

**Consider readiness for self-feeding**

In order for any self-feeding strategy to be successful the child and the caregiver must **both** be ready (Davies et al., 2006).

**Considerations for caregiver readiness:**

- Is self-feeding an important goal for the caregiver at this time?
- Is self-feeding [culturally relevant](#) (e.g. does the rest of the family eat with utensils? Is it the family's cultural norm to feed the child?)?
- Does the caregiver still have concerns about the child's swallowing safety, medical stability or nutrition/hydration status?
- Is the caregiver comfortable with the child attempting to feed themselves (Andrew et al., 2012) (i.e. are they ok with the child getting messy)?

**Considerations for child readiness:**

- Explore if the child shows any of the following "readiness" behaviours (Schuberth et al., 2010; Arvedson, 2006):
  - Able to stay seated long enough to eat
  - Able to eat without distractions (e.g. TV, toys, tablet)
  - Anticipates next bite
  - Reaches for spoon or cup and tries to bring to mouth
  - Enjoys food play
  - Shows food preferences

**Work on pre-requisite skills**

If a child is not showing signs of readiness and self-feeding has been identified as a goal, there are several pre-requisite skills that can be addressed. The following strategies involve increasing the child's participation at mealtime:

- Work on having the child sit for snacks and meals (Bailey & Angell, 2008)
- Decrease toys and other non-mealtime distractions currently used during meals and snacks (Gisel, 2008)
- Use cues and prompts while feeding the child (Eckman et al., 2008):
  - Wait for the child's mouth to open for the next bite
  - Leave the spoon in front of the child's mouth and have the child come forward to the spoon
  - Wait for the child's lips to close on the spoon instead of scraping food off

**CLINICAL PRACTICE TIP**

**Communicating the benefits of self-feeding**

Discuss with caregivers that self-feeding can:

- Lead to increased control for the child (e.g. how much, how fast, what order) which can help with their acceptance of food (Harding & Cockerill, 2015)
- Help reduce distractions needed during mealtime (e.g. watching TV)



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**Identify the child's developmental level**

Before attempting to address self-feeding challenges, it is important to first fully understand the stages of typical self-feeding development (Clark et al., 2007). The typical developmental sequence of self-feeding ([Table 7](#)) should act as a guide for any strategies designed to facilitate the development of a child's self-feeding skills.

*Note:* Typically developing children take several years to develop and refine their self-feeding skills, so children with physical or developmental disabilities should not be expected to become competent self-feeders in a shorter time frame.

After considering the caregiver and child's readiness to begin self-feeding and understanding the typical sequence of self-feeding development, the next step is to establish the child's developmental level as it relates to self-feeding. This involves understanding the child's [overall general development](#) as well as skills in specific areas such as fine motor and cognitive abilities. Having an understanding of a child's vision and overall sensory processing is also helpful. As with the development of other feeding skills, understanding where a child is at developmentally is more important than the child's chronological age when deciding where to begin with teaching self-feeding skills. Identifying the child's current developmental level will enable the clinician and the caregivers to identify appropriate goals, intervention approaches and realistic outcomes.

**Table 7: Typical chronological development of self-feeding skills**

Source: Morris & Klein (2006).

Age	Skill
6-7 months	<ul style="list-style-type: none"> <li>Self-feeds cracker</li> </ul>
9 months	<ul style="list-style-type: none"> <li>Independently eats finger foods</li> <li>Holds and bangs spoons</li> </ul>
12-14 months	<ul style="list-style-type: none"> <li>Brings spoon to mouth with palm down (with spills)</li> </ul>
15-18 months	<ul style="list-style-type: none"> <li>Scoops food onto spoon and then brings to mouth</li> </ul>
24 months	<ul style="list-style-type: none"> <li>Brings spoon/fork to mouth with palm up (less spills)</li> </ul>
33-36 months	<ul style="list-style-type: none"> <li>Self-feeds with spoon and fork (more coordinated)</li> </ul>

**CLINICAL PRACTICE TIP**



**Moving from raking to pincer grasp**

Put small pieces of food into a regular sized bowl to encourage the child to "dip" their hand in and use their fingers to pull the pieces out instead of using a raking grasp to pick the pieces up from a flat surface. Once the child is able to pick the pieces out of the bowl, move to using smaller and smaller containers that only allow the finger and thumb to reach in to pull a piece out. Removing cereal pieces or other small finger foods from the slots in an ice cube tray can be a great last step in refining a child's pincer grasp.

