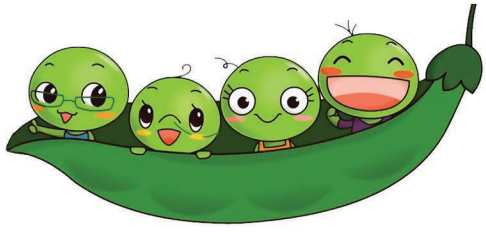
PEDIATRIC FEEDING DISORDER

Clinical Practice Guide for Healthcare Professionals

Alberta Health Services

Pediatric Eating And Swallowing



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Summary

PURPOSE

Pediatric Feeding Disorder (PFD) – A Clinical Practice Guide for Healthcare Professionals provides information, guidance and recommendations, to support healthcare professionals in making clinical decisions regarding the screening, assessment and management of children with pediatric feeding disorder. The guide was prepared for Alberta Health Services (AHS) by an expert clinical reference group under the auspice of the Maternal Newborn Child & Youth Strategic Clinical Network™ (MNCY SCN) and is aimed at achieving the best possible pediatric care throughout the province.

KEY PRINCIPLES

The guide reflects what is currently regarded as a safe and appropriate approach to the screening, assessment and management of children with pediatric feeding disorder (PFD). This document should be used as a guide, rather than as a complete authoritative statement of procedures to be followed in respect of each individual presentation. It does not replace the need for the application of clinical judgement to each individual presentation.

As in any clinical situation, and due to the heterogeneous nature of PFD, there are factors that cannot be covered by a single guide. Clinicians need to assess and develop individual treatment plans tailored to the specific needs and circumstances of the child and family. This guide should be read in conjunction with other relevant guidelines, position papers, codes of conduct, and policies and procedures, at professional, organizational and local levels.

USE OF GUIDE

Senior Operating Officers and Directors should ensure:

- This guide is adopted or local practices are developed based on Pediatric Feeding Disorder – A Clinical Practice Guide for Healthcare Professionals.
- Local practices are in place in all hospitals, facilities and community-based programs supporting children experiencing PFD.
- All clinicians treating pediatric clients are educated and supported in the use of the locally developed pediatric practices.

Directors and Managers are strongly encouraged to inform relevant clinical staff treating pediatric clients of this guide.

REVISION HISTORY

Version	Approved by	Amendment notes
Mar 31, 2020	AHS Maternal Newborn Child & Youth Strategic Clinical Network™	New Clinical Practice Guide
Jun 6, 2020	PEAS Steering Committee	Minor additions: Table 9 and new Appendix on Early Infant Feeding Difficulties
Jan 19, 2021	PEAS Steering Committee	Update to use Pediatric Feeding Disorder and oral sensorimotor terminology and minor updates to terminology in Table 8.
May 11, 2023	PEAS Steering Committee	Jurisdictional scan and literature reviews completed. Updated sections related to relational feeding and the neurorelational framework, screening, assessment, facilitating safe swallowing, sensory processing, and enteral nutrition. New sections included surgical management, home blended feeding, enteral nutrition administration, tolerance, and weaning.

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1 Introduction

1.1 BACKGROUND

Pediatric eating, feeding and swallowing difficulties are increasingly prevalent and often co-morbid with other conditions. For children with pediatric feeding disorder (PFD) and their families, it results in a significant impairment to family life including: time commitment, financial expense, psychological distress, morbidity and risk of mortality. There is a strong desire among families, healthcare, social services, and the education sectors to improve outcomes for this vulnerable population. It is widely acknowledged that systemic change and collaborative practice are needed in order to achieve these outcomes in this highly complex area of practice.

PFD may present in infants and children at any age. PFD can encompass all aspects of the child's development including feeding and swallowing, oral motor skills, and sensory processing, as well as nutritional requirements, and feeding relationships. PFD commonly develops as a result of a variety of circumstances, often complex, that may occur early in a child's life. Examples of complex and non-complex pediatric cases are listed in Figure 1.

In addition to its primary role of providing nutrition to support growth and development, a positive eating, feeding, and swallowing experience takes place in an environment of parent or caregiver responsiveness, socialization, communication, sharing and nurturing. Likewise, the mealtime environment and practices may be influenced by the community and culture of the family and child (Evans Morris & Dunn Klein, 2000).

1.2 AIM

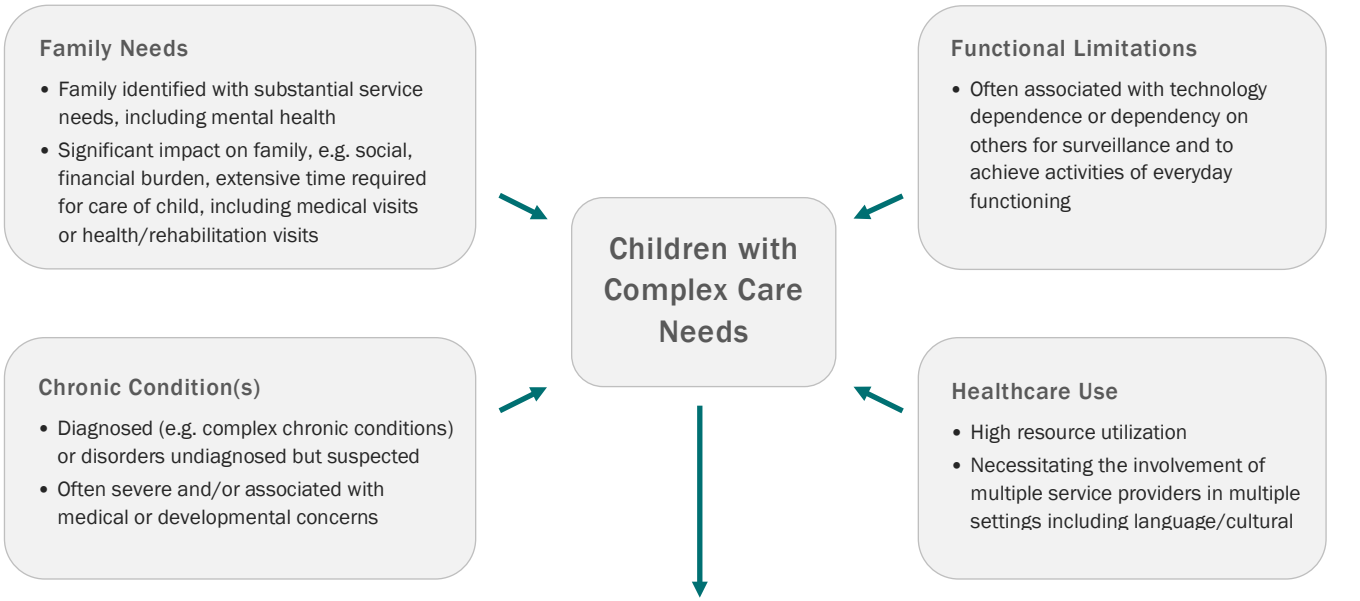
The Pediatric Feeding Disorder Clinical Practice Guide (CPG) is part of a quality improvement initiative with the purpose of standardizing and improving care for children with PFD in Alberta. The CPG aims to provide evidence-based clinical guidance to enhance quality of life and improve patient safety; these are pivotal to quality improvement in a field that has clinical and ethical complexity, and where very few guides and standards exist nationally and internationally.

1.3 KEY OBJECTIVES

This guide provides information, guidance and recommendations, to support AHS healthcare professionals in making clinical decisions regarding the screening, assessment and management of children with PFD. The guide aims to:

- Facilitate processes for quality improvement to optimize quality of care and health outcomes
- Optimize psychosocial outcomes in families
- Facilitate a consistent approach as close to home as possible
- Facilitate communication and collaboration among healthcare professionals and with families by using consistent language, definitions and strategies
- Assist practitioner decision-making for a variety of populations
- Offer clinician tips, tools and training resources to support lifelong learning and education

Figure 1: Definitional Framework for Children with Complex Care Needs Specific to Eating, Feeding and Swallowing



Pediatric Feeding Disorder: PFD is defined as impaired oral intake that is not age-appropriate, lasting at least 2 weeks, and associated with one or more disturbance of: medical, nutritional, feeding skill, and/or psychosocial function

Adapted from:
(Goday, et al., 2019)

Complex Needs Specific to Eating, Feeding, and Swallowing

- Multisystem involvement (gut, respiratory, cardiac, renal, metabolic, neurological)
- Technological dependency (feeding tube, tracheostomy, etc.)
- Non-technological dependency on supports for feeding or other activities of daily living
- Significant anatomical abnormalities
- Risk of aspiration/known aspiration
- Oral feed refusal and/or poor endurance causing suboptimal nutrition intake, dehydration and/or malnutrition
- Medically unstable
- Regulation issues which impact family dynamics
- Social/Mental health issues that compromise safety of the child or ability of the child/family to function at home, school or work

Non-Complex Needs Specific to Eating, Feeding, and Swallowing

- Healthy neonate requiring minimal guidance with breast or bottle feeding
- Infants with challenges with breast or bottle feeding or texture progression
- Isolated disturbances in oral intake that do not significantly impact intake of nutrients or growth or daily function (examples can include: sensory issues, mealtime management issues)
- Isolated cleft lip or palate

(Canadian Association of Paediatric Health Centres (CAPHC), Complex Care Community of Practice, 2018; NSW Office of Kids and Families, 2016)

1.4 SCOPE

This guide applies to infants, children and youth with PFD from birth to 18 years of age.

It offers a framework for screening, assessment and management strategies across the four health domains of medical, nutrition & hydration, feeding skill, and psychosocial dysfunctions. Clinicians working with particular diagnostic groups should refer to other more specifically related documents together with specialists in these areas. This guide excludes traditional psychiatric eating disorders as defined by DSM-5, e.g. bulimia, anorexia nervosa (DC:0-5 Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood, 2016), and picky eating.

1.5 AUDIENCE

This guide can be used by healthcare professionals working individually, or as part of a formal or informal PFD team. Healthcare professionals who may utilize this guide include (but are not limited to):

- community physicians
- dietitians
- gastroenterologists
- lactation consultants
- nurse practitioners
- nurses
- occupational therapists
- otolaryngologists
- pediatricians
- pharmacists
- physiotherapists
- psychologists
- psychiatrists
- respiratory therapists
- social workers
- speech-language pathologists
- surgeons

The topics and content of the guide are relevant for healthcare professionals across a variety of settings including: outpatient clinics, rehabilitation hospitals, community (including schools), home care environments, and urban and rural locations.

The area of PFD is a complex field requiring significant knowledge, practice, and experience. Clinicians should recognize and acknowledge their limitations in this area, and not work beyond the scope and competency of their practice. Where the need for skill development is identified, appropriate training, supervision and mentoring should be sought from an experienced healthcare professional in their field, or from an established pediatric feeding team.

Healthcare professionals should be aware of recent literature in their field, current best practices, relevant clinical competencies and their professional Code of Ethics. This guide provides a sufficient level of detail as to the considerations required for effective clinical reasoning, decision making and provision of service in the area of PFD inclusive of enteral feeding. It is intended that where adequate resources are not available in the local setting, the guide may be used to identify the need for onward referral or collaboration with more specialized services.

1.6 METHODOLOGICAL QUALITY OF CLINICAL PRACTICE GUIDE

This Clinical Practice Guide, as part of the Alberta Health Services (AHS) Pediatric Eating and Swallowing (PEAS) Project, was initiated in response to feedback from families and AHS healthcare professionals practicing in the area of PFD across Alberta. These stakeholders identified gaps in clinical knowledge and safety, and requested further education, guidance and standardization of screening, assessment and management of children with PFD.

The Standardized Practice and Education Working Group was established within the PEAS Project to facilitate the development of an evidence-based PFD clinical practice guide. Members of the working group were initially identified through an expression of interest process, with additional members invited to join the group as required. Group membership included speech-language pathologists, dietitians, occupational therapists, a psychologist, a psychiatrist, physicians, and nurses from the Alberta Children's Hospital (ACH), Stollery Children's Hospital (SCH), and Glenrose Rehabilitation Hospital (GRH), Community Rehabilitation, Home Care, and Community Care; with endorsement from the Maternal, Newborn, Child & Youth Strategic Clinical Network™ (MNCY SCN) Child & Youth Standing Committee, and in collaboration with Nutrition & Food Services, Health Professions Strategy & Practice, branches within the Government of Alberta, and families. The working group was chaired and provided project management support by AHS.

The scope of the guide was determined by the working group. Initially, a search was undertaken to identify any existing evidence-based guides which could be adapted for local use. The guide, *Feeding Difficulties in Children A Guide for Allied Health Professionals* from the New South Wales Office of Kids and Families (2016) (NSW Office of Kids and Families, 2016) was identified as a very thorough document that could be adapted to include the *Pediatric Feeding Disorder – Consensus Definition and Conceptual Framework* (Goday, et al., 2019), and *A Practical Approach to Classifying and Managing Feeding Difficulties* article (Kerzner, et al., 2015). From there, an outline was created to reflect the Goday, et al. and Kerzner, et al. articles for screening, assessment and management of PFD, and was amalgamated with the NSW guide and adapted based on cultural and linguistic relevance, local information and resources. A broad review of both published and unpublished literature was completed from national and international sources. Data extracted evidence tables were created and where supporting literature was identified, the working group made recommendations based on the evidence, integrated with clinical expertise. Reference to supporting evidence is incorporated throughout the guide. Where evidence was not found, the working group made a consensus recommendation based on clinical expertise. An evidence classification scale was applied to the identified literature. The working group decided that the classification scale added no additional value to the guide and was therefore not included.

Rapid literature reviews were also conducted by an analyst on the AHS Innovation, Evidence and Impact (IEI) team. Research questions were designed based on consultation with members of the Standardized Practice and Education Working Group. The literature search strategy was developed in consultation with librarians within the AHS Knowledge Resource Services department, who then conducted the searches on behalf of the IEI analyst. Searches were limited to literature published in English between 2009 and 2019. Evidence was summarized in narrative format and then sent to the working group for inclusion during the guide development process. These reviews were not intended to be comprehensive systematic reviews; rather, they provided a snapshot of the existing evidence related to the topic at hand.

Additions or changes made to the NSW guide by the working group were qualified by using the Appraisal of Guidelines for Research & Evaluation II (AGREE II). The guide proceeded through the PEAS Working Groups, PEAS Leadership, and Steering Committee (internal and external stakeholders) for review and approval.

1.7 ACKNOWLEDGEMENTS/SPONSORS

We would like to dedicate this work to the patients and family members who we have the privilege of working with and caring for, and together are shaping quality healthcare for children with PFD across the province.

We would like to thank everyone involved in the PEAS project who contributed to this provincial effort. This includes members of the Project Team, Steering and Leadership Committees, various Working Groups, families, and key experts who reviewed the evidence and developed materials such as this Clinical Practice Guide.

We would also like to thank the MNCY SCN for ongoing support and resources through the Health Outcomes Improvement Fund II.

1.8 REVISION REQUIREMENTS

It is intended that this guide is updated every three to five years in order to reflect any changes in evidence related to the screening, assessment, and management of children with PFD.

2 Key Principles of Practice

A child's eating, feeding and swallowing abilities are influenced by a range of individual, physiological, social and environmental factors. Intervention and health service provision should be tailored according to the specific needs of the child, their family, and environment. The following key principles should underpin the practice of clinicians throughout the screening, assessment and management of children with PFD.

2.1 CHILD SAFETY

A child's safety, welfare and protection are important factors to consider when working with families. Healthcare providers are uniquely placed to support families and work collaboratively to promote the development of a safe and healthy environment for all children, their parents and caregivers.

Refer to: How child intervention works

2.2 FAMILY-CENTRED CARE

"Family-centred service is made up of a set of values, attitudes, and approaches to services for children with special needs and their families. Family-centred service recognizes that each family is unique; that the family is the constant in the child's life; and that they are the experts on the child's abilities and needs. The family works with service providers to make informed decisions about the services and supports the child and family receive. In family-centred service, the strengths and needs of all family members are considered." (Rush & Shelden, 2011).

Refer to:

Patient & Family Centred Care

- AHS Insite - Patient & Family Centred Care (AHS Staff Login required)
- AHS Patient & Family Centred Care
- CanChild Family-Centred Service
- Institute for Patient- and Family-Centered Care

"At the core of the provision of family-centred care lies the premise that practitioners believe that all families are capable and competent." (Rush & Shelden, 2011).

The AHS Patient First Strategy provides the foundation for supporting children and their families. Clinicians focus on promoting respect, open communication, a team-based approach to care and supported transitions. Child and family perspectives, context, cultural considerations and strategies to involve families in co-designing services are essential to collaborative practice. For practice guidance, refer to Voice & Choice: Team and Self Reflection in Person & Family Centred Care.

Refer to:

Patient First Strategy

- AHS Insite - Patient First Strategy (AHS Staff Login required)
- AHS Patient First Strategy

For the purposes of this guide, the term 'parent' will be used to refer to any individual who takes on the role of caring for a child in the context of the family unit. The term 'caregiver' will be used in the context of educational and child care settings.

2.3 RELATIONAL APPROACH

Relational and responsive approaches to feeding serve as the foundation to guide assessment and management. In a **relational approach**, behaviour is interpreted through the lens of safety, challenge, or threat; safety, security, and trust in the relationship is promoted over reward and punishment (Rowell & McGlothlin, 2015); (Lillas & Turnbull, 2009).

Responsive feeding is embedded in a theoretical framework of responsive parenting (Black & Aboud, 2011). It emphasizes parental responsivity to the infant, and honours the partnership and relationship between the child or youth, and parent or caregiver. An important element of responsive parenting is serve and return interactions, which support healthy brain development and have a lifelong impact on development, and physical and mental health (Harvard University, 2016). The traditional example is a parent responding to a child's attempt to communicate by communicating back with words, or with eye contact or a playful interaction. Within the feeding relationship, serve and return is being responsive to a child's hunger cues and satiety cues. Early feeding problems may affect parent-infant interactions which can impact later feeding relationships (Browne & Sundseth Ross, 2011). In some cases, early feeding problems may be experienced as trauma.

A responsive feeding environment promotes both recognition and prompt response to the child's signs of hunger and satiety in emotionally supportive, and developmentally appropriate ways (Black & Aboud, 2011).

Responsive Feeding Therapy (RFT) is feeding guidance that depends on the caregiver's ability to read the child's cues in order to make the eating or feeding opportunity manageable, enjoyable, and successful, while retaining developmentally appropriate structure and expectations (Rowell & McGlothlin, 2015). As a philosophical and clinical framework, RFT describes an overarching interprofessional approach to feeding and eating interventions that is applicable across the life span (Rowell, Wong, Cormack, & Moreland, 2020). Responsive Feeding Therapy values include:

- Relationship: a dynamic and responsive exchange between the child and parent
- Autonomy: enabling the child to be in control of their actions
- Internal motivation: action that is self-driven
- Individualized care: personalized holistic care
- Competence: the parent and child feel they have the skills to manage (Rowell, Wong, Cormack, & Moreland, 2020)

Parents and caregivers need to be cognizant of their own triggers (emotional, sensory, physical, and environmental), so they can self-regulate and provide co-regulation for the child at mealtimes and other daily routines (Lillas & Turnbull, 2009).

2.4 TEAM APPROACH

Interdisciplinary practice is defined as a "dynamic process involving two or more healthcare providers with complementary backgrounds and skills, sharing common health goals and exercising concerted physical and mental effort in assessing, planning, or evaluating patient care. This is accomplished through interdependent collaboration, open communication and shared decision-making. This in turn generates value-added patient, organizational and staff outcomes" (Xyrichs & Ream, 2008).

An interdisciplinary approach analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole (Choi & Pak, 2008).

Team members from multiple disciplines play a critical role in the provision of care in the area of PFD. **Interprofessional collaboration** is the process of developing and maintaining effective interprofessional working relationships with learners, practitioners, patients, clients or families, and communities to enable optimal health outcomes. Foundational elements of collaboration include respect, trust, shared decision making, and partnerships (National Interprofessional Competency Framework: Canadian Interprofessional Health Collaborative, 2010).

A comprehensive, interdisciplinary team approach may not be feasible in all settings, due to geographical, financial, and organizational circumstances. However, it is recommended that where possible, all disciplines involved with the child work together in a collaborative family-centred model to meet the needs and goals of the child and their family. Clinicians who are not established as part of a site-based team should seek support and work with other disciplines to facilitate the provision of as holistic a service as possible. This support may come from within their own department, geographical area, specialist services or from a tertiary facility offering specialized care for eating, feeding and swallowing.

When appropriate, children with PFD should be under the management of a community physician, to oversee the child's care and act as a central point of coordination.

Refer to: PEAS Collaborative Practice

2.5 ALBERTA QUALITY MATRIX FOR HEALTH – CONTINUUM OF HEALTH & DIMENSIONS OF QUALITY

The Quality Matrix enables the public, patients, providers, and organizations to see how levels of quality and areas of need might intersect. It has been used in numerous ways, including policy development, strategic and service planning, and as a way to educate the public about quality in healthcare. This Matrix has been used to guide the development of evaluation tools for the PEAS Project.

Refer to: Alberta Quality Matrix for Health

2.6 OUR VALUES – AHS CARES

The five AHS values – compassion, accountability, respect, excellence and safety – are at the heart of everything that we do. They inspire, empower and guide how we work together with patients, clients, families and each other.

Refer to: AHS Vision, Mission, Values & Strategies

2.7 PROFESSIONAL PRACTICE AND REHABILITATION CONCEPTUAL FRAMEWORKS

Professional Practice in Action outlines how AHS supports excellence in professional practice. It illustrates the expectation of how professionals work at AHS so they can provide patient and family-centred quality care to Albertans. Professional Practice in Action is part of Our People Strategy and supports the Patient First Strategy. The Rehabilitation Conceptual Framework is a practical example of professional practice in action. This guide can be used to conceptualize, design and deliver rehabilitation services. The PEAS Collaborative Practice toolkit/handbook is a set of practical tools specific to PFD to be used by managers and

healthcare professionals including scope of practice, collaborative practice guidance, and communication tools to use with families.

Refer to:

Professional Practice in Action (AHS Staff Login required)

Rehabilitation Conceptual Framework (AHS Staff Login required)

PEAS Collaborative Practice

3 Conceptual Framework and Definitions

3.1 CONSENSUS DEFINITION: EATING

Eating is the ability to keep and manipulate food or fluid in the mouth and swallow it (Alberta College of Occupational Therapy, 2009).

3.2 CONSENSUS DEFINITION: FEEDING

From an occupational performance perspective, **feeding** is the process of setting up, arranging and bringing food to the mouth. It is sometimes referenced as self-feeding (Alberta College of Occupational Therapy, 2009); (American Occupational Therapy Association, 2014b). From anatomical and physiological perspectives, "feeding is the process involving any aspect of eating or drinking, including gathering and preparing food and liquid for intake, sucking or chewing, and swallowing". (Arvedson & Brodsky, 2002); (American Speech-Language-Hearing Association, 2019).

In the pediatric population, feeding is embedded in the relationship between an infant, child or youth, and a parent or caregiver. Feeding provides children and their parents or caregivers with opportunities to communicate and interact with each other to create a positive social experience that informs future interactions (Lefton-Greif M. , 2008). Children benefit from a responsive feeding environment (Black & Aboud, 2011) where the parent responds to the child's actions in a prompt, emotionally supportive, developmentally appropriate manner (Canadian Paediatric Society, Dietitians of Canada, Health Canada & Breastfeeding Committee for Canada, 2015).

3.3 CONSENSUS DEFINITION: SWALLOWING

From an occupational performance perspective, **swallowing** is moving food, fluid, medication or saliva from the mouth through the pharynx and esophagus into the stomach (Alberta College of Occupational Therapy, 2009); (American Occupational Therapy Association, 2014b).

From an anatomical and physiological perspective, "swallowing is a complex process during which saliva, liquids, and foods are transported from the mouth into the stomach while keeping the airway protected. Swallowing is commonly divided into the following four phases:

- **Oral Preparatory**—voluntary phase during which food or liquid is manipulated in the mouth to form a cohesive bolus—includes sucking liquids, manipulating soft boluses, and chewing solid food.
- **Oral Transit**—voluntary phase that begins with the posterior propulsion of the bolus by the tongue and ends with initiation of the pharyngeal swallow.
- **Pharyngeal**—begins with the initiation of a voluntary pharyngeal swallow which in turn propels the bolus through the pharynx via involuntary peristaltic contraction of the pharyngeal constrictors.
- **Esophageal**—"involuntary phase during which the bolus is carried to the stomach through the process of esophageal peristalsis" (Arvedson & Brodsky, 2002); (Logemann, 1998); (American Speech-Language-Hearing Association, 2019).

3.4 CONSENSUS DEFINITION: PEDIATRIC FEEDING DISORDER

Pediatric Feeding Disorder (PFD) is defined as impaired oral intake that is not age-appropriate, lasting at least two weeks, and associated with one or more disturbance of: medical, nutritional, feeding skill, and/or psychosocial function, and the absence of the cognitive processes consistent with eating disorders and pattern of oral intake that is not due to a lack of food or congruent with cultural norms (Goday, et al., 2019).

3.4.1 Diagnostic Criteria: Pediatric Feeding Disorder

A) A disturbance in oral intake of nutrients, inappropriate for age, lasting at least two weeks and associated with one or more of the following:
   1) **Medical dysfunction**, as evidenced by any of the following:
      a) cardiorespiratory compromise during oral feeding
      b) aspiration or recurrent aspiration pneumonitis
   2) **Nutritional dysfunction**, as evidenced by any of the following:
      a) malnutrition
      b) specific nutrient deficiency or significantly restricted intake of one or more nutrients resulting from decreased diet diversity
      c) reliance on enteral feeds or oral supplements to sustain nutrition and/or hydration
   3) **Feeding skill dysfunction**, as evidenced by any of the following:
      a) need for texture modification of liquid or food
      b) use of modified feeding position or equipment
      c) use of modified feeding strategies
   4) **Psychosocial dysfunction**, as evidenced by any of the following:
      a) active or passive avoidance behaviours by child when feeding or being fed
      b) inappropriate parent or caregiver management of child's feeding and/or nutrition needs
      c) disruption of social functioning within a feeding context
      d) disruption of parent-child relationship associated with feeding

B) Absence of the cognitive processes consistent with eating disorders and pattern of oral intake that is not due to a lack of food or congruent with cultural norms (Goday, et al., 2019).

3.5 CONSENSUS DEFINITION: PEDIATRIC SWALLOWING (DYSPHAGIA) DISORDER

Dysphagia is the term used to refer to a disruption, impairment, or disorder of the process of deglutition (the action or process of swallowing) that compromises the safety, efficiency, or adequacy of the oral intake of nutrients (Dodrill & Gosa, Pediatric Dysphagia: Physiology, Assessment, and Management, 2015); (Alberta College of Speech-Language Pathologists and Audiologists, 2013). Dysphagia may involve the oral cavity, pharynx, or esophagus, and affect the oral, pharyngeal, and/or esophageal phases of swallowing (American Speech-Language-Hearing Association, 2019). It affects an infant, child, or youth's ability to safely suck, drink, chew, eat, control saliva, take medication, or protect the airway.

Dysphagia is a skill-based disorder not to be confused with a behaviourally based feeding disorder. It can occur at any time during the lifespan and may be short or extended in duration. Dysphagia is not a disease but rather a symptom or secondary consequence of an underlying neurogenic, oncologic, structural, psychogenic, surgical, congenital, or iatrogenic pathology

(Alberta College of Speech-Language Pathologists and Audiologists, 2013). The most common causes of dysphagia are related to underlying medical or physical conditions. However, it is recognized that dysphagia can also manifest in psychological or psychiatric conditions (Vaiman, Shoval, & Gavriel, 2008).

3.5.1 Diagnostic Criteria: Pediatric Swallowing (Dysphagia) Disorder

Pediatric Swallowing Disorder, or dysphagia, is defined as compromised airway (e.g. laryngeal, tracheal, and/or bronchial) protection, aspiration, or laryngeal penetration in one or more of the four phases of swallowing: oral, oropharyngeal, pharyngeal, and/or pharyngoesophageal (American Speech-Language-Hearing Association, 2019); (Alberta College of Speech-Language Pathologists and Audiologists, 2013). Diagnosis includes description of the nature and severity of impairment.

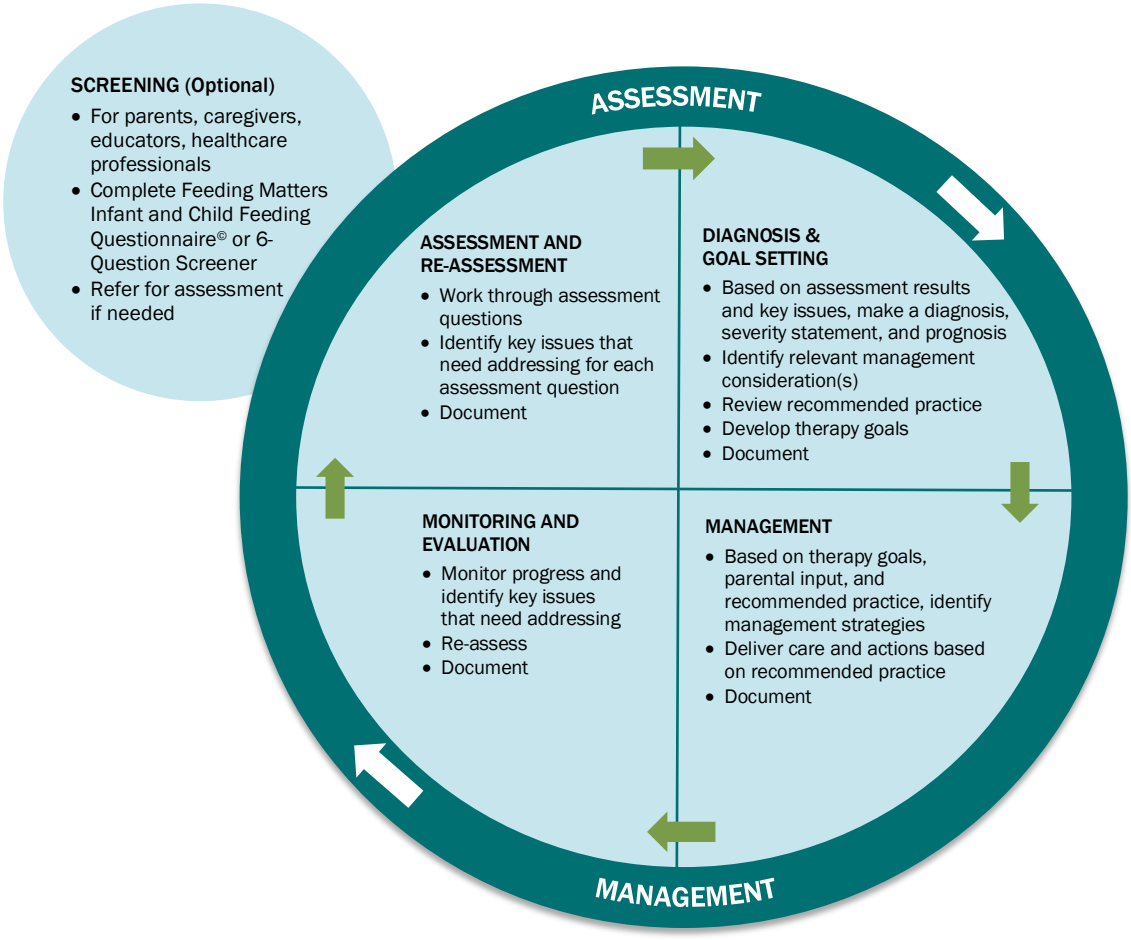
A clinical feeding evaluation does not reliably diagnose oropharyngeal dysphagia and aspiration (Duncan, Mitchell, Larson, & Rosen, 2018). Presenting symptoms, including coughing, choking, wet voice, wet breathing, tearing or red eyes, or changes in colour with feeding, do not reliably predict aspiration risk in children. For children at high risk for aspiration, instrumental evaluations of swallowing are recommended. (Duncan, Mitchell, Larson, & Rosen, 2018).

4 How to Use This Guide

Assessment and management of PFD in children is an ongoing, cyclical process (see Figure 2). The inner quadrants depict the four distinct, but interrelated steps in the Pediatric Feeding Care Cycle. Details regarding the necessary actions are recommended in each quadrant. The outer ring identifies the components of the guide that relate to the steps.

Figure 2: Pediatric Feeding Care Cycle

(NSW Office of Kids and Families, 2016)

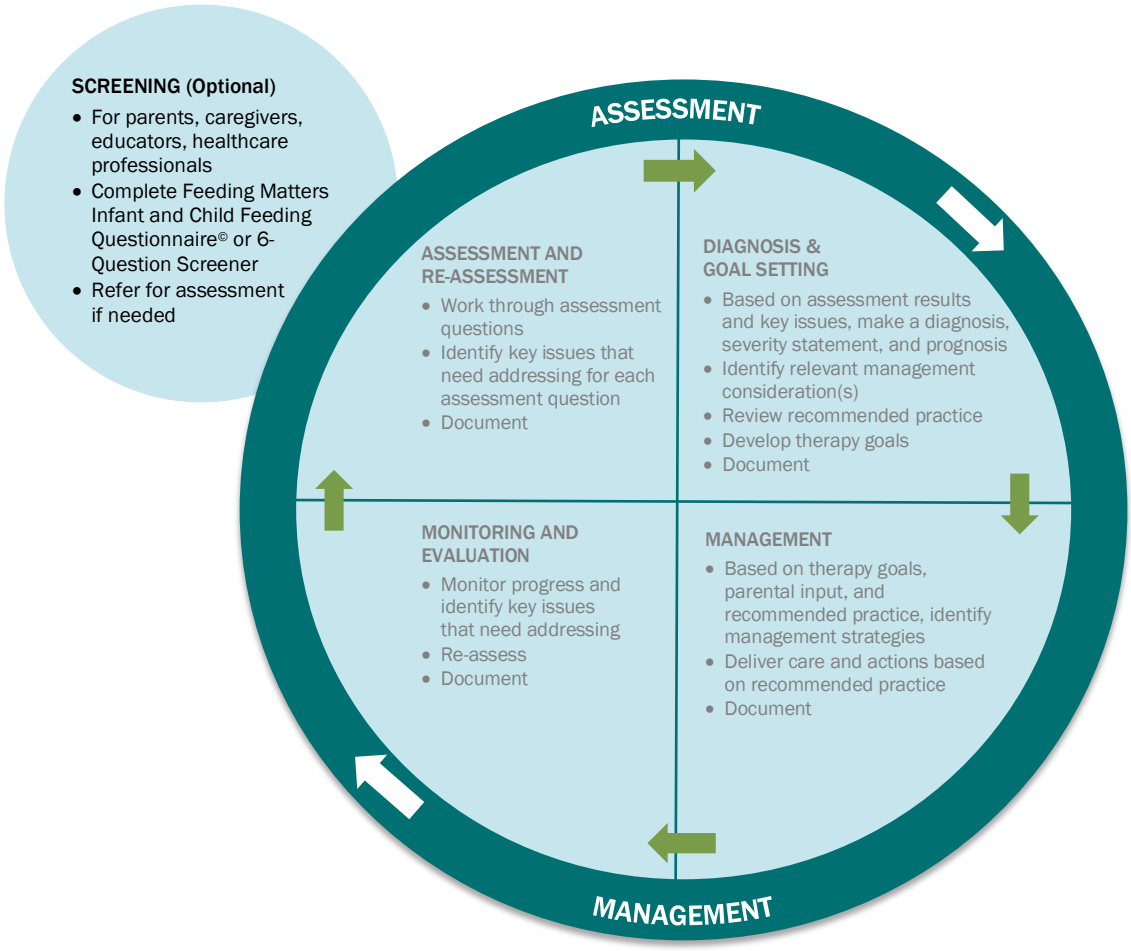


5 Screening

Screening is a strategy used for the purpose of investigation, and is positioned alongside the Pediatric Feeding Care Cycle as an optional precursor to assessment and management (see Figure 3):

Figure 3: Pediatric Feeding Care Cycle

(NSW Office of Kids and Families, 2016)



This section of the guide includes screening considerations related to:

- the purpose of feeding and swallowing screening
- screening tools

5.1 WHAT IS THE PURPOSE OF A FEEDING SCREENING?

Feeding screening may identify the risk of pediatric feeding disorder (PFD) so that infants, children and youth may be referred for a comprehensive assessment. Screening is not diagnostic and outcomes do not provide information about feeding difficulty severity or best management. Screening is carried out for the purpose of early identification that can support opportunities for a diagnosis and effective treatment, counselling, and education (World Health Organization, 2008). Screening is not the only pathway to an assessment and is not required prior to an assessment. There is no evidence to suggest an optimal time to screen a child for feeding difficulties. Concerned parents will typically identify if their child has difficulty eating, feeding and swallowing, and will bring their child for assessment when concerned about their child meeting their developmental milestones. Parents are advised to talk to a healthcare provider knowledgeable about feeding if they have concerns.

CONSIDERATIONS FOR FEEDING SCREENING:

Who should be screened?

- Any infant, child or youth with feeding concerns (or as expressed or identified by their parent)

Who could initiate a discussion for need of a feeding screen?

- Parents, caregivers and healthcare professionals
- Parents and caregivers are advised to talk to a healthcare provider knowledgeable about feeding if they have concerns

Who could complete a feeding screen?

- Parents
- Healthcare professionals

5.1.1 Screening Tools for Feeding Risk

Validated tools for screening feeding risk serve to:

- promote early identification of risk of having pediatric feeding disorder (PFD)
- present education about feeding milestones
- provide a referral method for a comprehensive assessment
- provide a platform for parents to discuss concerns with a healthcare professional

Multiple screening tools and methods exist to screen feeding risk. The recommended screening tools in this CPG include:

- the Feeding Matters Infant and Child Feeding Questionnaire© (ICFQ ©) (Silverman, Berlin, & Linn, 2020)
- the Feeding Matters Infant and Child Feeding Questionnaire© 6-Question Screener (Silverman, Berlin, & Linn, 2020)

5.2 WHAT IS THE PURPOSE OF A SWALLOWING (DYSPHAGIA) SCREENING?

Swallowing screening identifies those infants, children and youth with the greatest risk of having swallowing difficulties so that they may be referred for a clinical swallow evaluation or instrumental swallowing evaluation if indicated. By definition, screening is not diagnostic. Unlike clinical or instrumental swallowing evaluations, screening does not provide information about airway protection, dysphagia severity or best management. (American Speech-Language-Hearing Association, 2019); (American Speech, Language, & Hearing Association, 2004); (Swigert, 2019).

CONSIDERATIONS FOR SWALLOWING SCREENING

Who should be screened?

- Any infant, child or youth with aspiration risk concerns

Who could initiate a discussion for need of a swallowing screen?

- Parents, caregivers, and healthcare professionals

Who could complete a swallowing screen?

- Parents
- Healthcare professionals

5.2.1 Screening Tools for Swallowing (Dysphagia) Risk

Validated tools that screen for swallowing risk serve to (Speech Pathology Australia, 2012); (Stewart, 2003):

- determine aspiration risk (see Table 1)
- improve awareness of swallowing risks and impact on hydration and nutrition
- detect unsafe airway issues
- ascertain the need for a comprehensive assessment to determine anatomical or physiological abnormality
- provide a referral method for a comprehensive assessment

Recommended tools for families to screen for swallowing risk include:

- Feeding Matters Infants and Child Feeding Questionnaire© (Silverman, Berlin, & Linn, 2020)
- The Pediatric version of the Eating Assessment Tool (PEDI-EAT-10) (Arslan, Kilinc, Yasaroglu, Demir, & Karaduman, 2018)
- Parent-Reported Outcome Questionnaire for Swallowing Dysfunction in Healthy Infants and Toddlers (Baqays, 2020)

TABLE 1: INDICATORS THAT CHILD IS AT RISK OR MAY BE ASPIRATING

Signs and Indicators of Possible Aspiration

(consider secretions, solids eaten and liquids taken orally or by tube):

OVERT SIGNS	SUBTLE SIGNS
• choking • gagging • coughing • refusing to feed • wet or gurgly voice during or after feeding • hoarse voice • drooling or pooling of secretions • apneas or desaturations with feeds • noisy breathing • physiological instability	• watery eyes • sudden state or tone changes • ongoing need for supplemental oxygen or increased oxygen needs • recurrent, frequent respiratory infection • poor weight gain • minimal oral intake/lengthy feed times • fatigue with feeding • nasal flaring • colour changes

(NSW Office of Kids and Families, 2016)

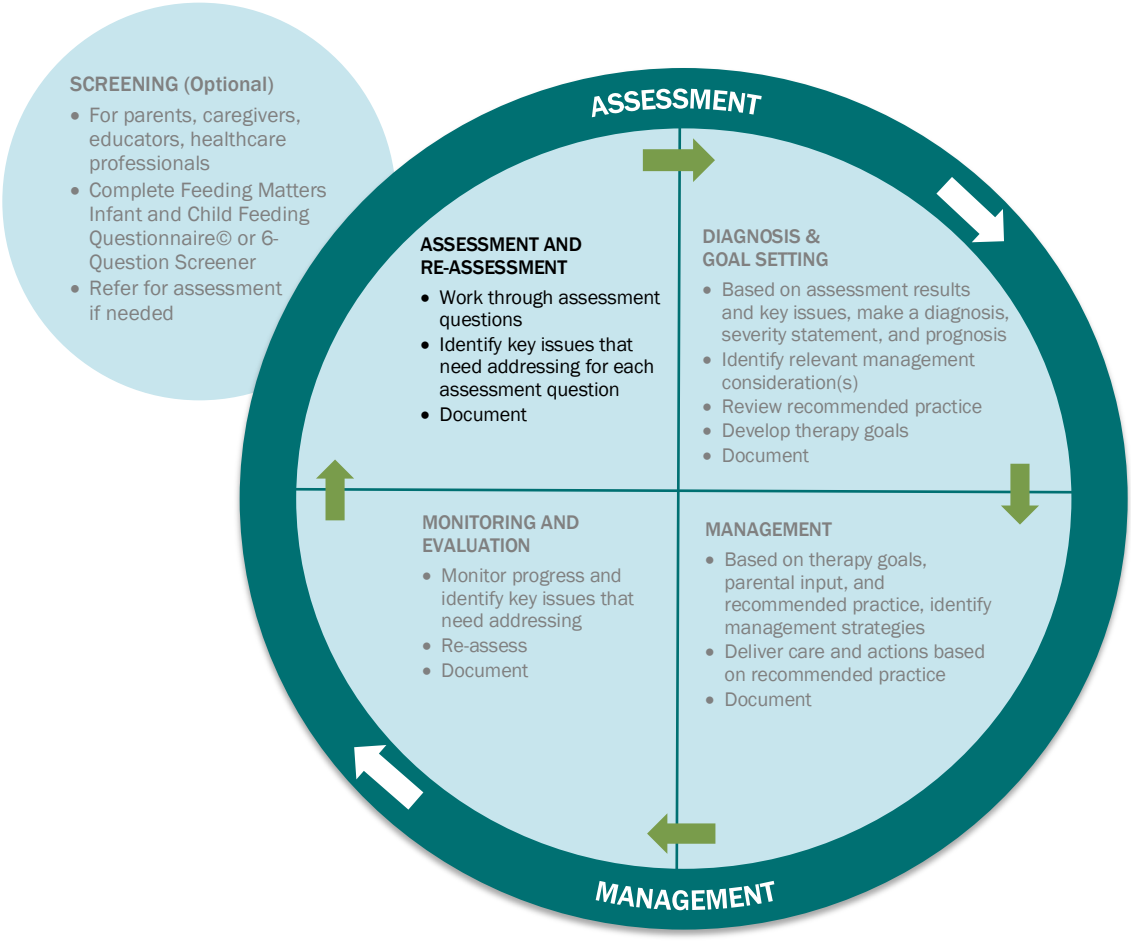
Note: Aspiration can also occur in the absence of signs or symptoms. Any observation of the preceding should be referred immediately for further investigation.

6 Assessment

Assessment is the foundation for intervention of every care plan. Assessment and re-assessment of feeding or swallowing difficulties includes working through the assessment questions, considering each of the health domains (Goday, et al., 2019), identifying where there may be dysfunction, and documenting. This is depicted in the Pediatric Feeding Care Cycle (Figure 4).

Figure 4: Pediatric Feeding Care Cycle

(NSW Office of Kids and Families, 2016)



This section of the guide includes assessment considerations related to:

- feeding and swallowing assessments
- oral hygiene and dental care
- lingual frenulum function

6.1 FEEDING AND SWALLOWING ASSESSMENTS

Consistent with the World Health Organization's (WHO) International Classification of Functioning, Disability and Health (ICF) framework (World Health Organization, 2001) comprehensive feeding and swallowing assessments are conducted to identify, describe, and diagnose:

- impairments in body structure and function affecting feeding and swallowing, including affected oral and swallowing phases
- limitations in activity and participation, including the impact on overall health (including nutrition and hydration) and the child's ability to participate in routine activities, e.g. family meals, meals at daycare and school, birthday celebrations with friends
- psychosocial, environmental and/or personal factors that serve as barriers to or facilitators to successful nutritional intake and mealtime participation, e.g. child's food preferences, parent and caregiver responsiveness, parent-child relationship, family support in implementing strategies for safe eating and drinking
- co-morbid deficits or conditions, such as developmental disabilities or syndromes
- the impact of feeding and swallowing impairments on quality of life of the child and family

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Some populations are at high risk for pediatric feeding disorder (PFD) and/or swallowing dysfunction (dysphagia). Population considerations include:

- *aerodigestive disease (airway, pulmonary, gastrointestinal)*
- *congenital heart disease*
- *diseases of the airway and lungs*
- *disorders that affect oral, nasal, or pharyngeal function*
- *malnutrition*
- *neurological impairments*
- *neurodevelopmental disorders*
- *prematurity*
- *sleep disorders*

(Goday, et al., 2019)

6.1.1 Feeding Assessment Consensus Definition

An initial assessment of feeding includes considerations within the medical, nutritional, feeding skill, and psychosocial health domains. Due to the interactions across these domains, impairment in one domain can lead to dysfunction in any of the others (Goday, et al., 2019).

A disturbance in oral intake of nutrients, inappropriate for age, lasting at least two weeks and associated with one or more of medical, nutritional, feeding skill, or psychosocial dysfunctions constitutes pediatric feeding disorder (PFD) (Goday, et al., 2019). The assessment process leads to the diagnosis of the presence or absence of pediatric feeding disorder (American Speech-Language-Hearing Association, 2019); (Goday, et al., 2019).

A thorough assessment also provides the basis for:

- a statement of severity, e.g. mild, moderate, severe (World Health Organization, 2002); (Skeat & Perry, 2005)
- a statement of prognosis (helps to manage intervention resources and promotes accountability)
- the development of a comprehensive management plan
- facilitating inclusion of all relevant healthcare professionals
- achieving the best possible safety, relational, and responsive feeding outcomes for the child

Interdisciplinary collaboration and a team approach is necessary to distinguish physiologic-specific symptoms and signs of pediatric feeding disorder (Goday, et al., 2019). For further information on discipline roles in relation to the assessment and management of PFD:

Refer to: PEAS Role Descriptors and Tasks within Full Scope

Effective feeding and eating assessments are very detailed and require the collection of all relevant information. Feeding and eating assessments can often take more than one hour to complete or continue over more than one appointment.

Information gathered about the child may include:

- medical, social and feeding history
- medications taken
- current nutrition intake from all sources (oral, enteral, other)
- growth measurements
- oral sensorimotor structure and function
- sensory processing
- overall motor development
- environmental factors
- parent responsiveness to child's cues
- feeding relationship
- an understanding of what is important to the parent and child

Sensitive Assessment of Feeding Issues

Parents of children with pediatric feeding disorder may experience high levels of emotional distress. It is essential that healthcare professionals are mindful of and responsive to parents' feelings, perspectives, beliefs, and cultural values. An assessment process that is not empathetic may contribute to parents feeling criticized and blamed, resulting in disengagement with the feeding service.

6.1.2 Feeding Assessment: 5 Key Questions

To guide a thorough feeding assessment, answer the following **5 Key Questions** and consider the four health domains (i.e. Medical, Nutrition & Hydration, Feeding Skill, and Psychosocial) within each question

1. **Is the current method of feeding safe?**
2. **Is the feeding adequate?**
3. **Is feeding a positive experience for child and parent?**
4. **Is feeding appropriate for child's developmental capacity?**
5. **Is feeding efficient?**

The questions included in this assessment are listed in order of priority to identify, diagnose, and address feeding problems. The questions and considerations included are aimed at supporting a thorough feeding assessment, rather than being used as a checklist. Clinicians should complete the assessment considering the child and family context, and their individual scope of practice. See below for more detailed considerations for each question and each domain.

Clinicians need to identify areas for management based on the combined results of the feeding assessment framework, rather than isolated issues from individual questions.

Ensure you have a complete history including diagnosis and medication list, physical exam, anthropometrics, nutrition assessment, medical and behavioural signs and symptoms, basic laboratory evaluation, and early referral to interdisciplinary teams (Kerzner, et al., 2015).

There exist several published assessment tools designed to evaluate one or more of the 5 Key Questions that guide a thorough feeding assessment. Many of these assessments describe their psychometric properties (validity and reliability of the measurement tool) in their respective technical manuals. The psychometric evidence of many assessments is either inadequate or inconsistent, with limited information on the validity and reliability of these assessments. Therefore most assessment tools should be used with caution (Speyer, Cordier, Parsons, Denman, & Kim, 2018); (Heckathorn, Speyer, Taylor, & Cordier, 2016); (Barton, Bickell, & Fuciles, 2018).

The following validated tools are designed to evaluate one or more of the 5 Key Questions that guide a thorough feeding assessment:

- Neonatal Eating Assessment Tool (NeoEAT) (Pados, Estrem, Thoyre, Park, & McComish, 2017)

- Pediatric version of the Eating Assessment Tool (PEDI-EAT-10) (Belafsky, 2008) (Thoyre, et al., 2017)
- Behavioral Pediatric Feeding Assessment Scale (BPFAS) (Crist & Napier-Phillips, 2001)
- Feeding/Swallowing Impact Survey (FS-IS) (Lefton-Greif, et al., 2014)
- Montreal Children's Hospital Feeding Scale: A brief bilingual screening tool for identifying feeding problems (Ramsay, Martel, Porporino, & Zygmuntowicz, 2011).

PEAS neither recommends nor discommends any of these validated tools. The feeding assessment process developed by NSW Office of Kids and Families was adapted and adopted in this guide.

6.1.2.1 Question 1: Is the Current Method of Feeding *Safe?*

Is swallowing safe? Are there reported or observed indications of the child not tolerating the current method of (oral and/or tube) feeding? To determine if feeding is safe, consider the following within each of the domains:

MEDICAL DOMAIN

- signs of aspiration or dysphagia
- disorders that affect oral, nasal, or pharyngeal function
- aerodigestive disease (known airway, pulmonary, gastrointestinal conditions)
- congenital and other heart diseases
- endurance
- respiratory control; increased work of breathing
- neurological status and neurodevelopmental disorders, e.g. seizures
- gestational age and adjusted age
- level of alertness
- allergies
- oral and dental hygiene
- medication

NUTRITION & HYDRATION DOMAIN

- food or nutrition-related history
- food, formula (oral or enteral) and nutrient intake
- fluid intake and hydration
- safe preparation of texture modified diets and fluids
- appropriate administration of enteral feeds
- supplement use

FEEDING SKILL DOMAIN

- oral mechanism: structure, sensation, cranial nerve involvement
- oral motor and pharyngeal functioning: range of motion, strength, tone, coordination, secretion management
- neurological and neurodevelopmental status: tone, joint stability and limitations, reflexes (including oral)
- general development: motor and postural control, communication, cognition, state
- positioning of child during feeding

PSYCHOSOCIAL DOMAIN

- parent/caregiver responsiveness, e.g. not force feeding
- parent-child relationship
- parent/caregiver stress and/or mental health
- child trauma: history and current status
- family unable to engage in assessment
- differences across feeding environments, e.g. home, childcare, school

6.1.2.2 Question 2: Is Feeding Adequate?

Are growth and nutritional intake appropriate for age and medical condition? To determine if feeding is adequate, consider the following within each of the domains:

MEDICAL DOMAIN

- excessive loss from vomiting, stool or urine
- malabsorption
- endurance
- respiratory control; Increased work of breathing
- drug-nutrient interaction: medication
- oral hygiene or care
- laboratory investigations

NUTRITION & HYDRATION DOMAIN

If there are acute concerns regarding hydration status, refer to a physician immediately. Signs or symptoms of dehydration may include reduced urine output, dry mucous membranes, abnormal respiratory pattern, lethargy, reduced skin turgor and sunken eyes.

- growth pattern
- intake of food, formula, fluid, and nutrients (oral or enteral)
- nutrient deficiency or toxicity
- hydration
- supplement use
- appetite
- urine and stool output
- diet restrictions (prescribed or child or parent initiated) and limited food repertoire

FEEDING SKILL DOMAIN

- oral motor skills to manage textures and consistencies
- neurodevelopmental and general developmental factors
- endurance
- range of food that is appropriate for the child's developmental capacity

PSYCHOSOCIAL DOMAIN

- child's ability to communicate hunger or satiety cues
- cultural or social expectations of growth
- environment: grazing, lack of routine
- child's sensory preferences and sensitivities

6.1.2.3 Question 3: Is Feeding a Positive Experience for Child and Parent/Caregiver?

Is feeding is a positive experience? Are there challenges in the relationship between child and parent that affect the mealtime experience? Are there broader relationship challenges between child and parent evident during non-mealtime interactions? To determine if feeding is a positive experience, consider the following within each of the domains:

MEDICAL DOMAIN

- parent/caregiver and child mental health diagnoses
- sleep patterns for parent and child
- child pain or discomfort related to a medical condition

NUTRITION & HYDRATION DOMAIN

- food over-selectivity
- child's response to being tube-fed
- hydration inadequacy

FEEDING SKILL DOMAIN

- failure to advance to age-appropriate diet despite adequate skill
- child's communication abilities: receptive, expressive
- child's sensory preferences and sensitivities
- parent knowledge and understanding of child's developmental strengths, challenges, and preferences

PSYCHOSOCIAL DOMAIN

- feeding roles: division of responsibility
- feeding relationship
- feeding environment (sensory and physical environment)
- parent/caregiver responsiveness: ability to self-regulate and co-regulate
- parent social and emotional state and coping strategies
- parent social-cultural beliefs
- parent social, emotional and economical resources
- child and parent learned experiences
- child and parent readiness for change
- child's social-emotional state and abilities: self-regulation of stress and emotion, history of trauma, mental health

Indicators That a Parent May Be Experiencing Mental Health Challenges

If any of the following, or any other serious mental health challenges are observed, recommend following up with a physician, psychologist, psychiatrist, or other mental healthcare professional for consultation or advice on management:

- ***Severe anxiety:*** *excessive reassurance seeking (including seeking multiple professional opinions), asking the same questions repeatedly, disproportionate focus on one aspect of feeding, e.g. weight, overestimating cost or likelihood of a poor outcome, reports of feeling restless, anxious, worried.*
- ***Depression*** *(including post-natal depression): presenting with flat affect or tearfulness, reports of feeling sad, empty, hopeless or excessive guilt, difficulties concentrating, making decisions or problem-solving, difficulties enjoying interactions with child.*

6.1.2.4 Question 4: Is Feeding Appropriate for the Child's Developmental Capacity?

What is the child's developmental stage across major domains of development, e.g. social-emotional, physical, language, and cognitive? Is the child's developmental age and ability taken into account during feeding? To determine if feeding is appropriate for the child's developmental capacity, consider the following within each of the domains:

MEDICAL DOMAIN
• neurodevelopmental delay or disorder diagnoses • developmental disorder diagnoses

NUTRITION & HYDRATION DOMAIN
• nutrition requirements related to a medical disorder • range of foods, fluids and textures offered vs eaten – is there a mismatch between skill and food or drinks offered?

FEEDING SKILL DOMAIN
• general development: cognitive, motor, communication, social-emotional • exposure to feeding that is appropriate for the child's developmental capacity • consistency modifications required • self-feeding ability – food and fluid • feeding environment -- positioning, where seated (orally fed/tube-fed), e.g. lap, stroller, high chair • time engaged in feeding

PSYCHOSOCIAL DOMAIN
• cultural feeding practices: opportunities for self-feeding • opportunity to get messy/explore food • mismatch between parental understanding and child's current developmental skill level and abilities

6.1.2.5 Question 5: Is Feeding Efficient?

Are nutrition requirements being provided in a reasonable, sustainable, achievable timeframe? To determine if feeding is efficient, consider the following within each of the domains:

MEDICAL DOMAIN

- impact of medications on feeding regimen (timing, frequency, alertness)
- medications causing excessive sleepiness
- recurrent illness – interfering with meeting targets

NUTRITION & HYDRATION DOMAIN

- volume of food or fluid required in relation to skills for efficient intake
- volume of enteral feeds in relation to tolerance
- appetite
- parent expectation and child's ability in relation to nutrition requirements

FEEDING SKILL DOMAIN

- timing, pacing and duration of meals/feeds
- learned experiences, e.g. pain associated with feeding
- sensory experiences, e.g. food smell, taste, texture, and temperature
- self-feeding vs assisted feeding (and skill of each)
- consistency modifications required
- feeding equipment, e.g. nipple flow rate, cup
- positioning to support gross motor skills

PSYCHOSOCIAL DOMAIN

- eating or feeding in various settings, e.g. school
- routine and structure
- caregiver responsiveness and relationship to facilitate efficient eating

6.1.3 Swallowing (Dysphagia) Assessment Consensus Definition

Any disruption, impairment, or disorder of the process of deglutition (the action or process of swallowing) that compromises the safety, efficiency, or adequacy of hydration and nutritional intake constitutes dysphagia.

The assessment process leads to diagnosis of the presence or absence of a pediatric swallowing disorder (dysphagia).