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Set the stage for success

Children are motivated to continue working on something they experience success with. Self-feeding is hard work, so setting the child up for success is critical in helping them learn new skills to achieve self-feeding goals.

1) Ensure optimal positioning

- Provide [supportive seating](#) if needed

2) Use appropriate teaching strategies informed by relevant theories and frames of reference based on the child's needs (Case-Smith, Law, Missiuna, Pollock, & Stewart, 2010). This may include:

- Backwards chaining
- Reducing the amount of assistance over time
- Practicing the component motor skills needed for self-feeding during other activities such as scooping activities, working on pincer grasp, having the child feed others or dolls

3) Increase motivation

- Ensure the child is hungry (practice at the start rather than the end of the meal)
- Practice at snack time when there is not as much pressure to eat
- Practice with the child's preferred foods
- Involve the child in food preparation if possible

4) Choose appropriate equipment

- Consider [utensils with short thick handles](#) which are easy to grasp and can increase control
- Consider [weighted utensils](#) which can decrease tremors and increase sensory awareness if needed
- Use bowls and utensils with high contrast for children with visual impairment
- Consider suction or non-slip bowls and plates or a non-slip placemat

CLINICAL  
PRACTICE TIP



Desire versus ability

When a child can self-feed but does not want to (Adams et al., 2011):

- Try having the child feed themselves for the first half of the meal and then the parent feed the child for the rest
- Take turns: After the child feeds themselves with one spoonful, the parent feeds the next spoonful
- Sit at the family table when eating, as eating in a group can be beneficial (Bell & Alper, 2007)
- Practice at snacks with fewer expectations
- Consult a behavior specialist



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**Set the stage for success (cont'd)**

- Practical suggestions:
  - Before recommending self-feeding equipment, **always** try it first with the child
  - Try commercially available equipment first, then adaptive equipment if needed
  - Present feeding utensils at the child's midline to let the child choose which hand they will use to grab it with

**5) Modify feeding methods or food presentation**

- Cut finger foods into long thin strips
- Practice scooping and spoon feeding with foods that stick to the spoon more easily



**CLINICAL PRACTICE TIP**



Applying theory into practice

Several foundational theories and frames of reference may need to be integrated to inform the intervention approach. Examples include:

**Theories**

- Developmental
- Learning
- Dynamic systems

**Frames of references**

- Environmental modification
- Motor learning and skill acquisition
- Biomechanical

More information can be found in these resources:

Case-Smith, J., Law, M., Missiuna, C., Pollock, N., & Stewart, D. (2010). *Foundations for occupational therapy practice with children*. In J. Case-Smith & J. O'Brien (Eds.) *Occupational therapy for children* (6th ed.) (pp. 22-55). Maryland Heights, MO: Mosby- Elsevier.

Kramer, P., & Hinojosa, J. (2009). *Frames of reference for pediatric occupational therapy* (3rd ed.). Baltimore, MD: Wolters Kluwer.

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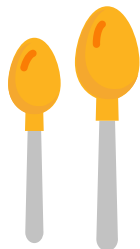
**Self-feeding**

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**Spoon options**

Recommending an appropriate spoon for a child requires consideration of their anatomy, their fine motor and oral motor skills. **Figure 10** summarizes the characteristics of commonly recommended spoons and when they may be appropriate.

**CONSIDERATIONS FOR SPOON SELECTION**



**Spoon feature: Plastic coated**

**Function:** The plastic coating protects the child's teeth, which may be helpful for a child with a tonic bite reflex.



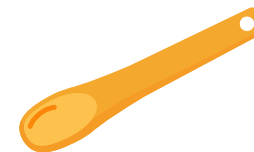
**Spoon feature: Shallow bowl**

**Function:** A shallow bowl may help a child to achieve better lip closure on the spoon to remove more food.



**Spoon feature: Short, thick handle**

**Function:** This design may help children grasp the spoon more easily and increase their control of directing the spoon to their mouth.



**Spoon feature: Narrow spoon**

**Function:** This shape fits better inside the child's mouth, allowing the the bowl of the spoon to go completely in the child's mouth to encourage lip closure on the spoon.



**Spoon feature: Weighted**

**Function:** A weighted spoon can increase sensory feedback and help improve motor control for children with tremors.



**Spoon feature: Bent handle**

**Function:** A child may benefit from a bent handled spoon if they have limited wrist rotation. However, avoid suggesting a bent handled spoon unless the child has established a dominant hand.