A thorough assessment provides the basis for:

- a diagnosis of swallowing dysfunction (dysphagia)
- a statement of severity (e.g. mild, moderate, severe) and/or risk, e.g. low, moderate, high risk (World Health Organization, 2002); (Skeat & Perry, 2005)
- a statement of prognosis (helps to manage intervention resources and promotes accountability)
- the development of a comprehensive management plan
- facilitating inclusion of all relevant healthcare professionals
- achieving the best possible safety and management of swallowing outcomes for the child

Refer to: Appendix 2: Components of Clinical Decision Making

6.1.4 Swallowing Assessment: 1 Key Question

To guide a thorough swallowing assessment, answer the following question:

1. Is swallowing safe?
    a. Are there signs and symptoms of decreased airway protection?
    b. Can physiological and respiratory stability improve safe oral feeding?
    c. Can compensatory strategies or diet modifications improve safe oral feeding?

6.1.5 Clinical Evaluation of Swallowing

The clinical evaluation of swallowing is the initial step in the diagnostic process (American Speech-Language-Hearing Association, 2019). The purpose of this evaluation includes:

- diagnose a suspected swallowing dysfunction
- identify site or which phase of the swallowing function may be affected
- identify severity and prognosis of the swallowing dysfunction
- refer to additional healthcare professionals or medical specialists
- determine whether further objective instrumental assessment is required
- develop a management plan for oral, pharyngeal, and/or laryngeal dysfunction (Ongkasuwan & Chiou, 2018)

The clinical evaluation of swallowing is comprised of a collection of measures, each providing a unique contribution to a comprehensive understanding of a swallowing problem (McCullough & Martino, 2013).

The components of a clinical evaluation of swallowing include assessment of:

- oral motor structure and function
- cranial nerves involved in swallowing

- feeding and swallowing
- suspected pharyngeal phase difficulties
- trials of conservative strategies or techniques
- information from instrumental evaluations if available
- results of additional diagnostic tests such as chest x-rays and upper gastrointestinal series

A clinical physical examination by physician(s), (e.g. general pediatrician, otolaryngologist, gastroenterologist, pulmonologist) of systems involved should be part of a comprehensive clinical evaluation.

The clinical evaluation of swallowing assessment should mirror the natural environment as much as possible. Elements from the natural environment to consider during assessment include: familiarity and responsiveness with the feeder, liquid and food choices, positioning, and typical equipment. Trials of conservative strategies or techniques include facilitating increased responsiveness, introducing novel liquids or foods, including consistency modifications, achieving improved positioning, and trialing new equipment.

Validated methods are recommended for interpreting and reporting results of all clinical feeding and swallowing assessments. The following measures are recommended:

a. Australian Therapy Outcome Measures (AusTOMs) for Speech Pathology Swallowing Scale© (Perry & Skeat, 2005)
b. Functional Oral Intake Scale (FOIS) Pediatric (Dodrill & Gosa, Pediatric Dysphagia: Physiology, Assessment, and Management, 2015); (Yi & Shin, 2019)
c. Safe Individualized Nipple Competence (SINC©) (Alberta Health Services, 2019)
d. Positive Oral Experiences Training Initiative (POETrI)

A clinical evaluation of swallowing cannot conclusively demonstrate anatomical problems, functional problems, or aspiration events nor does it reliably diagnose oropharyngeal dysphagia and aspiration (Duncan, Mitchell, Larson, & Rosen, 2018). Clinical evaluation of swallowing is open to subjective interpretation. It is a particularly ineffective diagnostic tool for infants and children experiencing silent aspiration, which has been estimated to involve 60-100% of aspiration cases (Weir, McMahon, Taylor, & Chang, 2011). For infants and children with concerns related to aspiration, or swallowing function, instrumental assessments of swallowing are recommended (Arvedson J. , 2008).

When to consider instrumental evaluations of swallowing:

- concerns related to aspiration or swallowing function to assess laryngeal integrity
- concerns related to oral and pharyngeal phase disorders
- preoperative evaluation, e.g. pre-surgical baseline
- additional information to support the course of management
- evaluate the effect of compensatory and treatment strategies (The Speech Pathology Association of Australia, 2012)

Contraindications to instrumental evaluations of swallowing:

- infant or child is drowsy, agitated, or unable to cooperate with the exam
- child has an intercurrent illness, e.g. viral bronchiolitis, which may be predicted to temporarily impact swallowing
- child is physiologically unstable

- additional information will not change the course of management

6.1.5.1 Instrumental Evaluation of Swallowing

Instrumental evaluation is conducted following a clinical evaluation when further information is needed to determine the presence, nature and extent of the swallowing disorder. It assesses swallowing structures, physiology, and biomechanics, and examines motor and sensory function. Instrumental evaluation goes beyond describing the presence or absence of aspiration; instrumental evaluation can also help to determine if swallow safety can be improved by modifying food textures, liquid consistencies, nipple flow rate, bite sizes, modified or specialty bottles, and/or positioning (Martin-Harris, Carson, Pinto, & Lefton-Greif, 2020).

Instrumental evaluations of swallowing are not necessarily conclusive. Instrumental techniques cannot irrefutably exclude aspiration given the time dependent nature of the evaluations and the situational nature of aspiration. These limitations should be taken into consideration when estimating the results of the evaluations.

The reliability of instrumental evaluations can be increased by adopting tools that decrease procedural variability and increase the quantification of oropharyngeal swallow physiology.

The most commonly used instrumental assessments of swallowing include the Videofluoroscopic Swallowing Study (VFSS) and Fiberoptic Endoscopic Evaluation of Swallowing (FEES).

6.1.5.1.1 Videofluoroscopic Swallowing Study (VFSS) or Modified Barium Swallow (MBS)

VFSS allows for the assessment of the swallow in all of the swallowing stages (Dodrill & Gosa, Pediatric Dysphagia: Physiology, Assessment, and Management, 2015). During this study, the patient is presented with barium-infused liquid and food, and videofluoroscopic monitoring is used to document integrity of laryngeal and pharyngeal structures, oral and pharyngeal phases of the swallow, swallowing disturbances, and airway protection (Bülow, 2012); (Arvedson & Lefton-Greif, 2017). VFSS also verifies success of modifications to increase swallowing safety. See Table 2 and Table 3.

TABLE 2: WHEN TO CONSIDER VFSS

WHEN TO CONSIDER VFSS	CONTRAINDICATIONS OF VFSS
• Patient cooperation is maximized • Some exposure to oral intake – a minimal amount is necessary to obtain enough diagnostic information from the study • Fatigue with feeding	• Potential for medical complications or potential for compromised pulmonary function (suboptimal endurance) • Child is NPO • Child is refusing feeding with evident aversive behaviours, and has minimal oral intake

TABLE 3: ADVANTAGES AND DISADVANTAGES OF VFSS

ADVANTAGES OF VFSS	DISADVANTAGES OF VFSS
• Defines oral and pharyngeal stages of swallowing • Provides dynamic imaging of oral, pharyngeal, and upper esophageal phases of swallowing • Non-intrusive (although for some the confined space may be considered intrusive) • Assesses various consistencies • Provides ongoing view of airway protection during sequential swallows • Verifies outcomes of modifications	• Must accept some oral intake • Does not provide comprehensive examination of esophageal structure and function • Radiation exposure (limits duration and repeatability) • Barium alters the taste and texture of liquids and foods • Operator dependent and open to subjective interpretation • Staff and scheduling requirements • Cannot assess an exclusively breastfed baby

(Logemann, 1998)

6.1.5.1.1.1 Image Acquisition Rate

When considering image acquisition rate, it is important to consider three components: fluoroscopy rate, pulse rate and frame rate. These three components should be compared to ensure that the necessary questions are answered while limiting unnecessary radiation exposure (Steele, 2015).

A full study is always recommended. Partial information may lead to erroneous assumptions about a child's swallow function resulting in unnecessary radiation exposure and compromised patient care (Bohilha, et al., 2013); (Bohilha, et al., 2013); (Cohen, 2009).

Refer to: Role Descriptors and Tasks within Full Scope for discipline specific roles with VFSS

6.1.5.1.2 Fiberoptic Endoscopic Evaluation of Swallowing (FEES)

FEES provides images of the anatomical structures involved in swallow physiology, which identifies structural and physiological swallowing impairments, as well as an assessment of aspiration risk (Willging, 2018). See Table 4 and Table 5.

TABLE 4: WHEN TO CONSIDER FEES

WHEN TO CONSIDER FEES	CONTRAINDICATIONS OF FEES
• Clinical signs of aspiration during the clinical evaluation for bottle or breastfeeding • Poor or questionable secretion management • Stertor • Stridor • Suspected laryngeal abnormality • Fatigue with feeding • Considering initiation of oral intake • Assess progress or change	• Inability to tolerate or pass a nasogastric tube • Anatomic conditions such as choanal atresia and nasal or pharyngeal stenosis

TABLE 5: ADVANTAGES AND DISADVANTAGES OF FEES

ADVANTAGES OF FEES	DISADVANTAGES OF FEES
• It is possible to complete if non-oral or limited oral intake • Assesses secretion management • Visualizes pharyngeal and laryngeal anatomy • Visualizes the vocal cords • Assesses various consistencies • Position of patient is flexible and not critical to results • Assesses swallow while breastfeeding • Portable and accessible • No limitations on time and repeatability • No taste alteration of liquids or solids (can use favourite foods) • No radiation exposure or risk of aspirating barium • Useful for biofeedback	• Intrusive • Actual swallow is obscured (white out) • Cannot assess esophageal phase • Operator dependent and open to subjective interpretation

(Arvedson, Brodsky, & Lefton-Grief, 2020)

Refer to: Role Descriptors and Tasks within Full Scope for discipline specific roles with FEES

6.1.5.1.3 Instrumental Evaluation of Swallowing Considerations

VFSS and FEES exams can be complementary and augmentative. Both tests provide information about modifications that can be made to enhance swallow safety and allow an infant or child to continue eating by mouth. In the case of frequent interval testing, FEES can be repeated as often as necessary. With FEES, there is no radiation exposure. VFSS, on the other hand, introduces radiation exposure and risk of barium aspiration, which has been shown to deleteriously impact health (Leder & Karas, 2000); (Sitton, et al., 2011).

Normal FEES and VFSS do not always exclude aspiration – just as normal outcomes from a clinical examination does not always exclude silent aspiration. An aspiration event can be situational, and the degree of impairment and level of risk may not be adequately captured at the time of the instrumental evaluation. Further complicating the assessment and interpretation of swallowing dysfunction is limited evidence describing the effect of aspiration on the lungs of children. The quality and type of aspiration that can or cannot be safely tolerated by the lungs has not yet been clearly defined (Tanaka, et al., 2019).

Validated methods are recommended to mitigate subjective interpretation of FEES and VFSS by standardizing the method of training and administration, analyzing impairment, and reporting results (Martin-Harris, Carson, Pinto, & Lefton-Greif, 2020).

VFSS: Tools recommended for the quantification of oropharyngeal swallow physiology include:

a. Penetration Aspiration Scale (Rosenbek, Robbins, Roecker, Coyle, & Woods, 1996)
b. BaByVFSSImP© (Martin-Harris, Carson, Pinto, & Lefton-Greif, 2020)

FEES: Tools recommended for the quantification of swallow physiology and secretion management include:

a. Penetration Aspiration Scale (Rosenbek, Robbins, Roecker, Coyle, & Woods, 1996)
b. Secretion Rating Scale (Murray, Langmore, Ginsberg, & Dostie, 1996)

It is important that test fluids match prescribed fluids in terms of viscosity, volume, dose, and method of administration as they apply to all feeding and swallowing assessments.

Refer to: The International Dysphagia Diet Standardisation Initiative (IDDSI)

When penetration/aspiration and residue are reported in isolation and as the only outcomes in instrumental evaluations, it:

- minimizes the complexity of the swallowing mechanism
- does not sufficiently capture degree of impairment and level of risk
- does not provide information to maximize function
- does not guide treatment

Results of instrumental assessments are reviewed in the context of findings from the clinical assessment.

6.1.5.2 Considerations for Total or Supplementary Non-Oral Nutrition

Total or supplementary non-oral nutrition may be recommended when an infant or child is assessed to be unable to safely swallow any liquid or food, or when dysphagia compromises their ability to obtain adequate nutrition and/or hydration orally (College of Audiologists and Speech-Language Pathologists of Ontario, 2007).

The physician, along with the other members of the interdisciplinary team, is responsible to discuss with the parents the possibility of proceeding with non-oral nutrition for the infant or child, and the risks and benefits associated with non-oral nutrition (College of Audiologists and Speech-Language Pathologists of Ontario, 2007).

Indications for non-oral nutrition include optimization of nutrition and/or hydration, and limiting the occurrence of aspiration (although not shown to effectively prevent aspiration pneumonia) (College of Audiologists and Speech-Language Pathologists of Ontario, 2007).

6.1.6 Additional Resources

Assessment Tools for Evaluation of Oral Feeding in Infants Younger Than 6 Months
Psychometric Characteristics of Non-instrumental Swallowing and Feeding Assessments

6.2 ORAL HYGIENE AND DENTAL CARE

Assessment of oral hygiene and dental care may be considered in response to concerns regarding feeding safety and adequacy, feeding as a positive experience, development, and efficiency.

6.2.1 Preventing Poor Oral Hygiene (Coating and Debris) and Early Childhood Caries (Dental Decay)

All children should receive their first dental visit within six months after the first teeth appear or by 12 months of age, whichever comes first.

Poor oral hygiene should be readily visible on visual examination; there may be visibly damaged or diseased tissue, or foreign material in the oral cavity such as food particles.

Early childhood caries (ECC) is a dental disease occurring in the preschool years; from eruption of the primary (baby teeth) dentition until secondary (adult teeth) dentition erupts. Treatment often requires hospitalization and general anesthesia. ECC can

lead to poor eating and there can be adverse effects on the development of secondary teeth. ECC begins with white lesions or lines which become larger, turning yellow or brown (Centre for Oral Health Strategies, 2008).

Children at risk:

- with poor general hygiene
- who do not brush their teeth regularly or parents who do not brush their child's teeth regularly
- with poor diets (high incidence of sugary or acidic food and drinks)
- who are enterally fed
- with poor oromotor skills
- with lingual ankyloglossia (tongue-tie)
- with disabilities or with sensory preferences may have challenges performing tooth brushing or oral care
- with medical conditions, e.g. gastroesophageal reflux (GER), eosinophilic esophagitis (EoE)
- receiving certain medications, e.g. inhaled corticosteroid

Refer to:

Oral Health Screening

AHS Oral Health
AHS Insite Oral Health (AHS Staff Login Required)

Everyday Care for Your Child
MyHealth.Alberta.ca: Dental Care From 6 Months to 3 Years

6.2.2 Identifying Oral Candida (Thrush)

Oral candida is an overgrowth of the fungus Candida albicans in the oral cavity. It can spread to all surfaces in the oral cavity, tonsils, and into the pharynx. Symptoms include white lesions or coating, redness, pain, and/or bleeding.

Children at risk:

- with poor oral hygiene, or who use oral appliances, bottles or pacifiers which have been poorly sterilized
- receiving medications that cause, or with medical conditions known to lead to, increased incidence of the growth of Candida, e.g. inhaled corticosteroids, antibiotics, immunosuppression, nutritional deficiencies
- lacking access to dental care (Carman, et al., 2012)

Refer to: MyHealth.Alberta.ca: Thrush

6.2.3 Identifying Sialorrhea

Sialorrhea refers to drooling or excessive flow of saliva as a result of limitations in a child's ability to control and swallow oral secretions. Sialorrhea can result in perioral chapping, maceration of skin, dehydration, odour, or social isolation. A history should include questions about snoring, noisy breathing or poor sleep patterns.

Children at risk:

- with a neurological condition with associated low oral tone or poor sensation, dysphagia, or with upper airway obstruction such as enlarged adenoids

Refer to:

Sialorrhea in Cerebral Palsy

Nationwide Children's Hospital: Sialorrhea

6.3 LINGUAL FRENULUM FUNCTION (ANKYLOGLOSSIA)

Assessment of feeding and screening for ankyloglossia (tongue-tie) may be considered in breast or bottle-fed infants in response to concerns regarding feeding adequacy, feeding as a positive experience, development, and efficiency.

Controversy exists regarding the clinical significance of ankyloglossia (Canadian Paediatric Society, 2015). Current evidence suggests that most newborns with ankyloglossia are able to breastfeed successfully. However, there is less evidence regarding the role of ankyloglossia in infants who are not breastfed and have feeding difficulties (Francis, Krishnaswami, & McPheeters, 2015).

Practical objective criteria for diagnosing ankyloglossia have yet to be validated, partially due to the lack of a universally accepted definition of ankyloglossia. The Canadian Paediatric Society recommends a thorough intraoral examination, including evaluation of tongue structure and function be performed in newborns with feeding difficulties to rule out other oral anomalies that may be contributing to breastfeeding difficulties (Canadian Paediatric Society, 2015). This recommendation is endorsed in the Alberta Health Services' Ankyloglossia: Assessment and Treatment in Newborns Clinical Practice Tool, which states a diagnosis of tongue-tie may not be made prior to completion of an infant feeding assessment and lingual frenulum functional assessment.

Validated methods are recommended for assessing, interpreting, and reporting results of an infant feeding assessment and lingual frenulum functional assessment, and a thorough intraoral examination, including evaluation of tongue structure and function is recommended for all children. The Hazelbaker Assessment Tool for Lingual Frenulum Function ™© (HATLFF™©) has been recommended by Alberta Health Services. If using this tool, the following should be considered:

- The HATLFF™© is a screening tool (insufficient as a predictor of breastfeeding outcomes)
- The HATLFF™© is highly operator dependent and should be completed by a health professional who has completed requisite administration training (training and experience greatly impacts validity of this tool)
- The HATLFF™© should be considered in its entirety, including interpretation and recommendations

Refer to:

Ankyloglossia: Assessment and Treatment in Newborns (AHS Staff Login required)

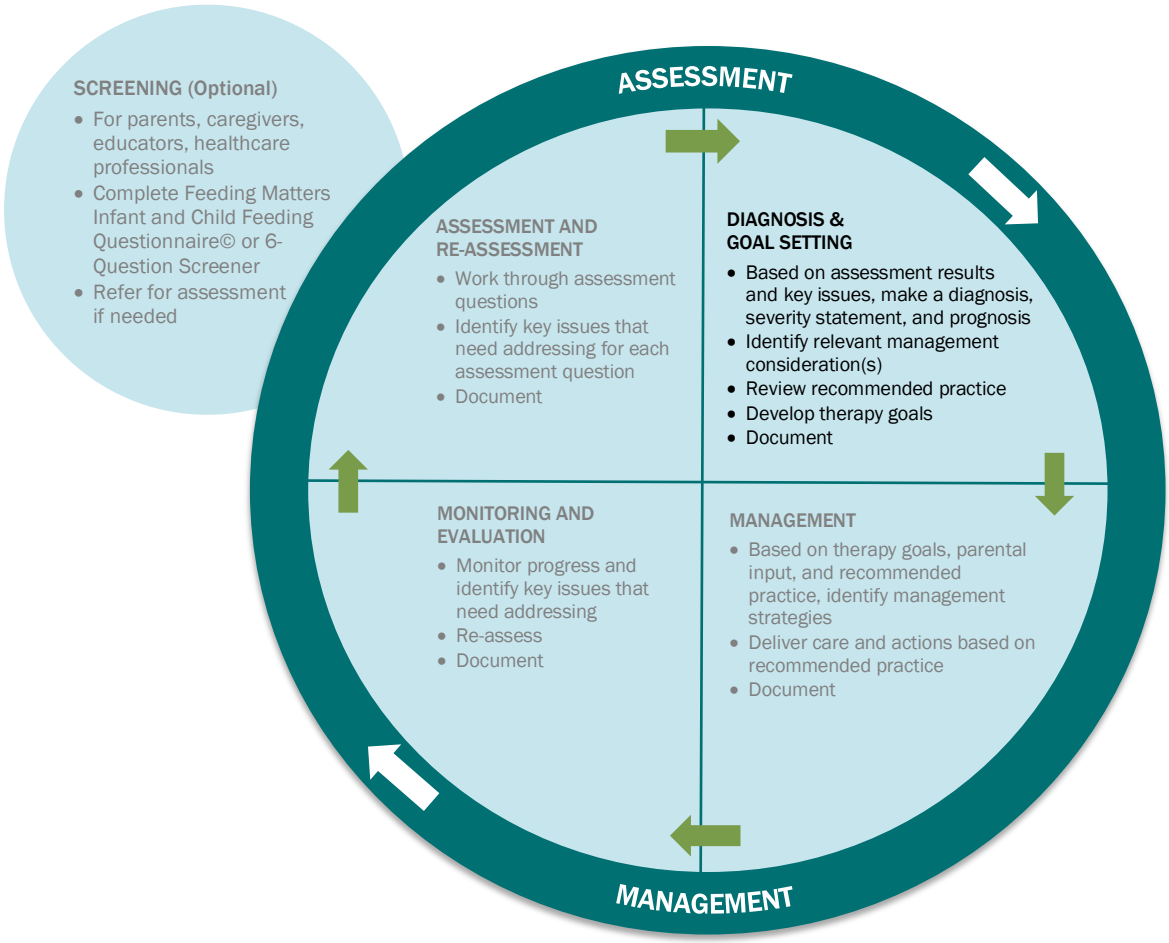
MyHealth.Alberta.ca: Tongue-Tie

7 Diagnosis and Goal Setting

The cyclical nature of pediatric feeding care continues in determining a diagnosis and setting goals. Based on assessment results and key issues, a diagnosis, severity statement, and prognosis are determined. Therapy goals are then developed based on management considerations and recommended practice, and are documented. This is depicted in the Pediatric Feeding Care Cycle (Figure 5).

Figure 5: Pediatric Feeding Care Cycle

(NSW Office of Kids and Families, 2016)



This section of the guide includes assessment considerations related to:

- diagnosis
- goal setting

7.1 DIAGNOSIS

Diagnosing requires the healthcare provider to identify and label a condition that the practitioner is responsible for treating. Coding systems are often used to differentiate diagnoses. Accurate and consistent application of diagnostic codes yields valid and reliable data on health utilization, costs, quality improvement and research outcomes. In the U.S., the term Pediatric Feeding Disorder (R63.3) was approved and included in the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10).

PEDIATRIC FEEDING DISORDER (PFD) IS THE RECOMMENDED TERM TO DIAGNOSE CHILDREN WITH IMPAIRED ORAL INTAKE THAT IS:

- not age-appropriate,
- lasts at least 2 weeks, and
- is associated with one or more disturbance of medical, nutritional, feeding skills, and/or psychosocial function.

Pediatric Feeding Disorder is not an eating disorder as described in DSM-5. It is also not related to food insecurity or congruent with cultural norms.

To support consistent diagnostic coding, the term Pediatric Feeding Disorder has been added to the Alberta Health Services provincial clinical informatics system Connect Care. In areas with alternative clinical informatics systems, consistent use of the term Pediatric Feeding Disorder is still recommended. Other terms can be used to describe associated conditions including but not limited to:

- Dysphagia (oral phase, oropharyngeal phase, pharyngeal phase, pharyngoesophageal phase, unspecified)
- Feeding difficulties, feeding difficulty in newborn
- Malnutrition
- Avoidant Restrictive Food Intake Disorder (ARFID)
    - A psychiatric disorder with anxiety resulting in nutrition sequelae as described in DSM-5.
    - It is important to rule out underlying medical or skill dysfunction as the diagnostic criteria for ARFID can overlap with PFD.

Benefits of using the Pediatric Feeding Disorder diagnostic term include:

- consistent messaging for parents and families
- awareness and consistent identification of children with pediatric feeding disorder
- better understanding of conditions associated with PFD across health domains
- accurate calculation of prevalence data in Alberta

- referral to the appropriate health care professionals.

Clinicians may progressively record diagnoses identified for each of the five assessment questions and associated domains, and their management considerations. Consideration of the combined results, and reference to the management section of the guide, can then be undertaken to develop and prioritize key management goals (NSW Office of Kids and Families, 2016).

Refer to:
Consensus Definition - Pediatric Feeding Disorder
Consensus Definition - Pediatric Swallowing Disorder

7.2 GOAL SETTING

Collaborative goal setting provides a means by which to plan ahead, provide direction and establish a clear, mutually understood trajectory of the child's management or treatment plan between the healthcare professional and parent or caregiver, and across the interdisciplinary team. Parent, and if possible child, participation in the development of the child's own meaningful goals and treatment plan, provides:

- confidence that their treatment team is working in a coordinated way to help them work towards goals that are important to them
- consistency, e.g. commitment to one plan, across the Eating, Feeding, Swallowing team, and parent or caregivers
- improved patient outcomes through shared decision making

Steps of Goal Setting

Step 1: Collaboratively choose a goal that is important to the child and family.

Step 2: Explore ideas to break down the goal into smaller, more manageable steps. Smaller steps enhance self-efficacy and goal attainment. Tools such as SMART (Specific, Measurable, Attainable, Rewarding, Timely) can be used.

Step 3: Explore potential barriers that may impact goal achievement; manage expectations by discussing the amount of change desired, the speed at which the change may be accomplished, and the ease of accomplishing the change and effects this change will have on other aspects of the infant, child, or family's life.

Step 4: Make one change at a time and record data to accurately track progress.

Step 5: Regularly review success as each goal is achieved (or steps within a goal) and before progressing to the next.

Step 6: Reassess goals on a regular basis to evaluate criteria for discharge.

Refer to:

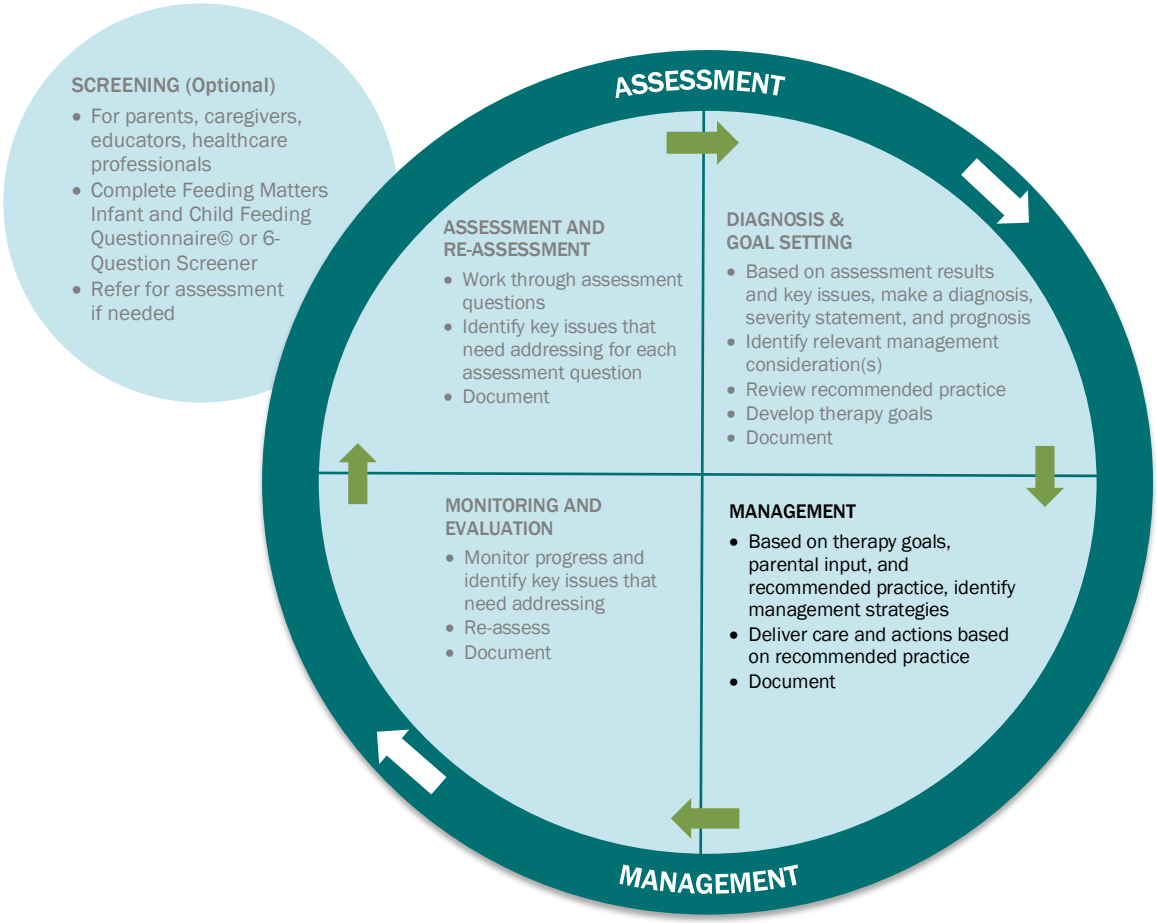
- Collaborative Goal Wheel Form
- Pediatric Collaborative Goal Setting Practice Support
- Rehabilitation Model of Care Sharepoint Site (AHS Staff Login required)
- Connect Care Document Library for information on Collaborative Care Planning and Goal Setting (AHS Staff Login required – search for "Goal")
- HealthChange

8 Management: Oral Feeding

Consideration of the cyclical nature of pediatric feeding care continues in the planning and implementation of interventions to address issues identified through eating, feeding and swallowing assessment, diagnosis, and goal setting. Management of pediatric feeding disorder (PFD) includes interventions or actions required to achieve the therapy goals. These goals and their respective outcomes are documented. This is depicted in the Pediatric Feeding Care Cycle (Figure 6).

Figure 6: Pediatric Feeding Care Cycle

(NSW Office of Kids and Families, 2016)



This section of the guide includes management considerations related to:

- medical stability
- facilitating safe swallowing
- nutrition management to improve nutritional intake
- seating and positioning
- feeding skill development
- feeding environments and routines
- sensory processing
- oral hygiene and dental health
- surgical management

8.1 MEDICAL STABILITY

Management of all medical diagnoses is crucial to the success of other interventions. If not well managed, a medical condition can further exacerbate pediatric feeding disorder (PFD) or hinder the progress of eating, feeding and swallowing interventions. In children who have been medically unstable, or non-oral for a considerable period, confirmation of medical stability and appropriate initiation of oral feeds should be obtained by a physician or nurse practitioner. Oral feeding progress can change from feed to feed, and day-to-day; monitoring and reassessment is essential.

TO BE CONSIDERED MEDICALLY STABLE FOR ORAL EXPERIENCES AND FEEDING TRIALS, CHILDREN NEED TO BE:

- Medically stable as per a physician or nurse practitioner
- At least 30 weeks gestation
- Off ventilation for at least 24 hours
- Able to maintain a resting respiratory rate of 60-70 breaths per minute or less with no respiratory distress cues
- Maintaining wakeful periods – quiet alert state
- Managing secretions (oral and pharyngeal)
- Tolerating enteral feeds
- Displaying hunger cues (preferred for feeding trials)

Examples of medical management may include but are not limited to:

- ***Gastroesophageal reflux disease (see Pediatric Gastroesophageal Reflux Clinical Practice Guidelines: Joint Recommendations of NASPGHAN and ESPGHAN) (Rosen, et al., 2019)***
- ***Allergy management***
- ***Constipation and impaction management***
- ***Oxygenation for respiratory disease***
- ***ADHD-related therapy or medication***
- ***Sleep hygiene***
- ***Seizure management, and***
- ***Medication review to improve appetite.***

8.2 FACILITATING SAFE SWALLOWING

Consideration of strategies to support safe swallowing function should be in response to concerns regarding feeding safety. Strategies may also be considered in response to concerns regarding adequacy, feeding as a positive experience, development, and efficiency.

KEY MESSAGES

- Strategies to help prevent distress should be applied.
- Management following identification of dysphagia should involve an interdisciplinary team approach.
- The goal of dysphagia intervention is to facilitate oral intake while minimizing risk of airway compromise. Any observation of indicators that a child is at risk or may be aspirating should be referred for further clinical assessment.
- It is recommended that the child's current feeding and swallowing skills be reviewed at the time of any significant change to their health, development, medical status, or after airway surgery.
- It is recommended that the child's swallowing abilities be reviewed following extubation of oral endotracheal intubation of over 24 hours.
- A pharmacist should be consulted for a medication review to consider risk of aspiration for optimal delivery of medications inclusive of feeding method (e.g. oral or enteral feeding) and formulations.

8.2.1 Dysphagia Management Strategies

Following identification of dysphagia, an interdisciplinary team approach is best practice to determine appropriate management strategies. The goal of dysphagia intervention is to facilitate oral intake while minimizing risk of airway compromise. The broad range of etiologies resulting in dysphagia create a heterogenous population and as a result, management is typically individualized to target specific skills or swallowing pathophysiology. Medical, surgical, skill, and nutrition considerations contribute to optimal management.

Optimal management can include:

- compensation (strategies which aim to immediately improve safety by compensating for pathophysiology)
- rehabilitation (interventions which aim to improve skills by influencing the physiologic underpinnings of the oropharyngeal mechanism)
- habilitation (interventions which aim to attain or keep skills)
- a combination of these (Speech Pathology Australia, 2012); (Khamis, et al., 2020)

Best available evidence suggests that individualized rehabilitation interventions should be based on oral and pharyngeal physiology. When interventions are aligned with motor learning principles combined with compensatory strategies, they can improve oral feedings skills and reduce reliance on tube-feeding (Khamis, et al., 2020).

Regular monitoring and re-evaluation by the interdisciplinary team is crucial to ensuring that pulmonary health is monitored where a dysfunctional swallow is suspected or established. Other roles of the team are to ensure that there is not reliance on compensatory strategies longer than clinically required (Khamis, et al., 2020), and the child continues to have a safe route for nutrition and hydration. Non-oral feeding should be considered when all other oral management options have been exhausted. Non-oral feeding may be provided in combination with oral feeds (Adams, Elias, & Council on Children with Disabilities, 2014).

If there is evidence of swallow dysfunction from an instrumental swallowing study, any changes to the viscosity or texture of fluids or solids must be closely supervised by the physician and dysphagia practitioner with ongoing re-evaluation.

Refer to:

Table 1 Indicators that Child is at Risk or may be Aspirating

Table 6 Signs of Swallowing Safety Concern in Infants and Management Strategies

PEAS Role Descriptors and Tasks within Full Scope

8.2.2 Compensatory Strategies

8.2.2.1 Pacing

Pacing is a compensatory strategy where the feeder periodically interrupts the feed, thereby slowing the rate of delivery. It can be used across all feeding situations and age ranges, e.g. breast, bottle, cup, liquids and solids feeding.

For infants, the aim of pacing is to increase safe oral intake by assisting the infant to coordinate their suck-swallow-breathe (SSB) cycle. Pacing also allows for re-establishment of normal respiration that supports coordinated SSB patterns.

The rate and frequency of pacing will be dependent on suck to swallow ratio, suck strength, age of the infant, and feeding method. Also to be considered is equipment, for example, the type of bottle chosen and nipple flow rates. See Appendix 3: Nipple Flow Rates.

For children, the aim of pacing is to increase safe oral intake by preventing the child from overfilling their oral cavity, as well as to ensure proper coordination of their respiratory cycle during meals (Harding & Wright, Dysphagia: the challenge of managing eating and drinking difficulties in children and adults who have learning disabilities, 2010). Pacing allows necessary time for children who require multiple swallows to clear their oral cavity and pharynx before taking another bite of food or sip of drink.

8.2.2.2 Altering Sensory Properties

Altering sensory properties of foods and liquids provides additional sensory input for swallowing. Taste, temperature, and tactile quality can be modified to facilitate motor action by stimulating receptors of the tongue and oropharynx.

8.2.2.3 Methods of Bolus Delivery

Methods of bolus delivery, including nipples, cups, straws, and spoons may be considered to reduce aspiration risks, facilitate normal feeding patterns, and improve intake. Equipment selection should consider the child's general development, oral anatomy, oral sensorimotor function and swallowing skills. See Appendix 5: Feeding Equipment.

8.2.2.4 Food Texture Modification and Progression

Children with dysphagia may be at increased risk of aspiration and choking as they transition to more challenging textures. When a child is at increased risk of choking, parents should be trained by a healthcare professional in what to do if their child is choking.

Children should be assessed for safety to progress onto more challenging food textures. Safe and timely progression will ensure they are meeting their developmental potential and that sensitive periods for oral feeding skill acquisition are not neglected (Harris & Mason, 2017). The child's oral sensorimotor function and swallowing function should be taken into consideration when making management decisions regarding texture progression (Sheppard, 1997).

In practice there are many ways to describe the variation in textures and forms of solid foods. The International Dysphagia Diet Standardisation Initiative (IDDSI) is a global standard with terminology and definitions to describe texture-modified foods and thickened liquids used for individuals with dysphagia of all ages, in all care settings, and for all cultures (© The International Dysphagia Diet Standardisation Initiative, 2019). Single IDDSI-only labeling for dysphagia products in Canada is targeted for January 1, 2023. At present, AHS has adopted some aspects of the IDDSI terminology and specifications. Additional terms may be included alongside IDDSI terminology to describe texture modified solids for children with or without dysphagia. See Appendix 4: IDDSI Terminology.

TABLE 6: SIGNS OF SWALLOWING SAFETY CONCERN IN INFANTS AND MANAGEMENT STRATEGIES*

PRESENTING PROBLEMS	PACING	EQUIPMENT SELECTION	TEXTURE MODIFICATION	POSITIONING & HANDLING	THERAPY SUGGESTION
Weak latch	compensatory	• trial different nipple shape (wide vs standard)	not applicable	• well-supported midline position • consider swaddling	• ensure optimal infant state
Weak suck	compensatory	• trial different nipple shapes (wide vs standard) • specialty nipple to facilitate fluid extraction	not applicable	• well-supported midline position • consider swaddling	• ensure optimal infant state • establish and strengthen non-nutritive suck
Fluid pooling and spilling from mouth	compensatory – to modify sucking and swallowing rate and coordination	• if strong suck, trial a slower flow nipple • trial different nipple shape (wide vs standard)	+/- depending on suck strength and effect of pacing	• elevated • side-lying position • well-supported midline position	• ensure optimal infant state • if soft, weak suck, consider risk of aspiration; offer small volumes and gradually increase
Prolonged sucking – minimal intake	compensatory – to establish nutritive SSB cycle	• increase nipple flow rate • consider other specialized feeding equipment if suck is inefficient	not applicable	• elevated • well-supported midline position	• monitor infant endurance and fatigue
Short sucking bursts,↑ respiratory rate, ↑ work of breathing	compensatory - to establish suck rhythm and SSB coordination	• adjust nipple flow rate	+/- trial of thickened fluids depending on suck strength	• elevated • well-supported midline position • side-lying	• monitor infant endurance and fatigue
Respiratory compromise	compensatory – to support optimal respiration	• trial slower flow nipple	+/- thickened fluids depending on swallow safety and instrumental swallowing assessment results	• elevated • side-lying position • well-supported midline position	• consider risk of aspiration; offer small volumes and gradually increase
Coughing or choking	compensatory – to establish safe SSB cycle	• trial slower flow nipple	thickened fluids or modified diet (based on instrumental swallowing assessment results)	• elevated • side-lying position • well-supported midline position	• consider risk of aspiration; offer small volumes and gradually increase

**Note for table above: These strategies can be modified for older children demonstrating oral sensorimotor and/or swallow incoordination. The pacing and texture modification strategies can be applied in the same way for cup (sip and swallow) and solid (chew and swallow) feeding.*

Equipment selection should consider the child's general development, oral anatomy, oral sensorimotor function, and swallowing skills. Many of the strategies that facilitate oral-motor function can be applied alongside specialized seating and positioning. Thickened fluids may be beneficial when there are signs of aspiration, difficulty controlling fluids in the mouth, and signs of delayed initiation of swallow.

8.2.2.5 Liquid Viscosity Modification and Progression

In addition to describing texture modifications to foods, IDDSI also offers person-focused descriptions of thickened liquids for persons with dysphagia.

Thickening liquids creates a cohesive bolus and slows the flow rate of the liquid which may improve oral control, and reduce premature oral and pharyngeal spillage. This allows an infant more time to organize their SSB pattern, trigger a swallow for airway closure, and reduce the risk of aspiration. By improving swallow safety and efficiency with of the use of thickened liquids, feeding tube placement may be avoided, there may be decreased tube dependency with oral intake, and/or pulmonary injury from recurrent aspiration may be prevented (Gosa, Schooling, & Coleman, 2011); (Gosa & Corkins, 2015).

While thickening may be highly beneficial and warranted in some clinical scenarios, it may not be suitable for all infants and children. There is evidence to suggest the potential for negative consequences including the onset of necrotizing enterocolitis (NEC), gastric distress, reduced feeding endurance and efficiency, as well as dehydration and malnutrition (Duncan, Larson, & Rosen, 2019); (Gosa, Schooling, & Coleman, 2011); Woods, et al., 2012). The use of thickening agents can also affect nutritional composition.

Thickening of liquids should only be considered when all other therapeutic options have been exhausted. Furthermore, thickeners should not be prescribed without first utilizing instrumental assessment. Studies, based on animal models, suggest that aspiration of thickened liquids may result in more injurious pulmonary complications (Nativ-Zeltzer, et al., 2018); (Nativ-Zeltzer, et al., 2021); & (Araie, et al., 2020). When instrumental evaluation is unsuccessful or unavailable, careful consideration should be given to the risks and benefits of thickened liquids specific to the patient, and in consultation with the interdisciplinary team.

When choosing the type of thickener, consider the age of the child, what it is being mixed in, and accessibility (many products are special order) (Beal, Silverman, Ballant, & et al., 2012); (Woods, Oliver, Lewis, & et al., 2012); (Rosen, et al., 2019). Check with the manufacturer and review product specifications before prescribing a thickener for children less than three years of age (Kwok, Ojha, & Dorling, 2017). See Table 7.

Thickness of a liquid mixed with commercial thickener can change depending on the type and temperature of liquid, type of thickener, and stand time after mixing (Gosa & Dodrill, 2017). For bottle-fed infants and children, successful management with thickened liquids requires evaluating the effort required to effectively suck and swallow the desired thickness in relation to the bottle nipple opening and flow rate (Gosa & Dodrill, 2017).

TABLE 7: THICKENER TYPES, PRODUCTS, CONSIDERATIONS AND RECOMMENDATIONS

THICKENERS	PRODUCT INFORMATION	GENERAL MIXING INFORMATION See product website for mixing directions and additional details	RECOMMENDATIONS FOR USE
SimplyThick ® Easy Mix™ **Xanthan gum**	• Free from common allergens • Vegan, kosher, halal, gluten-free • Odourless, tasteless • 5 calories per packet • For more information: www.simplythick.com	• Comes in small gel packages • Mixes into hot or cold liquids • Can be mixed with breastmilk as the amylase does not affect xanthan gum • Will maintain thickness in presence of saliva • Will thicken polyethylene glycol (PEG) laxatives • Instructions available for slightly thick (level 1), mildly thick (level 2), moderately thick (level 3) and extremely thick (level 4)	• Not recommended for any infant under 12 months of age, including preterm infants • Not recommended for children under 12 years of age who have a history or necrotizing enterocolitis (NEC)
Gelmix™ **Tapioca maltodextrin and carob bean gum**	• Free from common allergens • Tasteless, odourless, smooth • Organic, GMO free, arsenic free • Vegan, kosher, pareve • Gas and loose stool can be common in the first 2 weeks and usually resolves • Adds calories (10 kcal per 2.4g) • For more information: https://www.healthierthickening.com/gelmix-infant-thickener/	• Powder must be mixed into warm liquids • Can be mixed with breastmilk as the amylase does not affect the carob bean gum • Instructions for slightly thick (level 1) and mildly thick (level 2) available	• Not recommended for preterm infants less than 6 lbs or 42 weeks corrected age • Suitable for term infants after 42 weeks gestation and children (Meunier, et al., 2014) • Do not use if patient has galactosemia or an allergy to galactomannans • Guidelines suggest gum-based thickeners may also be used for gastroesophageal reflux management (Rosen, et al., 2019)
Purathick™ **Tara gum, tapioca maltodextrin**	• Free from common allergens • Tasteless, odourless, smooth • Organic, GMO free • Vegan • Adds calories (10 kcal per 2.4g) • For more information: www.purathick.com	• Comes as a powder • Mixes into hot or cold liquids. May thicken faster with hot liquids • Shake to dissolve and let stand for 5 minutes • Can thicken over time • Instructions for slightly thick (level 1), mildly thick (level 2), moderately thick (level 3), and extremely thick (level 4)	• Suitable for children over 1 year of age • Do not use if patient has galactosemia or an allergy to galactomannans

Nestlé Health Science Thicken Up ® Original **Modified corn starch**	• Has been known to cause loose stools • Tasteless, odourless • Kosher, gluten-free, lactose-free, low residue • Adds calories (15 kcal per 4.5g) • For more information: www.nestlehealthscience.ca	• Comes as a powder • Do not mix with breastmilk as amylase may break down the starch • Can thicken over time • Do not mix with polyethylene glycol (PEG) laxatives as it will not maintain consistent thickness; consult your pharmacist	• Suitable for children at least three years of age *
Nestle Health Science Thicken Up ® Clear **Modified corn and potato starch, maltodextrin, and xanthan gum**	• Allergen awareness: may contain milk ingredients • Clear, tasteless, odourless • Kosher, Gluten-free, Lactose Free • Adds calories (5 kcal per 1.4g scoop) • For more information see: www.thickenupclear.com	• Comes as a powder • Mixes into hot or cold liquids • Thickens quickly • Will not thicken over time • Do not mix with breastmilk as amylase may break down the starch • Will maintain thickness in presence of saliva • Instructions for mildly thick (level 2), moderately thick (level 3), and extremely thick (level 4)	• Suitable for children at least three years of age *
Iron fortified infant cereal (e.g. rice cereal, oat cereal)	• May contain common allergens • May provide excess carbohydrate and iron intake • Allergen awareness: many infant cereals contain milk ingredients	• Cannot be mixed with breastmilk as amylase may break down the starch • Inconsistent thickening to desired consistency with variable flow rate (Gosa & Dodrill, 2017) • Lack of standard recipes • Not recommended for use in a bottle related to viscosity issues	• Not recommended for dysphagia management • May be suitable for infants around 6 months of age (when solids would typically be introduced)

Nestlé Health Science adopted the Codex International Standards: Code of Hygienic Practice for Powdered Formulas for Infants and Young Children. As such, ThickenUp ® Original and ThickenUp Clear ® are subject to different quality requirements compared to products marketed for children less than three years of age and as such are not recommended for this population.

8.2.2.6 Thickeners and Polyethylene Glycol (PEG) Laxatives

When prescribing thickened liquids that are either commercially available or to be prepared at home using a commercial thickener per Table 9, consider the child's risk for potential drug interactions. Starch-based thickeners and polyethylene glycol (PEG) laxatives may interact leading to a thinning of thickened liquids (ISMP Canada Safety Bulletin, 2019), (Carlisle, et al., 2016).

Maltodextrin is a short chain polysaccharide that has undergone partial hydrolysis and therefore does not function as a starch. Xanthan gum may not interact with PEG laxatives in the same way as a starch. SimplyThick® has indicated on their website that their product can be mixed with PEG laxatives.

However, most thickeners are designed and tested exclusively for use with foods and drinks. They are not developed, tested or intended for use with medications, and therefore most manufacturers cannot provide guidance for use with medications.

When prescribing or recommending thickened liquids as part of dysphagia management, determine whether the child is using polyethylene glycol (PEG) laxative. Have the family consult with their interdisciplinary team including the pharmacist for consideration of alternative laxative therapy or an alternative delivery method of PEG laxative. Altering medications for administration is complex and requires clinical assessment and informed decision-making. It is unknown if PEG laxative will fully dissolve or alter the natural consistency of a naturally thick food product such as yogourt or applesauce. Selecting an alternate thickener to be administered with medication may still impact drug bioavailability and dissolution and therefore may not be a suitable option.

8.2.2.7 Impact of Texture and Viscosity Modifications on Nutrition and Hydration

Children with dysphagia may be at increased risk of poor hydration and inadequate intake and should be monitored carefully. Children with respiratory compromise (or increased work of breathing) typically have poor feeding endurance and as such may not have the capacity to take full oral feeds to sustain nutrition. Alternatively, some infants and children may experience increased energy expenditure associated with oral feeding and as such they may require additional nutritional support such as high calorie feeds or enteral nutrition.

It is important to consider the types of textures managed by the child and whether the food texture is impacting the child's nutrition and hydration:

- Children should be offered food textures in line with their developmental capacity. If children are offered foods beyond their oral sensorimotor function level, it may negatively impact the volume of food and fluid consumed and subsequently their nutritional intake. Modifying the texture, by making it easier for oral processing and swallowing, may result in increased nutrition intake and weight gain (Patel, Piazza, Layer, Coleman, & Swartzwelder, 2005). More challenging textures could be offered at snack times for skill development.
- Thickened liquids may negatively impact fluid intake for some children. It is important to assess and monitor the amount of fluid a child is able to swallow and their overall intake for optimal hydration.
- Children on texture modified food and fluids should still be offered a variety of healthy food choices and flavours within their managed textures and viscosities.

If the strategies listed above prove ineffective at maintaining safe and sufficient oral intake of food and fluids to meet hydration or nutritional needs, enteral nutrition therapy may be required.

8.2.2.8 Pill Swallowing

Not all oral medications are available in a composition that is safe for an infant, toddler, or child with dysphagia to swallow. For instance, infants, toddlers, and children with dysphagia may not be safe to swallow tablets or capsules (solid medication). Physicians and pharmacists can recommend suitable alternatives for infants and toddlers under their care. For children with dysphagia, consider consultation with a dysphagia practitioner who will collaborate with the physician and pharmacist to enable safe consumption of medications.

The recommended age for introducing solid medication to children without a diagnosis of dysphagia is between age 4 and 5; at this age, a child can reasonably follow instructions and learn how to control a solid floating in a liquid to swallow it safely. Signs of readiness to learn to swallow solid medications include drinking from an open cup, swallowing mouthfuls of liquid, and adequately chewing bites of chunky foods. Red flags include gagging, choking, or coughing on any of these.

Learning to swallow a solid medication may take practice. The following educational websites have been created to support families to coach their children to learn to swallow solid medications through creating positive experiences that build their confidence (Forough, et al., 2018); (Patel, Jacobsen, Jhaveri, & Bradford K.K., 2015); (Kaplan, et al., 2010).

Refer to:

- www.pillswallowing.com/ready
- www.youtube.com/watch?v=TBpxKwiSDL0

8.2.2.9 Medication Modifications

Modifying a medication may alter its effectiveness or stability or increase the risk of toxicity. Medications that are intended to be swallowed whole should never be crushed or chewed. Medications that function over a specific time instead of all at once (e.g. modified-release dosage tablets or capsules) should not be crushed. Modifying a medication may make taste or texture unacceptable to children. It is important to consult a pharmacist prior to recommending alterations of medication to improve administration and palatability, e.g. accessing compounded liquid formulations, cutting or crushing tablets, or mixing with small amounts of food or drinks. Each medication should be administered separately and as per the physician or pharmacist order. Consider consultation with a compounding pharmacist to discuss options to create personalized medications to meet the specific needs of a child, such as creating medications into gummy bear shapes and using different flavours.

Refer to:

- MyHealth.Alberta.ca: Helping Children Take Medicine
- Alberta Referral Directory

8.2.3 Rehabilitation Interventions

Rehabilitation interventions involve applying principles of neuroplasticity and motor learning to improve the physiology of swallowing behaviour.

Oral sensorimotor interventions aim to develop awareness, strength, coordination, range of movement, and endurance of the lips, cheeks, tongue, and jaw (Sjögreen, et al., 2018).

Direct oropharyngeal exercises include exercises involving the oropharyngeal musculature with the aim of changing participant swallowing physiology (e.g. strength-based exercises, respiratory coordination exercises, and skill-based programs). At present, the feasibility and effectiveness of using swallowing exercises with children remains inconclusive (Halfpenny, Stewart, Kelly, Conway, & Smith, 2021).

Best evidence reinforces dysphagia rehabilitation approaches that include motor learning factors such as intensity, duration, task specificity, and generalization.

At present, the strength of recommendations relating to oral sensorimotor interventions for children with dysphagia secondary to congenital or early-acquired disabilities is moderate due to lack of control groups, however, significant positive results are reported (Sjögreen, et al., 2018). Clinicians should always consider functional therapy tasks that directly impact eating and drinking ability and/or safety and closely parallel the desired task. See Table 8.

TABLE 8: COMPENSATORY, REHABILITATIVE, AND HABILITATIVE TECHNIQUES FOR DYSPHAGIA MANAGEMENT

MANAGEMENT	STRATEGY	EXAMPLE	OBJECTIVE
COMPENSATION			
	Pacing	Moderate the rate of intake by controlling or titrating the rate of presentation liquid or food provided, moderating the rate of presentation of food or liquid, and the time between bites or swallows	Encourage breathing (infants) Discourage overfilling the oral cavity (children)
	Modify texture	Offer moist, cohesive consistency	Reduce piecemeal deglutition, reduce choking risk
	Modify liquid viscosity	Thickened liquids consistency	Reduce risk of aspiration
	Modify position	Elevated side-lying positioning or semi-prone (for infants)	Maximize control of muscles for deglutition, reduce bolus flow, improve integration of suck-swallow-breathe sequence, reduce airway obstruction
	Provide head or face posture support	Provide jaw, lip, or cheek assist	Reduce risk of aspiration
	Use alternative equipment	Trial slow flow nipples	Reduce risk of aspiration
	Use adaptive equipment	Trial flexible cut-out cup	Reduce risk of aspiration
	Increase oral sensorimotor awareness	Alter food taste, temperature, tactile quality	Stimulate receptors of the tongue and oropharynx Provide additional sensory input for swallowing
REHABILITATION			
	Practice biting and chewing	Offer transitional foods which quickly dissolve	Improve underlying oropharyngeal physiology
	Refine bolus control and swallow	Offer small sips of water	Improve underlying oropharyngeal physiology

	Practice swallowing Strengthen the jaw, lips, cheek, and tongue	Dry swallow or effortful swallow	Improve underlying oropharyngeal physiology (e.g. strengthen jaw, lips, cheek, and tongue)
	Trial dysphagia exercises or maneuvers	Modified Shaker exercise, Effortful swallow, Masako Maneuver, Jaw Thrust* *This list is not exhaustive	Change the timing or strength of movements of swallowing Improve underlying oropharyngeal physiology (e.g. modified Shaker exercise improves the amplitude of pharyngeal muscle contraction)
	Trial biofeedback	Use surface electromyography, ultrasound, or nasendoscopy	Interpret visual information and make physiological changes during the swallowing process
	Trial electrical stimulation	Use an electrical current to stimulate the peripheral nerve	Improve underlying oropharyngeal physiology (e.g., increase the velocity of hyoid bone movement and reduce the pyriform sinus stasis)
HABILITATION			
	Support the development of oral sensorimotor skills that have yet be mastered	Offer oral stimulation with tastes, or time and volume limited oral feeding Begin with foundational skills and practice within the infant or child's zone of proximal development	Elicit the skills that emerge in the typical oral sensorimotor skill sequence
	Responsive feeding— **Focus on the caregiver-and-child dynamic**	Attempt to understand and read a child's cues for both hunger and satiety and respect those communication signals	Emphasize communication rather than volume
	Behavioural interventions based on principles of behavioural modification	Trial techniques such as antecedent shaping, prompting, modelling, stimulus fading, and differential reinforcement of alternate behaviour	Increase relevant actions or behaviours—including increasing compliance—and reduce maladaptive behaviours related to feeding and swallowing

8.2.4 Habilitation

Habilitation aims to support infants and children to attain or keep skills. In swallowing, habilitative therapy often functions to support the development of oral sensorimotor skills that have yet be mastered. In some cases, strategies are used for eliciting the skills that emerge in the typical oral sensorimotor skill sequence. For instance, therapeutic strategies for infants, such as oral stimulation with tastes, or time and volume limited oral feeding, may provide beneficial opportunities for purposeful swallowing.

Habilitation may include supporting the development of feeding and swallowing beginning with foundational skills and practicing within the infant or child's zone of proximal development (Graham, 2022).

Behavioural interventions focus on increasing applicable and relevant actions or behaviours and reducing maladaptive behaviours related to eating and swallowing (American Speech-Language-Hearing Association, 2022).

- ***PEAS does not endorse any products, procedures, or programs, and therefore does not have an official position on the use of any compensatory, rehabilitative, or habilitative management strategy cited within this Clinical Practice Guide.***

- ***PEAS endorses that health professionals who engage in any compensatory, rehabilitative, or habilitative management strategy ensure that it is within the scope of their professional practice and competence, considering their certification status, education, training, and experience (American Speech-Language-Hearing Association, 2022).***

8.3 NUTRITION MANAGEMENT TO IMPROVE ORAL NUTRITIONAL INTAKE/NUTRITION AND HYDRATION

Nutrition management to improve oral nutritional intake may be considered as a management strategy in response to concerns regarding feeding adequacy, feeding as a positive experience, development, and efficiency.

KEY MESSAGES

- Children with PFD are at greater risk of nutritional deficiencies. All children with feeding difficulties benefit from a nutrition assessment (Alberta Health Services, 2017).
- Infants and children with PFD often require oral nutrition support in order to optimize food and nutrient intake to support adequate growth and meet nutrition.
- Strategies to increase food and nutrient intake of infants and children vary based on age, medical condition, skill, psychosocial factors, and current oral intake. Energy, protein, fluid, fibre, and micronutrients such as calcium and iron should be considered.
- While considering the infant or child's feeding skills and preferences, encourage a healthy eating pattern for balanced nutrition to meet requirements and reflect taste, culture, budget and lifestyle. (Government of Canada, 2019)
- If oral nutrition support is ineffective, enteral nutrition support may be considered as an additional or alternative therapeutic management strategy.

Infants, children, and youth with PFD are at risk of inadequate nutritional intake, poor weight gain and growth delay or faltering. Oral nutrition support can be a useful firstline therapeutic nutrition management strategy to optimize growth and nutrition intake.