**Figure 10: Spoon features and function**

Sources: Schuberth et al., (2010); Gisel (2008).

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## 5) Cup, bottle and straw drinking

As with all areas of skill development, when selecting a cup or bottle, it is important to select one that is appropriate for the child's current developmental level. Ensure that the child is drinking safely and efficiently enough to meet their nutrition and hydration needs. This involves working with the child and the caregiver to identify the skills needed and/or to be developed to use a particular cup. [Table 8](#) reviews the different positions and oral motor skills (e.g. mouth, lip and tongue movements) needed to have success with using the bottle, sippy cup, open cups and straws.



### CLINICAL PRACTICE TIP

Spill-proof or "sippy cups"



The skills used to drink from a sippy cup are different from the skills needed to drink from an open cup or straw. The sippy cup was designed to be spill proof but for many children this makes drinking more difficult. Most children do not need to progress through a sippy cup to develop cup drinking skills.

**Table 8: Comparison of the positions and oral motor skills required for cup, bottle and straw drinking**

Sources: Carruth & Skinner (2002); Gisel & Alphonse (1995); Gisel (1994); Stolovitz & Gisel (1991).

	Bottle	Sippy Cup	Open Cup	Straw
<b>Most effective position for drinking</b>	 <ul style="list-style-type: none"> <li>Reclined position</li> </ul>	 <ul style="list-style-type: none"> <li>Head extended back and tip cup</li> <li>Upright or reclined</li> </ul>	 <ul style="list-style-type: none"> <li>Head is neutral</li> <li>Body requires to be upright</li> <li>Cup is tipped (fed by feeder)</li> <li>Arms tip cup (self-fed)</li> </ul>	 <ul style="list-style-type: none"> <li>Head is neutral or slightly forward</li> <li>Body requires upright position</li> </ul>
<b>Oral-motor skills required to drink</b>	<ul style="list-style-type: none"> <li>Co-ordinated suckle suck pattern</li> </ul>	<ul style="list-style-type: none"> <li>Lips apart on and tongue under spout</li> <li>Movement of tongue forward and back to suck</li> <li>Liquid flow is controlled by the cup (use of a valve) and the drinker (dependent on the strength of their suck)</li> </ul>	<ul style="list-style-type: none"> <li>Lips form a seal around the cup</li> <li>Jaw is stabilized</li> <li>Upper lip moves to draw in liquid in a sequence of sips</li> <li>Tongue tip is elevated, with tongue moving posteriorly</li> </ul>	<ul style="list-style-type: none"> <li>Lips form a seal around the cup</li> <li>Jaw is stabilized</li> <li>Upper lip moves to draw in liquid in a sequence of sips</li> <li>Tongue tip is elevated, with tongue moving posteriorly</li> </ul>

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## Cup, bottle and straw skill development strategies

Table 9 offers guidance on how to help a child develop the skills to successfully drink from each method.

### Table 9: Cup, bottle and straw skill development strategies

Sources: Gisel et al. (1995); Gisel (1994).

#### Bottle

- Infants have adaptive functions to suck reflexively. As the child ages, the suck reflex disappears which may change the child's ability to drink from a bottle.
- If the bottle is determined to be the only safe and efficient method to meet the child's nutrition and hydration needs, then bottle drinking should be maintained for intake while working on the skills required for other cups regardless of the child's chronological age.

#### Open Cup

- Grade and/or shape the task
- Suggest sipping from a spoon sideways to help the child learn to close their lips and take sips
- Suggest sipping from a short cup (e.g. cut-out cup or medicine cup), as it gives the feeder better control of pace and volume
- Recommend using thicker liquids (e.g. smoothie, yogurt, milkshake, apple sauce) to help the child work on skills of cup-drinking while slowing the flow of the liquid

#### Sippy Cup

- The valve can help slow the liquid down, allowing a child with a strong suck better pacing
- For a child who is not able to suck from a sippy cup, remove the valve to practice sipping rather than sucking to work towards open cup drinking
- Encourage caregivers to select only one sippy cup that works best for the child's needs and continue practicing with it
- Coach the child to close their lips around the spout and pace one sip at a time instead of sucking
- If the child is struggling with the sippy cup, recommend moving towards an open cup and/or straw