8.3.1 Estimating Energy and Protein Requirements

Energy requirements in children depend on growth, physical activity, metabolic status, and nutrition reserve. A child's energy requirements can be estimated using an appropriate equation and requires clinical evaluation. Ideal body weight may be required for some calculations. Energy requirements should be re-calculated at subsequent review appointments, to accommodate for changing weights and clinical presentation. A child's protein requirements can be estimated using an appropriate equation, and evaluated and adjusted according to disease state.

8.3.2 Supporting Adequate Growth

It is important to explore the parents' perceptions of their child's growth in relation to the child's feeding history. Discuss anthropometrics and reinforce typical growth patterns in relation to the child's growth.

Appropriate assessment of growth patterns will help to determine the child's risk of malnutrition (Dietitians of Canada and Canadian Paediatric Society, 2010) (Becker, et al., 2015). The World Health Organization Set 2 charts represent a growth standard and are used in AHS. The Fenton Growth Chart is used to monitor growth of preterm infants from 22 to 50 weeks.

Disease specific growth charts should only be used in conjunction with standard growth charts, not by themselves (Nutrition Services, 2023). Note that breastfed infants grow differently compared to formula fed infants and this should be a consideration when interpreting growth patterns. Frequency of growth monitoring is outlined in the AHS Childhood Growth Measurement Protocol.

Refer to:

Childhood Growth Measurement

Childhood Growth Monitoring Training and Resources

Growth Monitoring Summary Sheet

If a child is malnourished, child-specific nutrition interventions to target improved nutrient intakes should be implemented. Consider what the child can manage or will accept (Alberta Health Services, 2017). A high calorie high protein diet, food fortification, texture modification, oral nutrition supplements, and/or vitamin and minerals supplementation should be considered for infants and children with inadequate intake.

In the presence of malnutrition, chewing and/or swallowing issues may be present due to muscle and fat loss, which may impact the texture and types of foods the child can manage. Explore whether the family has food insecurity impacting access to sufficient, safe, and nutritious foods to meet their nutrition needs for health and adequate oral intake.

Refer to:

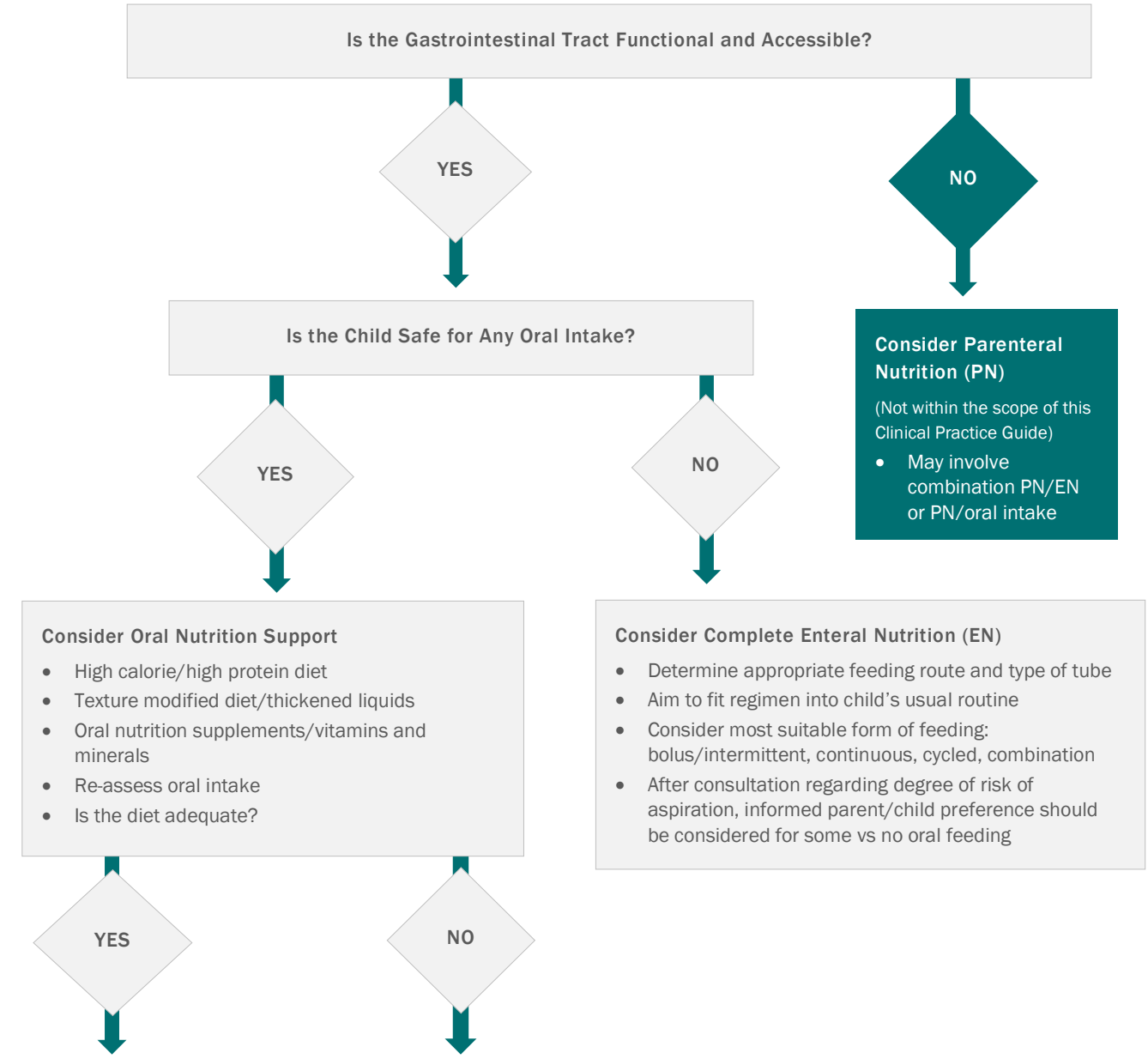
Nutrition Guideline - Household Food Insecurity

Free Food in Alberta

If oral nutrition support is inadequate, inefficient, not safe, and/or does not meet nutritional requirements for adequate growth, consider enteral feeding. See Figure 7.

Figure 7: Nutrition Support Decision Making Tree (Modality Algorithm)

For use when oral intake has been assessed as inadequate or inefficient



(NSW Office of Kids and Families, 2016)

8.3.3 Supporting Oral Nutrition for Exclusively Breastfed Infants

Breastfeeding provides nutritional, immunological and emotional benefits for the growth and development of infants, improves maternal health, and provides economic benefits to the family and the healthcare system. As a result, breastfeeding is strongly supported nationally and internationally.

Refer to:

- AHS Breastfeeding Initiative
- AHS 20-Hour Breastfeeding Course

Exclusive breastfeeding is recommended for a healthy full-term infant for the first six months, with the introduction of age-appropriate iron-rich foods, and continued breastfeeding for two years and beyond.

Refer to: Nutrition for Healthy Term Infants: Recommendations from Birth to Six Months

When an infant and parent present with breastfeeding challenges, a holistic assessment and understanding of maternal goals is needed to provide an individualized approach to management. Infant breastfeeding may require adjustments to latch, positioning, pacing, and/or routine among other factors. Inadequate milk transfer may lead to poor emptying of the breast, thus limiting production and breastmilk supply that compounds feeding issues and infant growth. In these situations, the parent and infant should be referred to a lactation consultant or healthcare professional with breastfeeding knowledge and skill to support them both.

Breastmilk supply should be optimized through infant stimulation at the breast, pumping, and/or other lactation supports. High calorie formula supplementation can also be considered as a bridge during times when breastmilk supply is low until optimal volumes are achieved.

If breastmilk supply remains inadequate or if the infant is tiring easily, it may be necessary to provide expressed breastmilk supplementation via bottle, at breast supplemental system, cup or enteral feed. Some families may decide to introduce infant formula. High calorie breastmilk supplementation may also be explored depending on breastmilk availability, volume accepted, and growth needs.

Breastfeeding may not be achievable for some parents and infants. In this situation, parents should be supported by the healthcare team to determine a feeding method that is both achievable and desirable to the parent and infant. A discussion supporting an informed feeding decision is recommended.

8.3.4 Supporting Oral Nutrition for Formula Fed Infants

Modifications to feed volume, concentration, or formula selection may be required to support an infant's intake when medical dysfunction, (e.g. prematurity, respiratory disease, neurological impairment, gastroesophageal reflux) is present and contributing to a feeding disorder.

Optimize feed volume using supportive strategies such as modifying the frequency of feeds and volume offered, pacing, changes in nipple flow rate, and positioning. The following can be used as a guide for the approximate amount of formula required by infants at different ages.

Refer to:

- Nutrition Guideline: Healthy Infants and Young Children - Safe Preparation and Handling of Infant Formula
- How Much Infant Formula to Prepare for Baby

High calorie formula may be needed to support sufficient intake but can contribute to constipation, diarrhea, reflux, increased satiety, and may exceed recommended micronutrient intake. Careful recipe preparation and monitoring is required by a healthcare professional.

Commercial cow's milk-based infant formulas are the standard choice for healthy term infants who are not exclusively breastfed. A change in formula may be required to manage symptoms of medical dysfunction that may impact feeding and formula refusal, e.g. allergy, malabsorption, pain from reflux. Infant formula selection may be based on age appropriateness, absorptive capacity, fluid allowance, and underlying disease state (Alberta Health Services, 2013a), (NSW Office of Kids and Families, 2016).

Refer to:

Provincial Nutrition Formulary (AHS Staff Login required)

Nutrition for Healthy Term Infants: Recommendations from Birth to Six Months

8.3.5 Supporting Oral Nutrition for Infants Between 6 - 12 Months

Introduction of complementary foods around six months to children with existing PFD may require additional care and consideration to support a positive feeding experience. Offer a variety of complementary foods at around six months and a variety of textures by nine months in accordance with feeding guidelines and developmental readiness (Alberta Health Services, 2017). Delayed introduction of texture beyond nine months of age is associated with PFD and increased selectivity. Some children may require slower texture progression based on feeding skills, efficiency, and intake.

Exposure to a wide variety of foods and flavours supports food exploration, skill acquisition and developing comfort with new foods. Overdependence on breastfeeding, infant formula, or cow's milk may decrease interest and appetite for solid foods which may negatively impact micronutrient intake. Encourage feeding that is appropriate for the child's developmental capacity and offer foods that address nutrients of concern, e.g. protein, calcium, iron, fibre. If oral nutrition support is needed to assist with growth, consider high calorie or high protein meals and snacks.

Refer to: Adding Calories and Protein to Your Child's Diet

Most healthy term infants are born with sufficient iron stores to meet their needs until about six months of age. Iron intake is often compromised in infants with PFD due to delayed introduction of iron-rich foods, texture acceptance, or feeding skills required to eat them in sufficient quantities. Offering iron-rich foods such as meats, fish, poultry, eggs, nuts, seeds, and legumes at meals and snacks daily can support adequate intake when offered in a texture the infant can manage safely and efficiently.

Refer to:

Nutrition Guideline: Iron

Iron for Babies and Young Children handout

8.3.6 Supporting Oral Nutrition From 12 Months Onward

Here are some strategies to support oral nutrition:

- If oral nutrition support is needed to assist with growth for this age group, encourage a variety of food from all food groups, with particular emphasis on energy-dense foods (Carney, et al., 2010). Aim for a structured routine of three main meals and two to three high energy, protein snacks each day.
- Mix energy-dense ingredients into usual family foods, e.g. butter, nuts, seeds. Be mindful to not hide new foods in preferred foods while trying to enhance nutrition intake.
- Offer age and developmentally appropriate portion sizes to support self-awareness of hunger and fullness which may impact the variety of foods accepted at the meal and reduce stress associated with being offered too much food. Teaching older children to serve themselves from the foods being offered promotes self-regulation of appetite, and feelings of confidence and control which contribute to a positive eating experience thus increasing food intake (Alberta Health Services, 2017).
- Offer a small portion of new or non-preferred foods many different times even if the child does not eat them. For some children, it may take six to 15 repeat exposures to taste and accept a new food to contribute to intake. More exposures may be required for a child with significant sensory preferences (Alberta Health Services, 2017).
- Serving new or non-preferred foods with a liked condiment or sauce may help acceptance of these foods and increase energy and/or protein.
- Continue to offer foods in a texture that is suited to the child's age and skill level to prevent choking and support efficient oral intake and adequacy.
- Consider commercial oral nutrition supplements for children who are not meeting macronutrient and micronutrient needs until nutrition needs can be met with food.

Refer to:
Iron Foods for Children Ages 1 and up
Adding Calories and Protein to Your Child's Diet

8.3.7 Ensuring Adequate Fluid Intake

Ensure safe and adequate fluid intake according to age.

Refer to: Dietary Reference Intakes: Electrolytes and Water

- For children who are experiencing dark, concentrated urine, try to optimize fluid intake – offer fluids more often, try flavoured water, add ice, use straws or special cups, and alternate bites with sips of fluid.
- For children who do not like to drink or have difficulty with fluids, high water content foods can be encouraged, such as fruit, vegetables, yogourt, soups, and ice cream. When overall nutrition intake is low, offering nutrient dense liquids is preferred such as blended soups, smoothies, and yogourt.
- Children with dysphagia may be a higher risk of dehydration related to swallow dysfunction, drinking skills, or sensory preferences. Some children may require thickened fluids to support safe and adequate intake. Some

children may exhibit a decline in fluid intake related to sensory preferences or effort required to drink thickened fluids.

8.3.8 Supporting a Healthy Eating Pattern

A healthy eating pattern refers to what a child will eat and drink on a regular basis, and helps the child and family feel good, maintain health, and meet nutrition needs. Regularly eating a variety of vegetables and fruits, whole grain foods, and protein foods while appealing to taste, culture, budget, and lifestyle may be a long-term goal to support balanced nutrition and long-term health (Government of Canada, 2019).

Limited food variety may result in constipation from inadequate vegetable and fruit intake, low appetite related to iron deficiency, B12 deficiency related to poor intake of animal products, and over or under nutrition of other nutrients. Limited food variety is often multifactorial in its etiology, however, pinpointing key social, behavioural and economic concerns may assist in prevention and/or management.

Early assessment and intervention can positively impact the ability of the child to accept new foods to overcome suboptimal food variety. The severity of a feeding-related medical condition is likely to influence the severity of food restriction.

Refer to: Make it a habit to eat vegetables, fruits, whole grains and protein foods

8.3.8.1 Key Concepts for Managing Risk of Limited Food Variety

Understand parent expectations: realistic expectations are key to achieving progress. Education for parents about age-appropriate portions and frequency of food types per day can help to establish realistic expectations of their child. See Canada's Food Guide and Healthy Eating Pattern for recommendations.

High levels of parental anxiety can lead to limited food variety for many reasons. Anxiety about lack of intake may lead to force feeding. Parental anxiety may also contribute to limited variety if parents offer only what the child will most likely eat. An environment that includes stress around food may influence a child's willingness to try new foods.

Consider socioeconomic factors like parents' cooking and food preparation skills, financial barriers, parent or sibling 'role modelling', cultural practices and expectations, and how food is offered. For example, if a family does not have vegetables in the house, and does not know how to cook vegetables then it is unlikely the child will be offered these.

Offering secondary choices after a food or meal is refused is counterproductive to improving food range and may contribute to overreliance on preferred foods. Offering preferred foods with non-preferred foods supports gradual acceptance of new foods (Alberta Health Services, 2017). Instead offer alternative foods that offer a similar nutrition benefit. For example:

- eggs, fish, legumes or tofu if meat and poultry is refused
- cooked, dried or tinned fruits and vegetables if raw varieties are refused or textures are not well managed
- limit highly processed foods (higher in sugar, salt and fat) when possible
- changing the form and presentation of the food may support texture progression or acceptance of a food
- avoid hiding or sneaking refused foods into preferred foods as this may negatively impact parent-child trust at the meal and may cause avoidance of previously enjoyed foods

Refer to:

Food Ideas by Colour

Food Ideas by Flavour

Food Ideas by Texture

8.3.8.2 Management Strategies for Limited Food Textures

Playing with food may support a no-pressure approach to food and texture exploration. Use a variety of food preparation techniques to assist with intake such as soft cooking methods (casseroles, minced meats), assembly meals (tacos, salads, platters, sandwiches), or condiment offerings such as dips and sauces. And, offer a gradual progression of food textures. For example:

- Puree meat → minced → soft-cooked pieces → strips of meat/whole chop or cutlet
- Puree fruit → mashed → naturally soft peeled pieces → whole fruit products

Refer to:

Food Textures for Children

Food Textures for Children Backgrounder

Children with sensory preferences may require more gradual texture progression and an individualized approach to management.

8.3.9 When to Consider Enteral Nutrition

Enteral nutrition should be considered when safety is compromised or growth remains inadequate despite oral nutrition support interventions. There are multiple indications for enteral nutrition, however, they are generally comprised of three categories: inadequate oral intake, airway protection, or inadequate intestinal function (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015).

Inadequate oral intake:

- increased nutrient needs, e.g. cystic fibrosis, lung disease, congenital heart disease, renal disease, infection, surgery, burns, trauma, malnutrition (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015)
- developmental, e.g. prematurity, prolonged neonatal intubation, neuromuscular disorder, neurological impairment (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015)
- behavioural, e.g. feeding aversion, unpalatable diet
- anatomical, e.g. cancer, burns, congenital malformation (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015)
- inability to meet >60-80% of individual requirements for >10 days; consider initiating enteral nutrition in children <1 year within 3 days, and within 5 days for children >1 year (ESPGHAN Committee, 2010)
- total feeding time in a child with complex care needs >4-6 hours/day (ESPGHAN Committee, 2010)
- growth faltering, wasting, and stunting (inadequate growth for >1 month in children <2 years, >3 months in children >2 years; triceps skinfolds <5th percentile, a decline in height velocity) (ESPGHAN Committee, 2010)

Airway protection:

- anatomical or developmental condition leading to unsafe swallow or aspiration, e.g. neurodevelopmental delay, congenital malformation, vocal cord paralysis (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015)

Inadequate intestinal function:

- malabsorption, e.g. short bowel syndrome, Crohn's disease, pancreatic insufficiency (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015)

8.4 SEATING AND POSITIONING

Consideration of seating and positioning may be relevant as a management strategy in response to concerns regarding feeding safety, adequacy, feeding as a positive experience, development, and efficiency.

KEY MESSAGES

- In infants, stability-mobility patterns play an important role in the coordination of the suck-swallow-breathe synergy.
- Positioning of the feet, legs, and hips influences the trunk which influences the head, neck, and upper limb control and function.
- Appropriate positioning of the child is essential for effective, efficient, and safe feeding. This may be facilitated by commercially available or specialized equipment.

8.4.1 Positioning of Infants and Young Children for Feeding

Feeding a child who has poor trunk control in an unsupported, upright position can make it difficult for the child to develop a refined chewing pattern (Evans Morris & Dunn Klein, 2000) and may place them at increased risk of aspiration. It is important that a child who has not yet achieved functional sitting and/or displays tonal issues (hypertonicity or hypotonicity) is well supported in their highchair or equivalent.

Midline positioning or alignment of head, trunk, and limbs can enhance the safety and efficiency of feeding in conjunction with strategies addressing food consistency and swallowing skills (Redstone & West, 2004). Infants need to be positioned age appropriately but with consideration for developmental level.

Midline development can influence the development of hand, foot and oral control. Infants require a stable base from which to develop movement and functional skills. Without this stable base, it is difficult to carry out controlled and functional movements (Evans Morris & Dunn Klein, 2000).

Positioning intervention will need to be provided to those infants and children who:

- are disorganized
- require support to maintain a midline position
- have not yet achieved, or cannot achieve, functional sitting without additional support

Considerations in evaluating the child's position for feeding should include information on the following:

- location of the assessment
- position of the child for feeding, for example, held by parent, seated in high chair or commercially available chair, or seated in specialized chair or equipment

Specific questions to be answered may include:

- is the child symmetrical?
- is head and trunk support required?
- is the head in a chin tuck position?
- are the pelvis, trunk, head and neck stable?
- are the feet and legs in stable supported position?
- is tilt or recline required?
- is the parent in a supportive position that allows eye contact with the child?
- what is the required action or follow-up?

8.4.2 Positioning for Breast and Bottle Feeding in Infants and Young Children

Midline positioning or alignment of head, trunk and limbs enhances safety and efficiency of feeding (Redstone & West, 2004). In order to ensure that the environment is conducive for learning positive cues for eating, the infant should ideally be held by a parent in a secure hold that allows for eye contact when being breast, bottle or tube feed, as this is the most natural environment to be fed in at this age.

There may be some situations, however, where the infant requires more supportive positioning. Specialized equipment such as a Tumble Form may be considered.

It is also important to consider the ergonomics of the parent feeding the child. They also need to well stabilized at the hip, trunk, shoulders, and arms to prevent fatigue, pain, and injury.

Wrapping vs non-wrapping:

- wrapping provides midline support, however, temperature needs to be considered, e.g. if the infant is too warm when wrapped, they may become sleepy, and wrapping becomes a strong cue for sleep time
- consider just wrapping the infant's top or bottom half if level of alertness is a concern
- side-lying for bottle feeds may assist with midline organization, control of flow of fluid, and control of potential pooling of fluid

8.4.3 Positioning When Introducing Solids

The child should be positioned in highchair or equivalent at the family table. This allows eye contact with the feeder, facilitates communication and family time, and therefore makes feeding more pleasurable (Redstone & West, 2004). It is not appropriate to feed an infant or child with developmental delays or tonal issues while the parent is seated in a rocking chair.

When planning to introduce solids, ensure the child has sufficient head control, and neck and trunk strength and stability to maintain an upright seated position, or have adequate seating supports to facilitate a secure upright seated position. Refer for a review of the seating system if needed.

8.4.4 Using Highchairs and Boosters

If recommending commercially available highchairs, it is most appropriate that they have a high back, some padding, tilt-in-space and an accessible tray. If tilt-in-space is not available, but is needed in order to not change the position of the pelvis, specialized seating may be required.

For children with minimal postural needs, the use of towels or foam to modify their posture may be adequate, e.g. at lumbar and laterals. To modify seat height and depth, some foam, flat cushions, or pillows can be used but it is essential to ensure that stability is maintained.

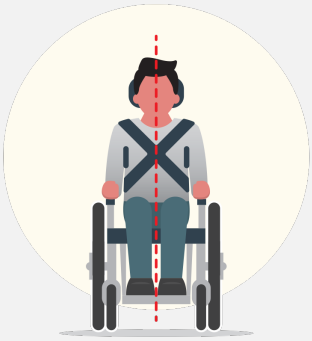
It is important for a child's feet to be supported during feeding. Ensure that the footrest is the correct height, or supports are in place as needed.

8.4.5 Positioning for Infants, Children and Youth with Significant Postural Needs

For children with moderate to severe postural needs, it is recommended that a referral to an occupational therapist and/or physiotherapist be made for comprehensive evaluation, recommendations, and assistance in arranging suitable and safe equipment. See Table 9.

TABLE 9: POSITIONING FOR INFANTS, CHILDREN AND YOUTH WITH SIGNIFICANT POSTURAL NEEDS

	POSTURAL NEED	PICTURE
Pelvic Stability	• Pelvic stability provides the base foundation of support in a sitting position. Pelvis should be positioned at neutral or with slight anterior tilt, with 90 degrees hip flexion	

	POSTURAL NEED	PICTURE
Feet Support	• Support feet on a stable surface as this will influence pelvis and hip stability	
Trunk Control	• Poor trunk control can lead to poor upper extremity and head control. Lateral supports may assist with providing adequate trunk stability for those children that cannot independently maintain a midline position of the trunk • Monitor the effect of lateral supports on a child's respiration	
Head Support	• Head support, e.g. a chair with a high back or a head rest, may be required if adequate head control has not yet been achieved • The more upright the seated position, the more the head and neck need to work; therefore tilt or recline may reduce the amount of effort involved in keeping the head and neck in midline • Tilt is preferable as it does not change the position of the pelvis	 

	POSTURAL NEED	PICTURE
Tray Access	• Initially provides extra trunk support and stability, and later provides a place for forearms and elbows as the child begins to attempt to self-feed	

8.4.6 Using Specialized Seating Equipment

It is important to have specialized supportive seating with a hi-low base. Feeder seats like the Tumble Form, or the Special Tomato floor sitter should be considered.

Specialized seating may offer:

- lateral support
- head rest, adjustable footrest
- tilt-in-space, recline
- height adjustment
- height and angle adjustable tray
- adjustable as child grows
- can be used in both a stroller base and hi-low base

Refer to: Equipment & Supplies list

8.5 FEEDING SKILL DEVELOPMENT

Facilitating the development of feeding skills in the infant or child who feeds orally or non-orally may be considered as a management strategy in response to the five questions regarding feeding safety and adequacy, feeding as a positive experience, development, and efficiency.

KEY MESSAGES

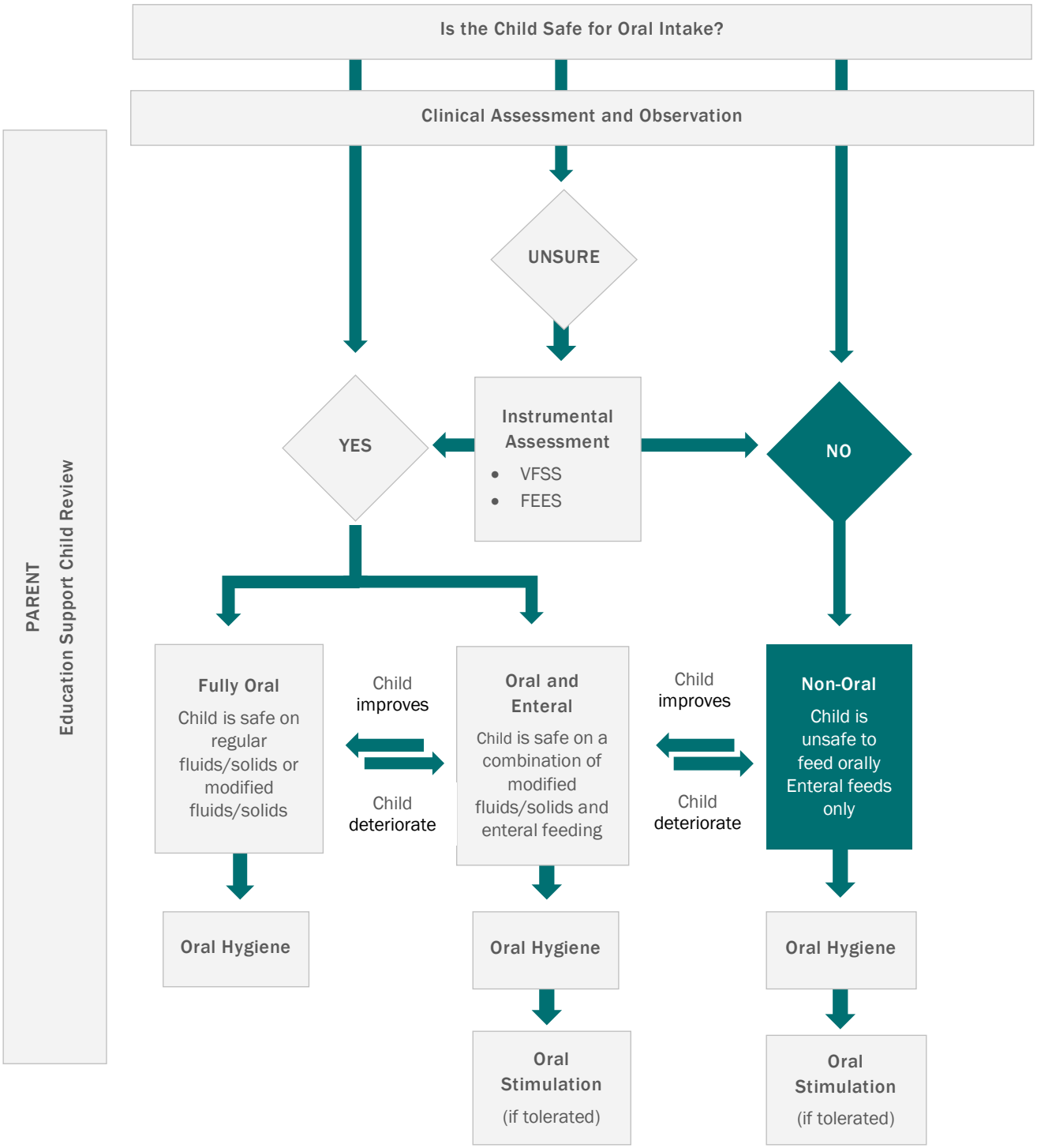
- It is important to consider the child's neurodevelopmental skill level when working with parents and children to facilitate oral feeding skills.
- As involuntary neonatal reflexes transition to voluntary movements, feeding skills can change and issues may emerge. This can be confusing and frustrating for parents who thought feeding was typical and now has changed.
- Collaborative goal setting enables parents to have a good understanding of the goals of the intervention, and of the timeline for the initiation and progression of feeding development.
- Interventions that are based on motor learning principles, and offered in the first two years of life when the brain is most plastic, yield the best outcomes.
- Reliance on compensatory strategies longer than clinically require may result in reliance on the strategy for life.
- Children with delayed or disordered oral reflexes and/or oral sensorimotor dysfunction will need individualized treatment techniques to improve physiology and facilitate oral sensorimotor function.
- Oral feeding progress can change from feed to feed, and day to day. As a result, monitoring and reassessment are essential.

8.5.1 Facilitating First Tastes

At this stage, the goal of facilitating first tastes is for positive oral feeding experiences, not quantity or nutritional content of intake:

- ensure that the child is awake and able to maintain a quiet alert state before offering tastes
- ensure child can coordinate non-nutritive sucking and breathing before initiating tastes
- children with delayed or disordered oral reflexes, and/or oral sensorimotor dysfunction may require specific treatment techniques, rehabilitation, or teaching new skills, to improve physiology and facilitate oral sensorimotor function
- facilitate midline positioning and flexion that promotes hand to mouth experiences which is an example of feeding readiness

Figure 8: Safe Swallowing Decision Flow Chart



(NSW Office of Kids and Families, 2016)

Oral reflexes may be elicited using a number of specific stimuli. The following strategies may be considered when working with parents and infants to facilitate typical oral reflexes:

- aid or arouse the infant into a calm alert state
- in the presence of oral hypersensitivity, systematic desensitization should be considered while addressing oral sensorimotor patterns with oral intake

8.5.2 Facilitating Infant Feeding as a Neurodevelopmental Skill

Feeding is a neurodevelopmental skill. Fragile infant feeders benefit from an infant-driven individualized approach to support safe oral feeding while acquiring positive feeding skills. Quality feeding is successful when the infant is engaged without signs of distress. The approaches outlined in SINC, POETri and the Oral Feeding Guideline support co-regulation between infant and caregiver and cue-based feeding during skill acquisition. Their key concepts may be leveraged for the ambulatory environment for infants with limited oral feeding when transitioning to home.

Refer to:

Eating in "SINC": Safe Individualized Nipple-Feeding Competence (AHS Staff Login required)
Oral Feeding Guideline

POETri Clinical Resource (AHS Login Required)
POETri Stages
POETri parent handout
POETri Frequently Asked Questions
Appendix 6: Typical Development Reflexes

Appendix 9: Organic Red Flags – Oral Sensorimotor Patterns

Feeding may be a challenging activity for some developing infants who require stability across the subsystems (physiologic, motor, state, and attention/interaction) within a stable nurturing environment. When an infant experiences a challenge in any of these subsystems, it has a profound effect on the others. Infants and fragile feeders are not always able to communicate physiological stability, engagement, and distress cues clearly. Examples of physiological changes indicating distress may include:

- significant changes in heart rate
- oxygen saturations outside normal limits for the child
- significant changes in respiratory status, e.g. rate, grunting, nasal flaring, coughing
- loss of postural tone
- loss of state or alertness
- a change in colour to pale, flushed, or grey

Engagement and disengagement (stress) cues may include:

- engagement cues: may include eye contact, relaxed face and body, feeding smoothly
- disengagement (stress) cues: may include frowning, arching, pulling away from bottle, crying, turning face away

Ongoing assessment of physiologic stability and engagement, using the infant's communication from moment to moment, guides feeding. Continuous infant-guided interventions are provided based on the infant's signs of engagement and signs of disengagement during feeding. A skilled healthcare provider can coach and support parents to successfully observe their infant's communication cues during feeds and activate strategies to support safe oral feeding (National Association of Neonatal Nurses, 2013).

Establish and maintain parent's milk supply if she wishes to offer human milk while the child is non-oral. If breastfeeding, the parent's milk supply can be negatively affected by prolonged non-oral feeding. Referral to a lactation consultant may be indicated if the parent has poor milk supply or considered proactively to prevent future supply issues.

8.5.3 Facilitating Child Feeding as a Neurodevelopmental Skill and a Relational and Responsive Process

To facilitate child feeding through the relational and responsive process:

- nurture the primary caregivers' role as the most important co-regulators for their infant
- promote both recognition and prompt response to the child's signs of hunger and satiety in emotionally supportive, and developmentally appropriate ways (Black & Aboud, 2011)
- provide feeding guidance that supports the caregiver's ability to read the child's cues in order to make the eating or feeding opportunity manageable, enjoyable, and successful, while retaining developmentally appropriate structure and expectations (Rowell & McGlothlin, 2015)
- intervene to prevent distress, physiological instability and disengagement of the child
- encourage parents to provide positive experiences around the mouth as tolerated by the child, e.g. sustained touch, kisses, toys, hands
- respond to sensory preferences, pace, and temperament

Collaborative goal setting between child, parent and healthcare providers enables a shared understanding of child and parent goals, interventions, and feeding progression. Progression is dependent on skill development. It may take time for skills to develop, so it is important to celebrate achievements as they occur.

Children with PFD, including those with sensory preferences, may find changes to food textures, temperature, taste, and mealtimes a source of discomfort and distress (Evans Morris & Dunn Klein, 2000). It is important to assist the child to explore at a level that is comfortable and safe for them. Small steps need to be taken to assist a child's transition through the new texture experience. Gradual changes to texture, e.g. thickness, lumpiness, and grainy properties of food in small amounts, may be necessary for children who have sensory aversions or strong preferences.

Alternatively, if the child has no difficulty at their current level with their oral skills, they may be eating 'easy' foods that are not challenging enough for them. They may stay at a certain developmental level longer than is clinically required. This decreases the child's ability to develop new oral sensorimotor function.

8.5.4 Facilitating Oral Sensorimotor Function

In the first three years of a child's life, their oral sensorimotor function rapidly changes in structural growth and neurological control (Arvedson, Brodsky, & Lefton-Grief, 2020). Feeding skills issues often emerge when the neonatal reflexes disappear.

This can be confusing and frustrating for parents who thought feeding was typical and now has changed. Advancing oral sensorimotor skills using interventions based on motor learning principles is considered best practice (Khamis, et al., 2020).

Interventions that are based on motor learning principles and offered in the first two years of life when the brain is most plastic, yield the best outcomes (McIntyre, Morgan, Walker, & Novak, 2011). The avoidance or limitation of oral feeding may unintentionally add to feeding skill impairment.

Management strategies, when paired with feeding and swallowing food and liquids, support children to:

- improve chewing and swallowing
- maintain or prevent decrease in oral sensorimotor function
- continually progress diet with consideration of safety and skill level

General motor learning principles and experience-based plasticity for feeding interventions (Homer, 2016); (Khamis, et al., 2020):

- address specific neuro-muscular impairments that negatively impact chewing and swallowing
- follow typical developmental order of oral sensorimotor function
- provide consistency and intense repetition in functional and motivating tasks
- may utilize food or liquids
- facilitate speed and endurance, focusing on movements related to bolus management and swallowing
- simplify tasks and provide maximal support during early stages of learning (practice desired skills with one food or drink)
- taper support as tolerated and increase contexts and environments as skills reach mastery
- continually reassess to upgrade goals and reduce support while maintaining safety

8.5.5 Considerations for Pacifier/Soother Use

A pacifier has been shown to be a simple, safe, and clinically effective tool in infant feeding interventions and general health.

Benefits of pacifier use:

- can be used to elicit and practice the non-nutritive suck (NNS), one of the earliest developed oral sensorimotor reflexes
    - development of the NNS is recognized as a stage in the development of feeding skills in infants (Browne & Sundseth Ross, 2011).
    - plays an important role in the development of ororhythmic behaviours, which are important in the reconfiguration of the suck central pattern generator to meet developmentally changing task dynamics (Barlow & Estep, 2006).
    - has been shown to have a significant effect on gastric motility, reduce transition time from gavage to full oral feeding (days), and decrease the length of hospital stay in preterm infants (Foster, Psaila, & Patterson, 2016).
    - evidence for positive effect on helping a preterm infant maintain and transition between behavioural states has been demonstrated, however, it is inconsistent across the literature (Foster, Psaila, & Patterson, 2016); (Harding, Cockerill, Cane, & Law, 2018).

- linked to reducing incidence of sudden infant death syndrome (Moon & Syndrome, 2016) provides a simple, non-invasive, and effective comfort measure for minor, routine procedures with neonates (Barrington, Batton, Finley, Wallman, & Canadian Paediatric Society Fetus & Newborn Commit, 2017).

Risks of pacifier use:

- pacifier properties can alter non-nutritive suck (NNS), (e.g. pacifier compression, pull stiffness, and nipple shape type yield different NNS dynamics) (Zimmerman, Forlano, & Gouldstone, 2017).
- prolonged soother use has been shown to alter the development of oral anatomy (e.g. posterior cross-bite, narrow upper jaws, labial segmental alignment, anterior open bite)
    - research shows that the risk of dental problems (e.g. changes in bite, alignment of teeth) increases with duration of soother use
    - studies show that pacifier use at one year is linked with development of an open bite and recommend that pacifier use be discontinued by age one (Chen, Xia, & Ge, 2015); (Ling, et al., 2018) (Zen, et al., 2019).
    - the risk for permanent malocclusion increases with pacifier use beyond age two and many studies recommend use should be discontinued by age four (Schmid, Kugler, Nalabothu, Bosch, & Verna, 2018), (Bueno, Bittar, Vazquez, Meneghim, & Pereira, 2013); (da Rosa, et al., 2020); (Melink, Hocevar-Boltezar, & Ovsenik, 2010).
    - a minimum of 4 – 6 hours per day of soother use is required to cause a malocclusion (Medeiros, et al., 2018) soother use itself has not been linked with dental caries, however, sweetened pacifiers have shown a strong association (Jain, et al., 2015); (Nelson, 2012).
- pacifier use may increase the risk of repeated otitis media. The risk appears to increase with prolonged and more frequent use
- except for premature infants, or infants who are unwell who may benefit from comfort benefits, research suggests that pacifiers not be introduced until breastfeeding is established
- offering a pacifier instead of a breast or bottle when an infant is rooting to feed may contribute to inadequate nutrition for growth and development
- a pacifier when contaminated with or exposed to infectious agents can transfer the infectious agent to the infant or child. Consistent care and cleaning of pacifiers helps to limit contamination and exposure
- in general, speech outcomes are not significantly associated with pacifier use, however, recent research suggests that the frequency of daytime pacifier use may increase the number of atypical speech errors a young child makes; these errors appear to resolve over time (Strutt, Khattab, & Willoughby, 2021)

For family friendly information, you can refer your patients to: https://caringforkids.cps.ca/handouts/pregnancy-and-babies/pacifiers

8.5.6 Considerations for Breastfeeding

This section assumes a lactation consultant has been consulted, or a healthcare professional with breastfeeding knowledge is part of the interdisciplinary team wherever possible. The following strategies may assist when first introducing the infant to breastfeeding:

- encourage skin to skin contact before and after feeding

- if breastfeeding, consider having the parent partially express the breast to avoid strong let-down of milk whilst baby is nuzzling, licking or attached for short periods
- allow infant to nuzzle at a partially expressed breast, and lick at the breast
- facilitate latching by stimulating the rooting reflex, appropriate breastfeeding position and providing external support as necessary:
    - adjust the breastfeeding position to optimize the infant's ability to adjust to the flow while maintaining a deep latch (laid-back nursing, transverse side-lying, or upright football position)
    - allow the infant to suck three to four times on nipple; if baby is demonstrating evidence of difficulty with suck-swallow-breathe, break the seal and give a rest from sucking; allow the child to breathe, reorganize and cue for readiness
    - consider removing infant from the breast during letdown if needed

8.5.7 Considerations for Bottle Feeding

The following strategies may assist when first introducing the infant to bottle feeding:

- optimize the infant's feeding position, e.g. elevated, side-lying, or other supported position
- offer droplets of milk (from a 1 mL syringe 0.1 mL at a time) onto a pacifier, finger, or lip
- offer a slow flowing nipple and provide external pacing by allowing the infant to suck three to four times on a milk-filled bottle and breaking the latch or tilting the bottle to remove milk. Allow the child to breathe, reorganize and cue for readiness (Pados, Park, & Dodrill, 2018)
- trial a slower flowing bottle if the need for external pacing persists throughout the feed
- if an infant shows signs of difficulty maintaining breathing while feeding, trial the elevated side-lying position and consider safety of swallow
- do not jiggle or turn the nipple to stimulate nutritive sucking or oral responses

8.5.8 Considerations for Solids

The following strategies may assist when first introducing the child to food:

- ensure that the foods that are tried are appropriate for the child's oral sensorimotor developmental level
- identify opportunities to increase food exposure and match sensory preference of child, e.g. food play, set table
- always ensure that a child is supervised when attempting new textures
- teach new skills as necessary to improve physiology and function, e.g. tongue lateralization may need to be explicitly taught for children who gag on lumps and solids (Speech Pathology Australia, 2012)
- introduce a variety of food textures to assist a child to accept different textures later in childhood
- repeated exposure is often an effective strategy to increase acceptability of foods

- delaying a child's introduction to lumpier foods longer than clinically required may result in reliance on a compensatory strategy of modified food texture and inadvertently contribute to selective eating habits that may continue throughout their lives

8.5.9 Additional Resources

Nutrition for Healthy Term Infants: Recommendations from Six to 24 Months
Nutrition Guideline: Introduction of Complementary Foods
Appendix 7: Early Infant Feeding And Swallowing Difficulties
Feeding Matters
Your Baby's Feeding Cues
Your Baby's First Tastes
Introducing New Foods to Your Child

8.6 FEEDING ENVIRONMENTS AND ROUTINES

Relationships, environments (physical and sensory), and routines may be considerations in the management of concerns regarding feeding as a positive experience.

KEY MESSAGES

- Mealtime is not just a time for eating, but a time for relationship building, exploring food, learning mealtime manners, and developing social skills.
- A child's ability to participate fully in the mealtime routine can be influenced by a range of factors, including the physical and sensory environments.
- A predictable mealtime routine and environment can help a child learn the difference between hunger and satiation, and may help with self-regulation.
- The communication, actions, and reactions of parents and other family members have a strong influence on the eating habits and behaviours of children.
- Support parents to observe their child's behaviours, reactions, and communications during a mealtime.
- Empowering parents to be involved in feeding their infant and child at every step of the way provides the foundation for a positive feeding relationship.

8.6.1 Supporting Mealtime Routines

Communication, socialization, a sense of family and belonging, sensory exploration, relaxation, and celebration are all part of the mealtime routine, and vary from meal to meal, family to family.

Feeding efficiency can be improved by limiting the length of the feeding session, and allowing for frequent breaks. Breastfed infants may feed six to eight times per day or more depending on the age of the infant. Infants should feed as long and as often as they want to. The parent's breasts should feel smaller and softer after feeds, and she should hear the baby swallow and see jaw movement during the feed.

Refer to: Healthy Parents Healthy Children

For infants and children accepting solid foods, meals may be as short as five to 10 minutes for some children but as a general recommendation should not exceed 30 minutes for meals, and 10 to 15 minutes for snacks. This may need to be adjusted based on a child's individual need. Total time spent orally feeding meals and snacks should not exceed four to six hours per day (Braegger, Decsi, Dias, Hartmann, & Kolacek, 2010); (Klawitter, 2003)

Other aspects:

- consistent routine helps the child to learn the difference between hunger and satiation (Satter, 2007)
- different families and cultures have various social expectations, rules, and ideas on appropriate manners at mealtimes. It is important that the child's and family's normal mealtime routine is identified and considered in deciding strategies collaboratively
- when working with parents and children to facilitate feeding skills, it is important to consider the child's needs and responses:
    - minimize distracting stimuli, such as excessive noise or light, toys, TV or iPad
    - minimize care routines around feeding times that may fatigue the child
    - provide opportunities for the child to see, smell and touch food
- Aid/arouse child to be ready for feeding using strategies to facilitate meal time engagement, e.g. unwrap the infant, change diaper or utilize visual cues, hand wash, set table

Refer to: Nutrition for Healthy Term Infants: Recommendations from Six to 24 Months

8.6.1.1 Setting up a Mealtime Routine

Research shows setting a mealtime routine is important for success. Encourage infant and child to be fed at the family table or within the typically family setting, e.g. infant can be breastfed at the table, cultural practices such as eating as a family on the floor. Designate a place by using visual cues to indicate that it is meal time, e.g. table cloth, placemat. However, be aware that it is also important to encourage flexibility to allow children to engage in mealtimes in different contexts and environments, e.g. school, eating out, holidays (Toomy & Ross, 2011).

Create a routine:

- offer a verbal cue, e.g. ten minutes before the meal time
- offer transition cues/activities to bring child to the table; engage with the child in-person before transitioning them to the table (Harvard University, 2016); (Griffith & Stapleton, 2013)

  Refer to: YouTube: 5 Steps for Brain-Building Serve and Return
- create a positive, and relaxed mealtime environment; talk about the events of the day; describe food and its properties: colour, shape, texture, and temperature; and comment on what the child is doing well. Avoid talk that includes cajoling, bribing and subjective food descriptions ("Mmm, this is yummy!") (Toomy & Ross, 2011)
- encourage the child to stay at the table for the duration of the meal and have a clear finishing routine, e.g. wipe hands and/or face, help clear the table (Cathey & Gaylord, 2004)

8.6.2 Supporting Mealtime Environments

Each element of the environment contributes to the type of meal that is experienced and whether or not the meal is enjoyed by both the child and parent. The physical, sensory, cognitive, and emotional needs of individual children and parents will influence the impact of environmental elements (Evans Morris & Dunn Klein, 2000).

8.6.2.1 Physical Environment

The physical environment includes the physical comfort and support received by the child and the parent (Evans Morris & Dunn Klein, 2000). The child's feeding and oral sensorimotor function is strongly influenced by their seating and positioning.

The comfort of the adult who is feeding the child is also important to the success of the meal. If a caregiver's body is poorly supported, they may become fatigued which may contribute to physical and emotional stress. Children can sense this stress and often misinterpret it as their fault (Evans Morris & Dunn Klein, 2000).

Other aspects of the physical environment include:

- utensils: dishes, cups, cutlery, placemats, table cloths
- furniture: arrangement of furniture in room, location of child's seat and others at the table
- food: texture, consistency, temperature, colour, size, shape, odour

The ideal environment is considerate of the child's sensory preferences and triggers (Lillas & Turnbull, 2009).

8.6.2.2 Sensory Environment

The sensory environment incorporates all sensory areas that are involved in mealtime. The child's sensory preferences, along with the family's sensory preferences, often determine where food is eaten. However, differences in sensory preferences and sensory triggers among family members can be problematic, particularly if one member is more sensitive that the rest of the family (Lillas & Turnbull, 2009); (Evans Morris & Dunn Klein, 2000).

Some children learn to eat only in the presence of distractions, e.g. when the television is on, or while playing with a favourite toy. Use of distractors has to be short-term with the intention of elimination because the child lays down the brain pathways for the distractor and not the pathways for eating, therefore, they do not know how to eat when not distracted, and shift into reflexive eating mode (Toomy & Ross, 2011).

The sensory properties of the food also need to be taken into consideration for children with sensory processing difficulties, e.g. strong food odours, amount of food presented on the plate, colour of the food. Children with strong sensory preferences or triggers may require specific intervention techniques to facilitate mealtime routines.

8.6.3 Considering Communication and Behaviour

It is important to help parents develop an understanding of what their child may be communicating, verbally and non-verbally, through their behaviour before, during, and after a meal (Evans Morris & Dunn Klein, 2000). Children who refuse to eat, engage in mealtime tantrums or show undesired responses at mealtimes may be attempting to communicate that something doesn't feel right (Evans Morris & Dunn Klein, 2000).

There are many potential factors that impact a parent's ability to observe and respond to their child's cues during mealtimes. It is important that parents are regulated so that they are available to co-regulate with their child. Consider factors which affect a parent's ability to be responsive:

- parent stress, anxiety, or depression
- economic stressors (e.g. food insecurity, housing)
- trauma history and emotional reactivity

When parents feel pressured by social or cultural expectations, they may resort to force feeding, and/or unhealthy eating practices and food choices to meet unvoiced or voiced expectations (Evans Morris & Dunn Klein, 2000).

It is important for a parent to be aware of how they are communicating and responding to their child, and what this is communicating about food and mealtimes. In an attempt to encourage eating, parents often become trapped in cycles of behaviour that inadvertently reinforce undesired eating behaviours. The communication environment includes the nonverbal communication of adult attitudes and expectations, and communication of their emotional experience (Evans Morris & Dunn Klein, 2000).

8.6.3.1 Responsiveness and Development

Early experiences affect the development of the brain, which impacts future learning, behaviour, and health. Adverse experiences early in life can impair brain architecture, with negative effects lasting into adulthood.

Supporting parents and caregivers to understand the importance of being attentive, sensitive, and responsive to their child's communication and needs will result in an environment rich in serve and return experiences. Unreliable, inconsistent, inappropriate or harsh responses from the parent or caregiver can negatively impact learning and behaviour which may contribute to difficult mealtime interactions. This negatively affects the parent-child relationship, which can result in long-term toxic stress.

Refer to:
Brain Architecture
Serve and Return

8.6.4 Supporting a Positive Feeding Relationship with Positive Mealtime Interactions

There are a number of ways to support children at mealtime:

- acknowledge and follow the child's hunger and satiation cues; ideally, internal cues of hunger drive a child to eat, not external motivators
- in supporting oral sensorimotor development, provide feedback on the child's efforts and successes; acknowledgement of a child's attempts includes verbal praise and non-verbal praise, e.g. a hug, that matches their self-regulation needs
- playing with the food is reinforcing in and of itself; a positive interaction at any level should be recognized as success
- use of rewards should be used in the short term with the intention of elimination
- force feeding or wiping food from a child's face during meals can be a sensory trigger leading to negative association with mealtimes and the parent or caregiver

8.6.4.1 Support the Parent and Child's Role

It is the parent's responsibility to choose what, when, and where to eat and the child's responsibility to decide whether to eat or not, and how much they will eat (Satter, 2007). Throughout the process, parents should be encouraged to:

- learn to trust the child's appetite and help them to understand their body signs for whether they are full or hungry
- let the child have a sense of control by offering them child-appropriate choices, e.g. selecting where they sit, which plate they use, or how the food is presented – on a plate or in a serving bowl
- provide foods that are in keeping with the child's sensory preferences and oral sensorimotor function and capabilities, expand foods by changing one dimension of the food while retaining the others, e.g. colour, shape

A single or combination of any of these factors influences the caregiver-child relationship (Goday, et al., 2019).

Refer to:
Nutrition Guideline: Health Feeding Relationship
Ellyn Satter's Division of Responsibility in Feeding

In addition, encourage the parent to not punish the child during mealtime (Cathey & Gaylord, 2004). Reinforce that toddlers will be messy. Allow for mess and exploratory play, especially for those children who are hypersensitive with food, taste, touch and texture.

8.6.4.2 Establish Expectations and Model Desired Behaviours

Support the family in choosing acceptable family rules that provide structure, allow exploration, are attainable and tailor strategies to the child's current abilities and preferences.

Suggest:

- they reduce focus on undesired mealtime behaviours; respond to these behaviours in a calm and neutral manner and state expectations, e.g. "Food stays on the table"; ignore undesired behaviours if safe to do so
- during family meals, parents and/or siblings should sit where the child can see them so that they can be a model for appropriate mealtime and food interactions

8.7 SENSORY PROCESSING/REGULATION

Sensory processing may be a consideration in the management of concerns regarding feeding safety, adequacy, feeding as a positive experience, development, and efficiency.

KEY MESSAGES
• How a child responds to sensory information during mealtimes may impact their feeding development and mealtime experiences.

8.7.1 Understanding Sensory Processing for Feeding

"The task of the sensory system is to integrate the raw data of incoming sensory signals in a way that gives us an accurate picture of sensory events, as well as to modulate those signals in a way that is most adaptive to the situation at hand" (Lillas & Turnbull, 2009).

Sensory processing is an expansive term which captures several processes associated with the ability of an individual's neurological system to interact, interpret, and respond to their environment (Dean, Little, Tomchek, & Dunn, 2018), (Miller & Lane, 2000), (Dunn W. , 2009), (Huebner, 2001). Neurological sensory processes include the reception (activation of sensory receptors), modulation (organizing), and integration (make meaning) of sensory inputs (Miller & Lane, 2000), (Humphrey, 2002), (Miller, Anzalone, Lane, Cermak, & Osten, 2007). The corresponding behavioural response provides a visible manifestation to the sensory process (Miller & Lane, 2000). The mechanism for sensory processing is intertwined with other brain functions (Dunn W. , 2014), with learning being an implied factor in linking sensory information to meaningful experiences and adaptive responses (Lillas & Turnbull, 2009).

As feeding is a complex, multi-faceted occupation, consideration of sensory processing in the context of feeding difficulties is important (Benson, Parke, Gannon, & Munoz, 2013); (Yi, Joung, Choe, Kim, & Kwon, 2015). Sensory based approaches have demonstrated benefits to children presenting with feeding difficulties (Benson, Parke, Gannon, & Munoz, 2013); (Kim, Kwon, Yi, & Kim, 2021) (Seiverling, et al., 2018) and have been shown to influence behavioural presentations (Seiverling, et al., 2018); (Kim, Kwon, Yi, & Kim, 2021), as well as physiological presentations such as feeding difficulties related to neurological (Benson, Parke, Gannon, & Munoz, 2013) and cardiorespiratory presentations (Davis, et al., 2014).

Understanding a child's sensory preferences, their response to their sensory environment, and the sensory nature of feeding itself can contribute to a holistic and comprehensive approach to supporting children with pediatric feeding disorder.

8.7.2 Intervention Strategies

When addressing sensory components of feeding difficulties, it is essential to consider sensory processing as a part of a bigger picture of feeding intervention/management planning (Yi, Joung, Choe, Kim, & Kwon, 2015); (Benson, Parke, Gannon, & Munoz, 2013). As such, an interdisciplinary approach is important in supporting children with sensory-related feeding difficulties (Davis, et al., 2014).

Cognitive strategies and strategies focused on experiential learning have been shown to teach compensatory approaches and problem solving to impact lasting change in how a child engages with the functional task (Macoun, Schneider, Bedir, Sheehan, & Sung, 2020). A combination of approaches, including sensory, experimental learnings, and cognitive-based approaches can be used. Some literature supports specific approaches for children with sensory-based selective eating difficulties such as the Sequential-Oral-Sensory (SOS) approach, (Kim, Kwon, Yi, & Kim, 2021); (Benson, Parke, Gannon, & Munoz, 2013) which is a systemic desensitization and play-based approach that incorporates sensory skills within feeding plans and cognitive-based interventions such as teaching around food hierarchies. Other studies reference sensory integration therapy (SIT) for children diagnosed with autism who present with sensory differences and feeding difficulties (Seiverling, et al., 2018), though some of these approaches are known to be intensive and require adherence to stringent protocols.

Regardless of the approach taken, outcome measurement is essential; applying sensory-based interventions need to be undertaken as a trial with clear informed consent, intentional application, and outcome measurement to ensure intervention efficacy (Pollock, 2009).

Feeding and eating inherently involve sensations and processing of these sensations. It is appropriate to give it due consideration for assessment and treatment, giving due diligence to treatment efficacy.

Refer to:

Appendix 8: Sensory Systems

Sensory Processing – Occupational Therapy Pediatric Clinical Practice Guide) (AHS Staff Login required)

Sensory Processing – Standard Approach(AHS Staff Login required)

Get Permission Approach
Sequential Oral Sensory Approach to Feeding
Food Play
Your Baby's First Tastes
Introducing New Foods to Your Child

8.7.3 Preparing for Mealtimes

A child needs to achieve and maintain a state that matches the demands of the activity they are undertaking (Williams & Shellenberger, 1996). For mealtimes, a calm but alert state is required. A child may be able to improve their ability to self-regulate and manage their responses to sensory information, or require ongoing support from a parent to recognize and modify sensory input.

Preparation includes:

- activities or sensory preferences that prepare a child for mealtimes (these are highly child-specific)
- activities or techniques to increase oral alertness or to calm sensitivities
- consideration of the sensory aspects when setting up the environment, such as increasing sensory preferences and reducing sensory triggers (these are highly child-specific)

8.7.4 Supporting Mealtime Routines and Environments

Intervention that focuses on a child's routine and environment is more likely to increase their participation as well as a parent's feelings of competence in supporting the child. Accommodating for the child's sensory processing needs rather than fixing atypical patterns leads to better outcomes, which are child- and occupation-focused within the context they have to function (Dunn W. , 2009).

Consider the use of equipment to manage a child's sensory preferences or triggers, e.g. brightly coloured or muted plates, dependent on visual preferences, noise-cancelling headphones for noise reduction.

Preliminary evidence that compression and pressure provided through weighted tools, including vests and lap blankets, may have a positive effect on a child's sensory processing with appropriate evaluation by a trained healthcare professional and structured implementation (NSW Office of Kids and Families, 2016).