#### Straw

- Suggest placing the straw in the side of the mouth between the top and bottom lip. Placing it on the side decreases the amount of lip closure that the child has to achieve
- Recommend using a squeezable cup with straw to allow the feeder to help the child learn the sucking motion. The feeder can squeeze gently, helping the child bring liquid into their mouth. To promote success as the child develops the suction needed to obtain the liquid, the feeder can gradually provide less help to grade the amount of suction needed to obtain liquid
- Use these strategies to help promote independence

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## Conclusion

The goal of this handbook was to provide the most current evidence, combined with clinical practice, pertaining to pediatric feeding and swallowing issues in a format that could support clinicians with navigating the complex nature of this work. While we hope that we have achieved this goal, we also recognize that the clinical aspects of pediatric feeding and swallowing addressed herein are only a part of the picture.

Acknowledging the roles that caregivers play in the feeding evaluation and management process is critical to the success of the outcomes. For caregivers, there are few issues more stressful and emotional than when their child or the child they are caring for is struggling with feeding. Research on the experiences of caregivers of children with feeding challenges is equally important for clinicians to be aware of and understand as we partner with caregivers. This research suggests that while navigating feeding and swallowing evaluation and management, it is essential to do so in ways that ensure both the needs of the child and caregivers are met. Partnering with caregivers and providing appropriate education and training will help to ensure that children safely meet their nutrition and hydration needs and work on meaningful feeding and swallowing goals.



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**PART 4: HANDBOOK DEVELOPMENT**

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## Evidence gathering

A targeted search of clearinghouses and repositories was conducted to locate high-level knowledge products such as CPGs, position statements and systematic reviews. Search terms were identified in consultation with the development team (Figure 11).

pediatric feeding, pediatric swallowing, feeding and swallowing, pediatric dysphagia, feeding disorders, swallowing disorders

Figure 11: Example search terms

The search was limited to products: (1) printed in the English language; (2) focused on children between the ages of 1 to 18 years; (3) published between 2000 and May 2016 in guideline clearinghouses or repositories; and (4) excluded NICU, food selectivity, behavioural feeding issues, weaning from enteral tube feeding and failure to thrive.

Clearinghouses searched include:

- National Guideline Clearinghouse
- Canadian Task Force on Preventive Health Care
- Cochrane Collaboration
- Cincinnati Children’s Hospital Medical Center
- American Academy of Pediatrics
- Guidelines and Audit Implementation Network (GAIN)
- American Academy of Physical Medicine and Rehabilitation Physiotherapy Evidence Database (PEDro)
- Canadian Medical Association Infobase

- Registered Nurses Association of Ontario (RNAO)
- Canadian Pediatric Society
- Trip Database
- Canadian Thoracic Society: Guidelines and Standards

The outputs of this search (Figure 12) were reviewed by development team members for relevance to the handbook. Knowledge products were assessed using the Appraisal of Guidelines for Research and Evaluation (AGREE II) instrument to assess quality, methodology and rigor.

Additional, supplemental literature searches were conducted for systematic reviews and primary research on an ad hoc basis, where evidence for a given topic was not identified as part of the CPGs. Broad internet searches using Google and Google Scholar portals were also conducted with additional resources identified by the development team.

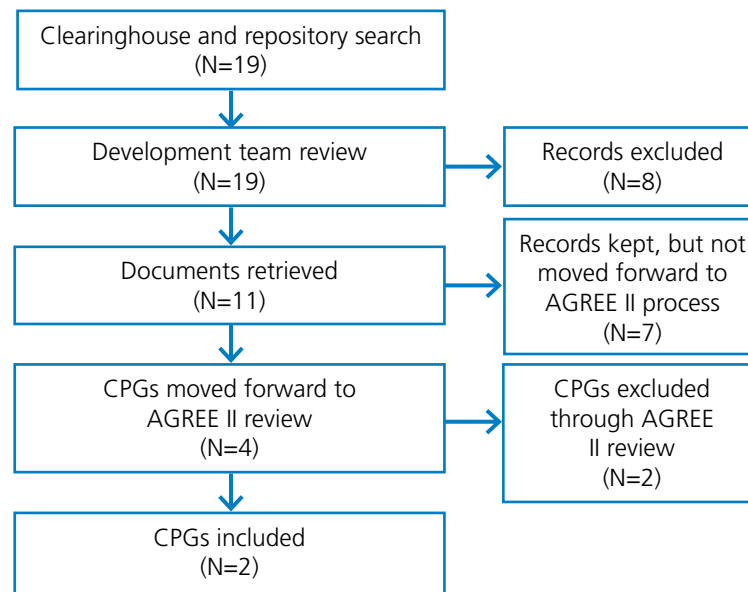


Figure 12: Search outputs

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**Guideline recommendations**

The Royal College of Speech Language Therapists (2005) and the Speech Pathology Australia (2012) clinical guidelines were the primary resources to form the evidence base for this handbook. **Table 10** identifies the topic areas for which guidelines had clinical recommendations.