Refer to:

Center on the Developing Child - Harvard University

Alberta College of Occupational Therapists

ACOT Position Statement on Use of Weighted Covers

Support provided by caregivers is important across all the settings in which the child spends time (home, school, respite). Caregivers can be encouraged to understand and be respectful of the child's sensory needs, especially aversions to touch, sight, sound, and movement by using strategies such as:

- letting the child know the caregiver is approaching and needs to provide hands-on assistance
- using the tone or volume of voice the child is comfortable with and responds to
- reducing the amount of food offered at any one time to reduce visual overstimulation

8.7.5 Additional Resources

New Foods Step by Step

New Foods Step by Step - Using the resource

From Best Practices to Breakthrough Impacts - A Science-Based Approach to Building a More Promising Future for Young Children and Families

Nutrition Guideline - Healthy Feeding Relationship

8.8 ORAL HYGIENE AND DENTAL HEALTH

Oral hygiene and dental care may be considered as a management strategy in response to concerns regarding feeding safety, adequacy, feeding as a positive experience, development, and efficiency.

KEY MESSAGES

- Good oral hygiene is integral to good general health status.
- Children with dysphagia, cognitive impairments, oral sensory processing difficulties, or on enteral feeding are at a greater risk of having poor oral hygiene. Poor oral hygiene can lead to respiratory conditions such as aspiration pneumonia in these populations.
- All healthcare professionals should take a role in promoting good oral hygiene as well as identifying and managing conditions such as oral candida and sialorrhea.

8.8.1 Prevention of Poor Oral Hygiene and Dental Caries

Parents of infants should begin oral hygiene practices before teeth erupt by using a soft moist cloth to clean the gums. Parents of infants should clean the teeth as soon as they appear, using a soft moist cloth or a soft baby toothbrush if the baby accepts it.

In children, encourage regular tooth brushing twice a day with fluoride toothpaste. Children should spit out toothpaste after brushing but not rinse. If children are not able to spit, then only use a rice grain-size amount of toothpaste for toddlers and a pea-size for older children. Parents need to help young children brush their teeth under the age of eight years.

Also:

- advise parents to avoid transfer of oral bacteria (see Table 10) to their child by maintaining good oral health themselves and by not placing food, utensils, pacifiers or nipples into their own mouths and then into their child's mouth
- all children should receive their first dental visit within six months after the first teeth appear or by 12 months of age, whichever comes first
- for children with age-appropriate oral sensorimotor function and developmental skills, discourage prolonged bottle feeding or prop feeding and introduce a cup around six months
- avoid sugary foods and drinks (including bottle or sippy cup containing juice or carbonated beverages)

Refer to:

Healthy Parents Healthy Children

MyHealth.Alberta.ca: Dental Care From Birth to 6 Months

TABLE 10: MANAGEMENT STRATEGIES FOR POOR ORAL HEALTH

ISSUE	MANAGEMENT STRATEGIES
Oral Candida	• referral to a physician for assessment and pharmacological management • brushing teeth with fluoride toothpaste and rinsing with water
Sialorrhea	• Implement behavioural strategies to encourage regular swallowing and wiping of oral secretions • referral to a physician and an otolaryngologist for assessment of airway compromise, pharmacological management, administration of botulinum toxin and surgical management of drooling is recommended
Oral health when oral intake isn't safe	• clients who are not safe for oral intake and are enterally fed are at risk of the oral cavity becoming dry and unclean; this increases their risk of infection and disease • tooth brushing twice daily with fluoride toothpaste, antiseptic mouthwash and water; lip moisturizer, and saliva substitute or oral lubricants may help keep the oral cavity clean and moist • referral to pediatric special needs dentist for regular check-ups or assistance with cleaning; a general dentist or dentist experienced in working with children would also be suitable if there are no special needs dentists available

(NSW Office of Kids and Families, 2016)

8.9 SURGICAL MANAGEMENT

8.9.1 Ankyloglossia Management

Ankyloglossia (tongue-tie) is a condition where limited tongue mobility is caused by a restrictive lingual frenulum. Definition disagreement exists amongst otolaryngology experts, which limits the application of standardized diagnostic criteria. This, paired with factors such as an increased focus on the benefits of breastfeeding, increased awareness of ankyloglossia, and an increase in practitioners who treat ankyloglossia, has contributed to children being over-diagnosed and, in some cases, unnecessary surgery (Messner, Walsh, & Rosenfeld, 2020).

As such, controversy exists regarding surgical management of ankyloglossia in breastfed infants. Frenotomy refers to a simple incision of the lingual frenulum. While frenotomy appears to improve breastfeeding difficulties and maternal pain in some infants with tongue-tie, breastfeeding difficulties may resolve without surgical intervention with adequate lactation and feeding therapist support. The role of frenotomy in non-breastfed infants has not been adequately investigated. Assessment of other causes for feeding difficulties in this population is important (Messner, Walsh, & Rosenfeld, 2020).

Prior to frenotomy consult, a standardized formal assessment of lingual frenulum function and an evaluation by a lactation consultant or lactation practitioner should be completed. Frenotomy may be considered when breastfeeding difficulties are not improving with conservative management. The child should also be assessed for nasal obstruction, airway obstruction, laryngopharyngeal reflux, and craniofacial abnormalities as potential contributors to pediatric feeding disorder. Failure to diagnose and treat these other disorders can negatively impact outcomes after lingual frenotomy (Messner, Walsh, & Rosenfeld, 2020).

There is insufficient evidence to support a specific technique for a frenotomy. Although recognized as a safe and well-tolerated procedure, frenotomy is not without risks and complications such as bleeding, infection, lingual nerve damage (Mills, Keough, Geddes, Pransky, & Mirjalili, 2019), injury to Wharton's duct, airway obstruction, injury to salivary structures, oral aversion, and

scarring (Messner, Walsh, & Rosenfeld, 2020). If surgical intervention is deemed necessary, it should be performed by a physician experienced with the procedure. The physician must possess the necessary training to recognize contraindications to frenotomy and ability to manage post-surgical care (Canadian Paediatric Society, 2015).

Informed consent should include adequate counselling that surgical treatment does not always resolve feeding difficulties and further assessment of other causes for feeding problems may be required (Messner, Walsh, & Rosenfeld, 2020).

Frenotomy should not be mistaken for frenuloplasty (incision of lingual frenulum with rearrangement of the tissue) or frenectomy (removal of the lingual frenulum) which are more invasive surgeries. There is limited evidence on the indications, outcomes, and preferred technique for frenuloplasty in older children and adolescents. Improved quality of life related to social and mechanical issues has been demonstrated (Messner, Walsh, & Rosenfeld, 2020).

8.9.2 Surgical Management of Dysphagia and Pediatric Feeding Disorder

Dysphagia is a multifactorial, complex condition that may or may not be caused by a physical malformation that is amenable to surgical intervention (Lawlor & Choi, 2020). Conditions that may benefit from surgical intervention may include but are not limited to:

- Pierre Robin sequence, also known as Pierre Robin syndrome, Pierre Robin malformation, or Robin sequence
- Unilateral vocal cord paralysis
- Esophageal atresia, long gap esophageal atresia, tracheoesophageal atresia
- Esophageal achalasia
- Laryngeal cleft
- Cleft lip and/or palate

8.9.2.1 Pierre Robin Sequence

Babies born with Pierre Robin sequence are a heterogenous group. They may present with no other abnormality except for the micro- or retrognathic mandible, breathing and swallowing difficulties, with or without cleft palate (and lip), or they may be syndromic or have another genetic abnormality with several other ailments (cardiac, neurological, structural, behavioural, metabolic, etc.) that may present with the same clinical manifestations. There is some evidence that feeding improves with improvement of airway obstruction. After mandibular distraction osteogenesis, 82% of children were feeding exclusively orally where babies with isolated Pierre Robin fared better than the syndromic children (93.7% versus 72.9%). Treatment of cleft lip and palate as a comorbid condition and limited use of repeat instrumental assessments in this population may have impacted the results (Breik, Umapathysivam, Tivey, & Anderson, 2016).

8.9.2.2 Unilateral Vocal Cord Paralysis

Unilateral vocal cord paralysis, mostly secondary to iatrogenic trauma, has been investigated increasingly for its association with dysphagia and pediatric feeding disorder. Injection laryngoplasty (using several different agents) and thyroplasty may improve protection of the lower airway as documented using standard instrumental assessment along with voice quality. Laryngeal reinnervation is being practised and reported more often, however, more is known about its impact on voice than on dysphagia.

Most surgeons will combine injection laryngoplasty with reinnervation, which adds to the difficulty of attributing outcomes to a particular procedure (Butskiy, Mistry, & Chadha, 2015).

8.9.2.3 Esophageal Atresia

With respect to esophageal atresia, use of conventional thoracotomy or thoracoscopy both demonstrated efficacy in establishing some form of oral feeding (Drevin, Andersson, & Svensson, 2021). It is unclear to what extent compensatory strategies were required, such as the use of thickened liquids, and the use of supplemental tube feedings. The heterogenous etiology of long esophageal gap (congenital or acquired) makes it difficult to assess the impact of various surgical techniques on dysphagia and pediatric feeding disorder outcomes (Liu, Yang, Zheng, Dong, & Zheng, 2017). This is also true with respect to esophageal atresia and tracheoesophageal fistula (Yang, et al., 2016).

8.9.2.4 Esophageal Achalasia

Surgical management of esophageal achalasia has demonstrated success with Heller's myotomy (78%), esophageal dilatation (44.9%), and peroral esophageal myotomy (99.3%) (Goneidy, Cory-Wright, Zhu, & Malakounides, 2020) in improving dysphagia outcomes.

8.9.2.5 Laryngeal Cleft

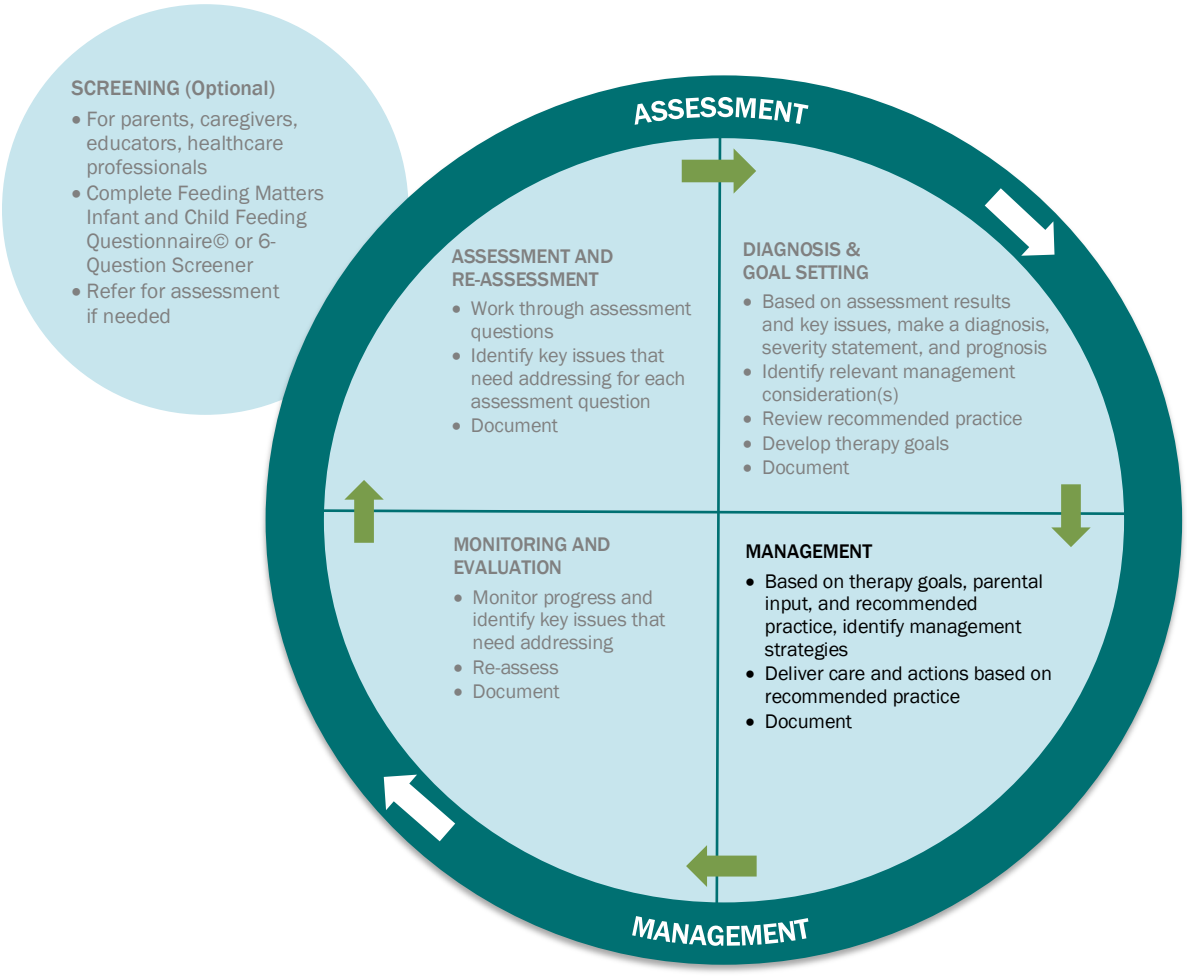
Recently, there is more literature addressing interventions to augment the interarytenoid area, or treatment of type 1 laryngeal clefts. Injection laryngoplasty has been shown to decrease the rate of aspiration from 91% pre-injection to 62% post-injection, with 90% of parents reporting symptom improvement. For those children treated with endoscopic repair, the rate of aspiration decreased from 73% to 28% after repair, with 80% of parents reporting symptom improvement (Reddy, Byun, Downs, Nguyen, & White, 2020).

9 Management: Enteral Nutrition Therapy

Consideration of the cyclical nature of pediatric feeding care continues in the planning and implementation of interventions to address issues identified through eating, feeding and swallowing assessment, diagnosis, and goal setting. Management of pediatric feeding disorder (PFD) includes interventions or actions required to achieve the therapy goals and documentation. This is depicted in the Pediatric Feeding Care (see Figure 9).

Figure 9: Pediatric Feeding Care Cycle

(NSW Office of Kids and Families, 2016)



This section of the guide includes management considerations related to:

- enteral feeding
- transition from tube to oral feeding

9.1 ENTERAL FEEDING

Enteral feeding may be considered as a management strategy in response to concerns regarding feeding safety, adequacy, and efficiency.

KEY MESSAGES

- Children who are enterally fed should receive oral stimulation and/or oral feeding when safe to do so with the support of the healthcare team.
- Decisions about enteral feeding route will be made by the physician, dietitian, interdisciplinary team, and family.
- Establish initial and ongoing feeding goals with the child and family that define the quality of feeding (i.e. whether it's a positive experience), type of feeding, volume of feeds, and duration of tube feeding.
- Breastmilk is the optimal choice for infants. When breastmilk is not available, a standard infant formula is recommended until 12 months of age. Specialized formula and home blended food for tube feeding may also be considered to meet the clinical needs of the child.
- Enteral feeds can be administered by continuous, cycled, bolus, or intermittent, or a combination of these methods based on the needs of the child and family.
- Enteral feeding is a process which requires ongoing monitoring and reassessment to support tolerance, oral intake progression, and weaning when appropriate.

For children with concerns of safety from oral feeding or who are unable to meet all their nutritional needs orally, additional nutrition support in the form of enteral nutrition may be required to optimize health and nutritional intake for growth and development (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015).

Enteral nutrition is the delivery of nutrients in the form of breastmilk, formula, home blended food, and other fluids directly into the gastrointestinal tract, via an enteral feeding tube (ESPGHAN Committee, 2010); (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015).

When oral intake is not possible, enteral nutrition is the preferred method of feeding for patients who have a functioning gastrointestinal tract. Although not without risk, enteral nutrition is preferred over parenteral nutrition as it supports normal gastrointestinal function, has less risk of infectious and metabolic complications, and is more economical (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015).

Refer to: Figure 7: Nutrition Support Decision Making Tree

9.1.1 Involving the Interdisciplinary Team

When managing infants, children, and youth, it is important to consider that enteral feeding requires knowledge from an interdisciplinary team (ACI Nutrition Network, 2012). The interdisciplinary team is imperative for ensuring the family has the knowledge, ability, and confidence to safely manage the transition to enteral feeding. They provide expertise in the selection of

feed type, route, feeding equipment, and tube feeding care. The team explains the enteral feeding process to the family, prepares the child, and supports them during enteral tube insertions.

Goals and benefits of enteral nutrition should be discussed by the interdisciplinary team with the family prior to its initiation to help reduce tube dependency. Establish initial and ongoing feeding goals with the child and family that define the quality of feeding (i.e. whether it's a positive experience), type of feeding, volume of feeds, and duration of tube feeding.

9.1.2 Considering Enteral Feeding Route

The following need to be considered by the interdisciplinary team (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015) when choosing the most appropriate enteral feeding route:

- risk of aspiration (see Table 1)
- considerations specific to the child's medical condition, gastric function, or previous surgeries
- expected duration of enteral feeding
- needs and desires of the child and family

The decision regarding the most suitable enteral feeding route is generally made by the physician and interdisciplinary team in collaboration with the child and family. The dietitian should be involved with the decision-making process based on knowledge of current intake from oral and/or enteral nutrition sources, tolerance, and nutrition requirements.

Enteral feeding tubes are described by where they enter the body and where they deliver the enteral feed. When safe to do so, gastric feeding is preferred over jejunal, as gastric feeding tubes are easier to place and offer more physiologic feeding compared to transpyloric (i.e. jejunal) feeding (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015); (Braegger, Decsi, Dias, Hartmann, & Kolacek, 2010).

- nasoenteric tubes (or simply called nasal tubes) are inserted through the nose; nasogastric tubes are nasal tubes that deliver feed into the stomach, while nasojejunal tubes are nasal tubes that deliver enteral nutrition to the jejunum (small intestine)
- gastroenteric tubes are feeding tubes that are surgically inserted through a stoma (gastrostomy) into the stomach. A gastrostomy tube typically provides enteral nutrition into the stomach, whereas a gastrojejunal tube delivers the enteral nutrition into the jejunum
- A jejunal tube may be surgically placed through a stoma called a jejunostomy to enter and deliver enteral nutrition directly into the jejunum. Jejunal feeding is indicated when gastric feeding is not possible or tolerated, such as with aspiration, gastroparesis, gastric outlet obstruction, or abdominal surgery

The use of nasal tubes is considered primarily for temporary or short-term enteral nutrition support. Consideration of gastrostomy insertion for longer duration of enteral support is highly recommended when enteral feeding is expected to extend beyond four to 12 weeks. Selection of the most appropriate enteral feeding route can be guided by the decision tree in Figure 10. Tube specific care recommendations regarding nasoenteric tube size, measuring, taping, and placement checks are provided by the home enteral nutrition support programs.

Although inconclusive, increased food aversion has been noted in children using a nasogastric tube for greater than three months, compared to those who used it less than three months or those with a gastrostomy tube (Ricciuto, Baird, & Sant'Anna, 2015).

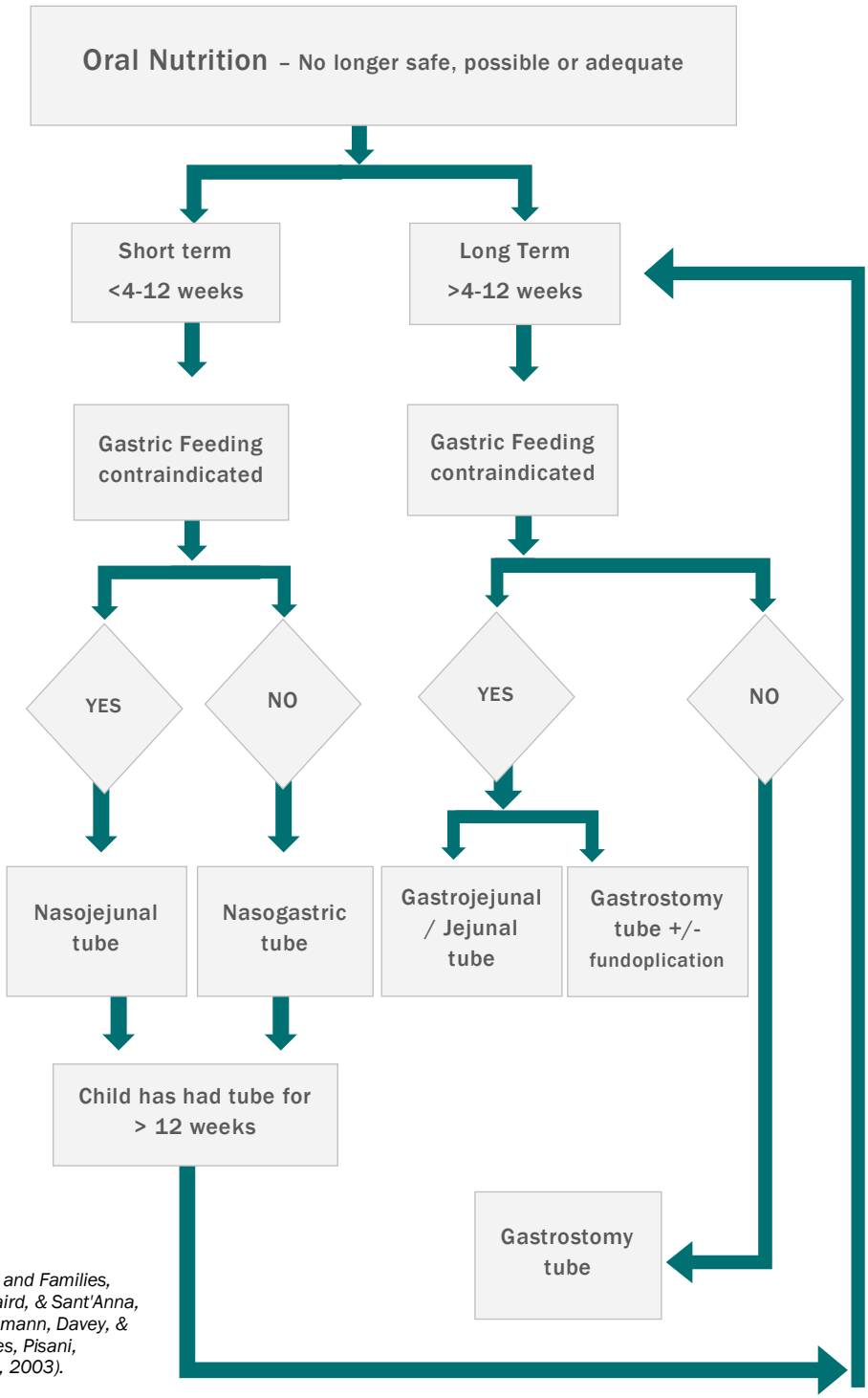
- late preterm infants are more likely to exhibit oral sensorimotor sensitivity and facial defensiveness in later infancy if they received more than three weeks of enteral nutrition using a nasogastric tube (Dodrill, et al., 2004)
- in contrast, a recent study found no difference in food aversion behaviours in children with established tube dependency regardless of the use of a nasal or gastrostomy type tube (Wilken, Bartmann, Davey, & Bagci, 2018). However, it should be noted that many of the children in both groups had experienced nasogastric tube feeding for longer than three months
- in the absence of a randomized controlled trial, which is not feasible, the role of nasal tubes in the development of food aversion and tube dependency cannot be known, but factors such as painful reinsertions and quality of life, are highly relevant
- furthermore, in adult patients, the use of nasogastric tubes, as opposed to gastrostomy tubes, has been associated with increased risk of gastroesophageal reflux and aspiration pneumonia, likely also relevant for children with dysphagia who require more than short-term enteral support (Gomes, Pisani, Macedo, & Campos, 2003), (Alnassar, Oudjhane, & Davila, 2011).

Physicians and the interdisciplinary team should provide information and guidance to parents and children (as appropriate) early in the treatment process. This communication will assist and support decision-making which is based upon current practice recommendations, family preference, and the anticipated duration of enteral feeding (ESPGHAN Committee, 2010); (National Institute for Health and Care Excellence, 2006); (European Society of Parenteral and Enteral Nutrition (ESPEN), 2005); (Canadian Paediatric Society, 2009), (Spanish Society of Parenteral and Enteral Nutrition (SSPNE), 2011).

Children who are fed by a nasoenteric tube should be reviewed by the interdisciplinary team, with the child and family, within 4 to 12 weeks to discuss the ongoing management and consideration of transition to an alternate feeding tube, e.g. gastrostomy, jejunostomy, (Boullata, et al., 2017); (Dunitz-Scheer, et al., 2009); (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015); (Braegger, Decsi, Dias, Hartmann, & Kolacek, 2010). As there are risks to both long-term nasoenteric tube use and gastrostomy tube insertion, it is essential to consider the child's medical needs, overall health, ability to safely consume oral intake, and recent progress with feeding skills and oral intake (ESPGHAN Committee, 2010), and together determine the best option for the child in the short term, and the long term (as applicable).

Figure 10: Decision Making for Selection of Enteral Feeding Route

This is a proposed decision tree based on available evidence and current guidelines. All final decisions regarding enteral feeding route are made in collaboration with the child and family.



(NSW Office of Kids and Families, 2016); (Ricciuto, Baird, & Sant'Anna, 2015) (Wilken, Bartmann, Davey, & Bagci, 2018) (Gomes, Pisani, Macedo, & Campos, 2003).

9.1.3 Enteral Nutrition Selection

A nutrition assessment is recommended when choosing an enteral feed type to meet the specific nutrition needs of the child. Breastmilk is the optimal choice for infants. Breastmilk can be fortified to provide additional nutrition if required. If breastmilk supply is insufficient or unavailable, formula may be used in conjunction with breastmilk or as an appropriate substitute.

There are a wide variety of formulas designed for infants as well as older children and adults (See Table 11). Formula for enteral feeding may be selected based on age, growth, nutrition requirements, underlying disease state, (e.g. food allergy, conditions requiring specific formulations, absorptive capacity), fluid allowance, palatability, and accessibility. The formula may also be modified with additives for individual patients to better meet nutritional goals (National Health and Medical Research Council, 2012) (ESPGHAN Committee, 2010) (Boullata, et al., 2017) (NSW Office of Kids and Families, 2016) (Alberta Health Services, 2013a).

Home blended food for tube feeding may also be considered in discussion with a dietitian and the interdisciplinary team. Home blended food for tube feeding can be defined as whole foods and liquids blended into fine puree or liquid that is administered through an enteral tube (Coad, et al., 2017) (Epp, 2018) (Johnson, Spurlock, & Pierce, 2015). Commercially prepared blended foods and liquids for tube feeding may be referred to as blenderized formulas to distinguish from blends prepared in the home setting. Medical stability, absence of malnutrition, a mature stoma, adequate tube size, tolerance to bolus feeding, ability to tolerate variable nutrient, electrolyte and fluid intake, and family ability to prepare feeds and assume the additional workload are all factors contributing to successful home blended food for tube feeding (Gallagher, et al., 2018) (Zettle, 2016) (Coad, et al., 2017) (Epp, 2018).

9.1.3.1 Home Blended Food for Tube Feeding

9.1.3.1.1 Benefits and indications for home blended food for tube feeding

Blended food diets have been shown to have a positive effect on the health outcomes of enterally-fed children including improvements in nausea, vomiting, gagging, retching, diarrhea, gastroesophageal reflux, constipation, overall wellness, and oral intake (Phillips, 2019); (Soscia, et al., 2021); (Trollip, Lindeback, & Banerjee, 2020); (Batsis, et al., 2020); (Breaks, Smith, Bloch, & Morgan, 2018); (Durnan, Toft, & Flaherty, 2018).

In some instances, reduced medication requirements (Gallagher, et al., 2018), hospital admissions, and emergency visits were observed after the first year on a blended diet (Batsis, et al., 2020); (Kernizan, et al., 2020); (Breaks, Smith, Bloch, & Morgan, 2018).

Positive experiences and outcomes are often reported by families using home blended food for tube feeding over commercial formula. Parent empowerment, de-medicalization of the feeding relationship, and mental health benefits have been cited (Breaks, Smith, Bloch, & Morgan, 2018); (Durnan, Toft, & Flaherty, 2018); (Phillips, 2019); (Soscia, et al., 2021); (Trollip, Lindeback, & Banerjee, 2020). Children were reported as having improved well-being, were happier, more relaxed, more energetic, and had better social inclusion (Soscia, et al., 2021); (Trollip, Lindeback, & Banerjee, 2020).

Home blended food for tube feeding may be recommended in the following populations:

- infants (from around 6 months of age) and children who are medically stable (Association of UK Dieticians, 2019); (Durnan, Toft, & Flaherty, 2018)

- children with a well-healed gastrostomy stoma and minimum tube size 12 French (Fr) or greater (Kernizan, et al., 2020); (Association of UK Dieticians, 2019); (Coad, et al., 2017); (Gallagher, et al., 2018); (Epp, Salonen, Hurt, & Mundi, 2019)
- children with reflux symptoms that are challenging to manage and who may benefit from a higher viscosity feed (Hron, et al., 2019); (Hron & Rosen, Viscosity of Commercial Food-based Formulas and Home-prepared Blenderized Feeds, 2020)
- children who have undergone fundoplication experiencing rapid gastric emptying and dumping syndrome leading to upper GI symptoms (Batsis, et al., 2020); (Coad, et al., 2017)
- families who have a suitable home environment with access to a kitchen with a fridge and a high-power blender, and are willing to monitor their child's nutrition and fluid intake (Coad, et al., 2017)

9.1.3.1.2 Concerns with home blended food for tube feeding

Reported disadvantages of home blended food for tube feeding may include:

- initial increased start up costs such as purchasing a high-power blender
- a change from formula coverage to planning for food costs
- increased preparation time compared to commercial formula (Batsis, et al., 2020)
- inconvenience compared to commercial formula availability
- shorter administration time due to food safety
- blended food getting stuck in the tube
- volume tolerance
- meeting nutrition needs

Many families are willing to overlook these challenges due to the perceived benefits and improvements observed in children receiving home blended food for tube feeding (Durnan, Toft, & Flaherty, 2018); (Soscia, et al., 2021); (Phillips, 2019).