**Table 10: Guideline recommendations**

Handbook section	Topic	Royal College of Speech Language Therapists	Speech Pathology Australia
Using a feeding and swallowing framework	Using a feeding and swallowing framework	X	X
Clinical evaluation	Feeding and swallowing history	X	X
	Feeding observation	X	X
Medical	Medical	—	—
Nutrition and hydration	Nutrition and hydration	—	—
Swallowing safety	Clinical evaluation of swallowing	X	X
	Instrumental assessment	X	X
Positioning	Selecting positioning equipment to support feeding and swallowing needs	X	X
	Suboptimal positioning: Understanding the “why”	—	—
Skill development	Feeding according to developmental level	X	—
	Texture progression and chewing	—	X
	Self-feeding	—	—
	Cup, bottle and straw drinking	—	—
Conclusion	Conclusion	X	X

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## Conflict of interest declaration

Handbook contributors have no conflict of interest to declare.

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## Disclaimer

This handbook is a compilation of best evidence and practices to assist clinicians in assessing and treating feeding and swallowing issues in children with physical and developmental disabilities. This handbook was developed for **clinicians to use as a guide** in clinical decision making to provide practical suggestions to manage feeding and swallowing issues, but does **not constitute professional clinical advice**. Clinicians are required to exercise their own clinical judgment in using the handbook and application of any information contained in this handbook should be based on individual/ client /patient needs, the relevant circumstances, and local context.

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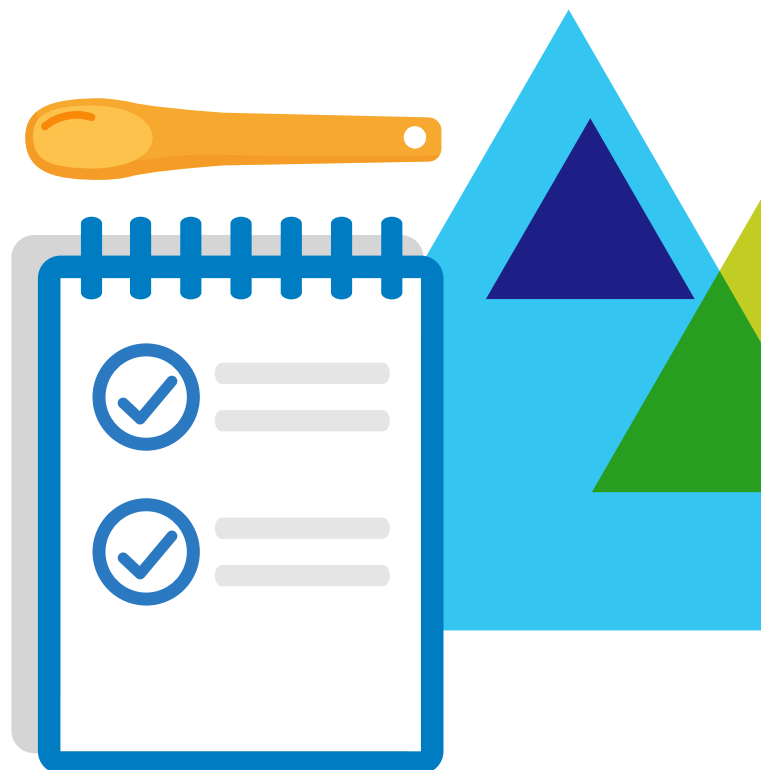
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## Holland Bloorview

Holland Bloorview Kids Rehabilitation Hospital is Canada's largest children's rehabilitation hospital dedicated to improving the lives of children with disability. As a fully affiliated hospital with the University of Toronto, we are home to the Bloorview Research Institute and the Teaching and Learning Institute, allowing us to conduct transformational research and train the next generation of experts in childhood disability. For more information please visit [www.hollandbloorview.ca](http://www.hollandbloorview.ca)



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