9.1.3.1.3 Administration of home blended food for tube feeding

Home blended food for tube feeding is best administered as bolus feeding using a syringe due to its thickness. Less viscous blends may be administered by gravity large bore feeding sets but can be prone to clogging due to inadequate blending and sediment accumulation (Gallagher, et al., 2018); (Johnson, et al., 2019); (Breaks, Smith, Bloch, & Morgan, 2018); (Coad, et al., 2017).

Children unable to tolerate syringe or gravity bolus feeding may achieve improved volume tolerance using a pump, being mindful of the short hang time (up to 2 hours). Blends with an IDDSI (International Dysphagia Diet Standardization Initiative) level 2 thickness (mildly thick) or less (level 1 slightly thick or level 0 thin) may be administered using select feeding pumps (Batsis, et al., 2020); (Epp, Salonen, Hurt, & Mundi, 2019); (Coad, et al., 2017). See Table 12 Feeding Pump Criteria and Figure 11 Feeding Pump Selection.

Refer to:

International Dysphagia Diet Standardization Initiative to determine IDDSI level of thickness:

- IDDSI Flow Test video
- IDDSI Flow Test handout

9.1.4 Choosing an Appropriate Enteral Feeding Regimen

In order to enhance motility and nutrient metabolism in the child with an enteral feed, the preferred method of enteral feeding is by bolus feeding (Schanler, Shulam, Lau, Smith, & Heitkemper, 1999) (Patel, Piazza, Layer, Coleman, & Swartzwelder, 2005) (Rovekamp-Abels, et al., 2015). Enteral feeds can also be administered by continuous, intermittent/bolus, cycled or a combination of these, each method with its own advantages and disadvantages.

Refer to:

Appendix 10: Tube Feeding Schedules/Regimens for Enteral Feeding

Figure 7: Nutrition Support Decision Making Tree

Provincial Enteral Nutrition Insite Page (AHS Staff Login required)

TABLE 11: GENERAL FORMULA SELECTION FOR ENTERAL FEEDING

FEED TYPE	COMPOSITION	INDICATIONS	CONSIDERATIONS
INFANT FEEDING			
Breastmilk	• optimal nutrition for infants when available and safe for use	• contraindicated for galactosemia and illicit drug exposure as defined by the AHS Breastmilk Safe Management Policy	• age of the infant, breastmilk supply, composition, route (breast, bottle or enteral tube)
Infant formula	• standard formulas are cow's milk based and contain lactose, although soy based and modified cow's milk based formulas are available to meet specific needs of the infant	• recommended alternative for infants when breastmilk is not available or not in sufficient quantities	• composition, format (powder, liquid concentrate, ready-to-feed), safe preparation of equipment and formula, tolerance
Pasteurized donor human milk (DHM)	• mature breastmilk from screened donors that is pooled, pasteurized, and lower in protein than a parent's own breastmilk in the early stages of lactation	• indications are outlined in the AHS DHM procedure • if used for preterm infants, fortification is needed to meet nutrient needs	• low protein, high cost, and access limitations
Extensively hydrolyzed infant formula	• protein broken down into peptides and amino acids, variable medium chain triglyceride (MCT) content	• cow's milk protein allergy • malabsorption • short bowel syndrome	• cost, palatability
Amino acid-based infant formula	• protein is broken down into amino acids, variable MCT content	• cow's milk protein allergy • multiple food protein intolerance • malabsorption • short bowel syndrome	• cost, palatability, access
Specialty formula	• fat-modified formula, carbohydrate-modified formula, preterm, post-discharge preterm	• used in disease-specific circumstances, e.g. chylothorax, carbohydrate metabolism disorders, preterm infants	• cost, palatability, access, may need recipe from dietitian to ensure nutritionally complete
PEDIATRIC			
Polymeric – includes high energy or high protein formulations	• contains intact nutrients and requires normal digestive and absorptive function of the gastrointestinal tract	• recommended as first-line formula for most children (Koletzko, et al., 2015)	• some formulas may contain fibre and/or prebiotics
Semi-elemental	• protein is partially broken down into peptides and amino acids, fat and carbohydrate sources	• malabsorption • short bowel syndrome	• cost, poor palatability; access

FEED TYPE	COMPOSITION	INDICATIONS	CONSIDERATIONS
Elemental	• amino acid-based formula	• intolerant to semi-elemental • cow's milk protein allergy • multiple food protein intolerance • malabsorption • short bowel syndrome	• poor palatability, cost powdered preparation
Blenderized or home blended food	• commercially prepared blenderized formulas, home blended food for tube feeding, or a combination	• whole foods approach • retching, tolerance • patient preference	• age of child (around 6 months or older), complementary or sole source of nutrition
Modulars/Additives	• separate macronutrients (carbohydrate, fat, protein)	• can be added to formulas to tailor nutrition needs	• safe preparation of formula, administration, and changes in osmolarity and nutrient balance

When choosing an enteral feeding regimen, consider the following (Bauer, 2002) (American Society for Parenteral and Enteral Nutrition Board of Directors, 2009):

- current medical condition, nutrition and biochemical status
- tolerance to any previous enteral nutrition regimens
- safety of ongoing oral intake to complement enteral feeding, general consumption
- child's age, activity level, preferences, lifestyle, development, and family routine
- nutrition needs, and specific nutrient requirements for optimal growth and development, volume required to optimize tolerance, and water flushes to support hydration needs
- route of delivery and formula type
- refeeding risk
- expected duration of nutrition support
- cost effectiveness and/or implications
- parent ability to safely administer the regimen
- sustainability of the proposed regimen, e.g. complex routines may be ok for short-term success, but may not be sustainable for longer term intervention, requires reassessment

Enteral feeding should only be started following medical confirmation of tube placement. In most cases, enteral feeds can be started at full strength with the volumes being gradually increased in stages either as an increased infusion rate or as a larger bolus (Shaw & Lawson, 2007).

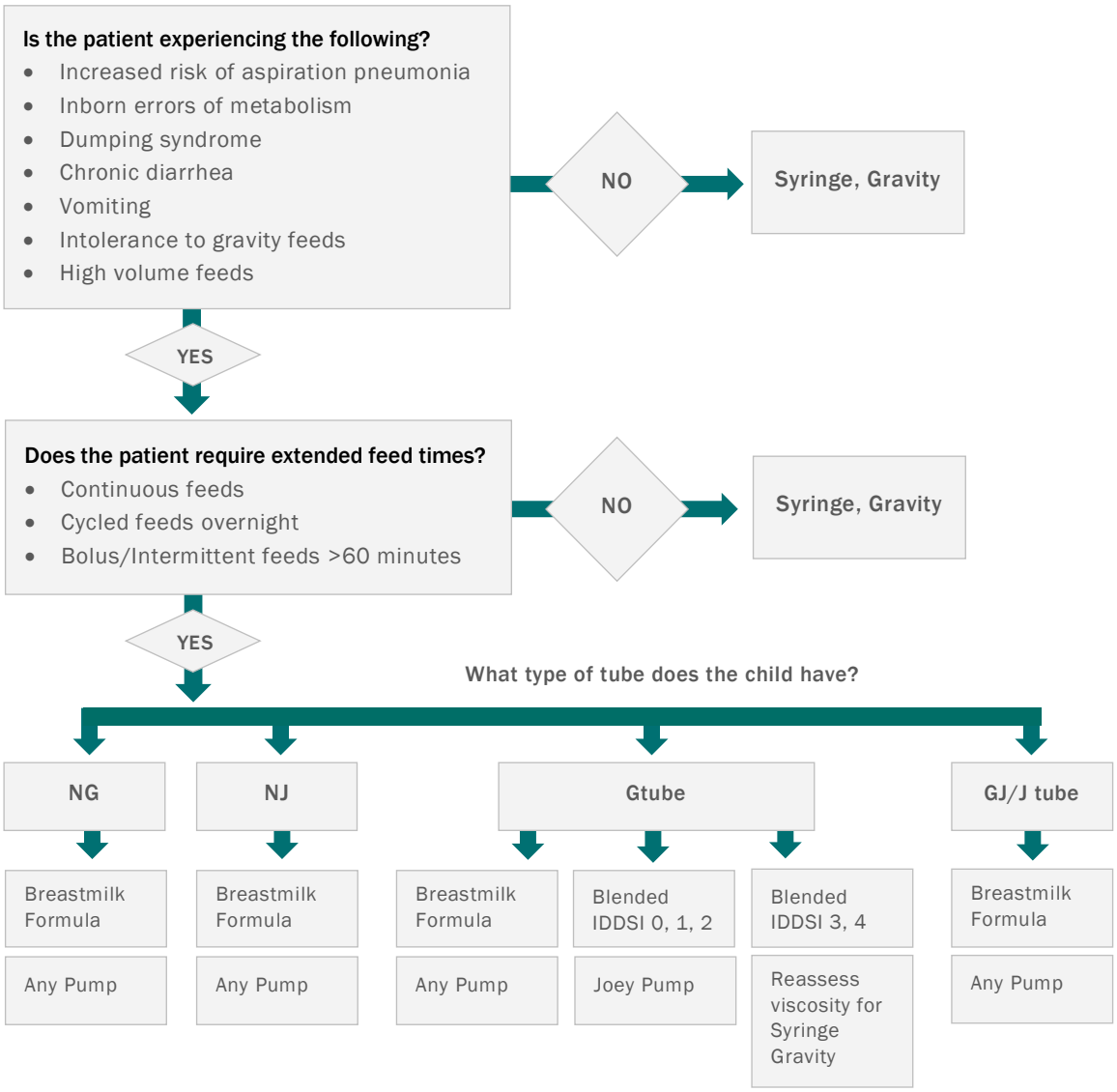
Consideration of advancing feeding regimens should be undertaken upon review of the above-mentioned factors. As feeds progress towards goal rate or schedule, the child's tolerance and medical stability should be monitored.

Clinical condition, tube type, tolerance, and family needs may influence administration of enteral feeds requiring an enteral pump (See Table 12). Continuous pump feeding is required for jejunal feeding due to the lack of reservoir capacity in the small bowel. Bolus feeds are contraindicated for jejunal feeding (Boullata, et al., 2017) (Braegger, Decsi, Dias, Hartmann, & Kolacek, 2010) (NSW Office of Kids and Families, 2016). Intermittent pump feeding may be possible and should be determined based on individual needs and tolerance. However, particularly for infants, consultation with the medical team is recommended due to potential risk of hypoglycemia when ceasing jejunal feeds (NSW Office of Kids and Families, 2016).

TABLE 12: FEEDING PUMP CRITERIA

Medical indications requiring a feeding pump	• continuous • cycled (i.e. overnight) • bolus/intermittent Feeds > 60 minutes	Required for management of: • increase risk of aspiration pneumonia • inborn errors of metabolism • dumping Syndrome • chronic Diarrhea • vomiting • intolerance to enteral feeds delivered by gravity • high volume enteral feeds • post-pyloric/jejunal tube
Indications for feeding pump discontinuation	• able to tolerate a transition to bolus feeds ≤ 60 minutes	Examples: • gravity feeds tolerated • jejunal feeds discontinued
Non medically supported requests for feeding pump (and suggested responses)	• formula is too viscous to run by gravity • family is familiar with pump use • family preference without supporting rationale *It is important to note that families who source feeding pumps on their own will be responsible for purchasing their own pump supplies (i.e. feeding sets)	Education provided: • how to use large bore feeding bags, dilute formula (in consultation with a dietitian), or push feed with syringe • provide education for gravity of bolus feeding • exceptional and short-term circumstance, e.g. palliation

Figure 11: Feeding Pump Selection



The indications for feeding pump use may change with time. A child should be reassessed and transitioned from a pump to gravity or syringe feed administration when the original indication for the pump has resolved.

9.1.5 Enteral Nutrition Administration Time

When selecting a feed regimen, consider the type of feed and the safe administration time at room temperature for that feed type. This is referred to as the hang time. There is limited safety evidence for hospital hang times, mostly guided by lab-based studies (Lyman, Gebhards, Hensley, Roberts, & San Pablo, 2011); (Zozaya, et al., 2018); (Castro , et al., 2019); (Lakananurak, Nalinthassanai, Suansawang, & Panarat, 2020) and expert consensus (i.e. American Society of Parenteral and Enteral Nutrition (ASPEN) (Boullata, et al., 2017). Furthermore, there is limited evidence to support an extended hang time in the home setting except when feeding a ready-to-use formula (Lyman, Gebhards, Hensley, Roberts, & San Pablo, 2011). Extended hang times

pose a risk to nutrient loss (evidence from breastmilk studies) and for bacterial contamination (Evans, Preston, Daly, Neville, & MacDonald, 2010).

Fat and energy loss may occur in relation to the feeding set material interacting with the feed type (i.e. breastmilk), and the amount of time required to administer the feed. The highest fat loss occurs in the first 30 minutes of administration, however, fat loss will continue to increase with longer administration times (Castro , et al., 2019) (Zozaya, et al., 2018).

Bacterial contamination in the home setting may be impacted by:

- inadequate handwashing (Evans, Preston, Daly, Neville, & MacDonald, 2010)
- increased feed handling and aseptic technique [(Evans, Preston, Daly, Neville, & MacDonald, 2010), (Lyman, Gebhards, Hensley, Roberts, & San Pablo, 2011)]
- reduced accuracy of formula preparation compared to the hospital setting (Evans, Preston, Daly, Neville, & MacDonald, 2010)
- complex recipes impacting proper storage of ingredients (Evans, Preston, Daly, Neville, & MacDonald, 2010)
- home enteral feeding greater than 5 years (Evans, Preston, Daly, Neville, & MacDonald, 2010)

Safe extended hang times for ready-to-use formula up to 12 hours can be achieved with reinforcement of proper hand washing, preparing feeds in a clean area, minimizing unnecessary feed handling, and proper storage of breastmilk, formula, and additives. See Table 13.

TABLE 13: RECOMMENDED HANG TIMES

PRODUCT FORMAT	FEED TYPE	HOSPITAL HANG TIME	HOME HANG TIME
Closed system (ready-to-use formula in the manufacturer bag)	Ready-to use formula	24 hours	Up to 48 hours per manufacturer
	Ready-to-use blenderized formula	24 hours	Up to 48 hours per manufacturer
Open system (cans, tetras, concentrates, powders)	Ready-to-use formula	8 hours • Infants and children greater than 2 months of age	Up to 12 hours
		4 hours • Infants less than two months of age; preterm, low birth weight, immunocompromised	4 hours
	Ready to use formula with additives	4 hours	4 hours
	Reconstituted formula from liquid concentrate	4 hours	4 hours
	Reconstituted formula from powder	4 hours	4 hours
		2 hours • Infants less than two months of age; preterm, low birth weight, immunocompromised	2 hours
	Freshly expressed or pumped breastmilk, with or without additives	4 hours	4 hours
	Thawed, previously frozen breastmilk brought to room temperature	2 hours	2 hours
	Home blended food for tube feeding	2 hours	2 hours
	Blenderized ready-to-use formula	8 hours	12 hours *may vary by manufacturer

(Boullata, et al., 2017), (Lyman, Gebhards, Hensley, Roberts, & San Pablo, 2011); (Lakananurak, Nalinthassanai, Suansawang, & Panarat, 2020); (World Health Organization, 2007)

9.1.6 Reuse and Cleaning of Enteral Feeding Equipment

Enteral feeding is a potential source of infection due to the risk of bacterial contamination of feed products and enteral feeding equipment (Osland E. , 2008); (Osland, Andersen, Coleman, & Marshall, 2021). It may occur as a part of feed preparation, administration, or with retrograde bacterial growth migrating from the feeding tube into the delivery set over time (Osland E. , 2008).

Equipment used to administer enteral feeding may include syringes, feeding sets (bag with tubing), adaptors, tube extensions, and enteral feeding pumps. Bacteria can accumulate at the distal end of the feeding tube and the Y-port of feeding sets which can be increased with handling and extended hang times (Mathus-Vliegen, Bredius, & Binnekade, 2006). Enteral feeding equipment is generally intended for single use. Despite limited evidence, however, they are often reused due to cost, supply shortages, and environmental impact.

There is limited evidence on the safety and clinical outcomes of cleaning and reusing enteral feeding equipment in the home setting. It is uncertain whether enteral feeding equipment reuse up to 72 hours leads to the development of adverse gastrointestinal symptoms (diarrhea and vomiting) or gastrostomy site infection. Evidence on the effectiveness of cleaning methods for feeding sets when evaluated by bacterial count is also uncertain. No studies have evaluated the reuse of syringes for bolus feeding (Osland, Andersen, Coleman, & Marshall, 2021). It is also unclear whether the formula type (i.e. specialty or elemental formula) increases plasticizer leaching in feeding sets to impact the reuse of enteral feeding equipment.

Enteral feeding equipment that is reused should be sufficiently cleaned to reduce the risk of bacterial contamination of subsequent feeds.

- Feeding pumps should be cleaned and serviced according to the manufacture guidelines to maintain function and warranty.
- Feeding equipment such as syringes, feeding sets, adaptors, and tube extensions should be cleaned using warm soapy water, scrubbing for 30 seconds or more, and rinsing with hot water.
- Rinsing equipment with sterile water between bolus feeding may further limit contamination (Osland, Andersen, Coleman, & Marshall, 2021).

TABLE 14: EQUIPMENT REUSE RECOMMENDATIONS FOR AHS PEDIATRIC HOME NUTRITION SUPPORT PROGRAMS:

ENTERAL EQUIPMENT	REUSE
Feeding sets	Up to 3 days
Adaptors and extensions	Up to 1 month
Syringes	Daily

See Equipment Supply Quotas for details and exceptions.

9.1.7 Risks and Complications of Enteral Feeding

Complications of enteral feeding are dependent on the type and route of feeding. See Table 17.

Refeeding syndrome can be an early complication of initiating enteral feeds in malnourished patients or those with severely restricted oral intake. Prevention requires identification of children at risk (Alberta Health Services, 2013), measuring and correcting electrolyte abnormalities before initiating nutrition support, and increasing nutrient delivery slowly. Children at risk include those with chronic malnutrition, no intake for seven to ten days, weight loss of ten per cent within two to three months, below 70 per cent ideal body weight, intake < 50% requirements for more than 14 days, pre-existing electrolyte disturbances (particularly low phosphate), and prolonged gastrointestinal malabsorption (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015). There is also a risk of overfeeding malnourished children who have had malnutrition but have low energy needs.

Metabolic consequences of refeeding syndrome include hypophosphatemia, hypokalemia, and hypomagnesaemia and can lead to severe medical complications including muscle weakness, impaired cardiac and respiratory function leading to fluid overload, cardiac arrhythmia, and possible death (Khan, Ahmed, Khan, & MacFie, 2011). Monitoring for signs of refeeding syndrome in children at risk is recommended one to four times per day for the first three days and daily thereafter for the first two weeks of

feeding (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015). Electrolyte repletion (per guidelines) is needed when abnormalities are identified.

Refer to:

ASPEN Pediatric Nutrition Support Core Curriculum – Refeeding Management Guidelines, p 543

Enteral formulas are formulated to provide adequate amounts of micronutrients to meet age-related energy requirements. As such, children with low volume feeds or low energy feeds, e.g. those with neurological impairment, may be at higher risk of micronutrient deficiency. Micronutrient supplementation and additional monitoring may be required to optimize nutrient intakes (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015).

9.1.8 Administering Medication

When administering medications via enteral route, consult with the pharmacist, physician, or nurse to ensure safe and effective use of medications. If a child is safe to take medications by mouth, this is the preferred route. However, therapists focusing on feeding should consider if medications have an unpleasant taste. This may cause distress or aversion and potentially limit progress with oral feeding. Not all medications may be given via enteral feeding tube, and absorption may be altered depending on the location of the tube. (Boullata, et al., 2017). See Table 15.

TABLE 15: ENTERAL TUBE MEDICATION ADMINISTRATION: BEST PRACTICES

• flush tubing before and after medications administration
• administer medications separately
• do not mix medication with enteral feed
• use liquid medications or finely crushed immediate release medications that are appropriately diluted
• do not crush and administer delayed release medications
• consider drug-nutrient interactions
• consider tube delivery site and known site of absorption of the medication
• monitor medications that may have unreliable absorption, e.g. phenytoin
• consider osmolality of liquid medications in children with feeding intolerance such as retching and diarrhea
• consult pharmacist (Alberta Referral Directory) for all critically important medications given by enteral nutrition route

9.1.9 Monitoring Enteral Nutrition

Monitoring should be child specific based on age, disease, severity of illness, degree of malnutrition, and metabolic stress. A quarterly assessment for all enteral nutrition patient populations is recommended as a minimum (Boullata, et al., 2017). Monitoring should include evaluation of growth and nutrition adequacy, tolerance of feed type and delivery, as well as oral feeding readiness and/or progression, to guide revisions to the enteral feeding plan (Corkins, Balint, Bobo, Yaworski, & Kuhn,

2015). A physical exam and medication review are also recommended. Although lab monitoring may be recommended as part of inpatient care, it is not routinely indicated in the outpatient clinics/community setting for medically stable children who are tolerating their feeds and growing well. Targeted laboratory investigations may be needed based on disease state or if a nutrition-focused physical exam identifies signs of nutrient excess or deficiency. Ongoing monitoring with adjustments should be made towards achieving both long and short-term goals. See routine monitoring parameters in Table 16 (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015). These recommendations do not apply to children on home parenteral nutrition who also have enteral nutrition.

TABLE 16: PARAMETERS FOR MONITORING ENTERAL NUTRITION

Parameters for Monitoring Outpatient Enteral Nutrition With or Without Oral Intake

Reassess the home tube-fed patient at least quarterly, considering patient acuity and progression of clinical care.

GROWTH PARAMETERS **In general, growth should be assessed at each appointment or as per clinic practices**	
• weight	• monthly (< 2 years of age) to every 3 months (> 2 years of age) *
• length or height	• monthly or at clinic
• head circumference	• monthly or at clinic
• weight velocity and z scores	• weekly or monthly *If clinic visits are less frequent than the parameters above, assess whether this reduced frequency is appropriate
INTAKE PARAMETERS	
• oral or enteral intake, energy, protein, vitamins, minerals, fluid	• monthly
GI TOLERANCE	
• abdominal girth • gastric residuals • emesis • stool • ostomy	• as indicated based on patient report
PHYSICAL	
• physical exam	
• temperature	• report when > 38.5 degrees
• tube placement	• prior to each feeding
• tube site care	• daily
• balloon volume	• when medication changes occur
• medications	• as required
• labs	

Adapted from (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015); (Boullata, et al., 2017).

9.1.10 Assessment of Tube Feeding Intolerance

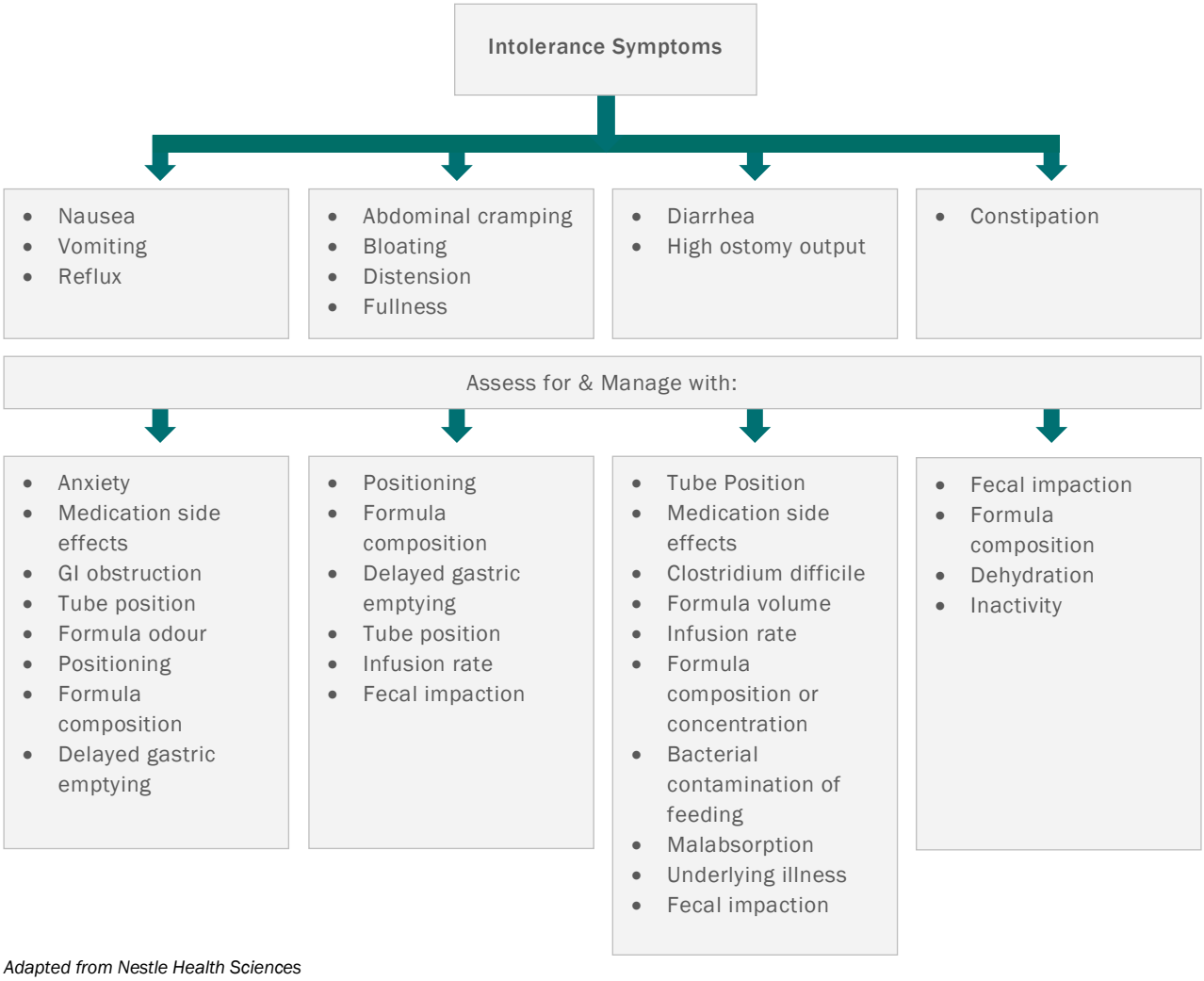
Complications associated with enteral nutrition may be prevented or managed with routine monitoring and adjustments based on tolerance.

Assessing tube feeding tolerance consists of monitoring for the following gastrointestinal symptoms:

- nausea, vomiting, diarrhea, constipation, abdominal pain, and abdominal distention.

Infection, bacterial overgrowth, medications, or contamination of formula from improper preparation and storage can cause intolerance symptoms (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015). It is important to identify the underlying cause for intolerance before changing formulas or tube feeding regimens (see Figure 12.) Revision of the enteral nutrition care plan should occur when intolerance is impeding the progress of feeding goals.

Figure 12: Identifying Cause of Tube Feeding Intolerance



Adapted from Nestle Health Sciences

Persistent feeding intolerance may require consultation with a pediatric GI physician to evaluate for conditions such as an intestinal inflammatory process, small bowel bacterial overgrowth, bowel obstruction, or intestinal strictures (ASPEN Corkins 2015).

9.1.11 Troubleshooting for Enteral Nutrition

It is important for healthcare professionals and parents to be aware of potential signs that an enteral feeding review is required, and methods for overcoming common issues, including when to report these to members of the interdisciplinary team. See Table 17.

TABLE 17: INDICATORS FOR AN ENTERAL REVIEW

	CONCERN	POSSIBLE CAUSES	POSSIBLE PREVENTION AND SOLUTIONS
Gastrointestinal	aspiration	• nasoenteric tube may be misplaced	• stop the feed • seek medical attention
	abdominal distension or pain, cramping, nausea, vomiting, diarrhea, retching, or dumping syndrome	• first feed of the day may be more sensitive due to mucous in the stomach • air in the stomach, stomach is too full, or feed is given too quickly • tube has moved into a poor position - spoiled formula or dirty equipment • acute illness • excessive or inadequate feed volumes • gut dysmotility including potential influence of medications • excessive or inadequate fibre and/or fluids • temperature of feed is too cold • medication side effects	• check tube placement • consider venting or burping more permanent tubes before during and after feeding • administer feeds and flushes more slowly or offer smaller more frequent feedings • make and store formula as directed • keep feeding sets clean • warm the formula • have the physician or pharmacist review medications
	constipation	• low fluid intake • low fibre intake • low activity level • medication side effects • slow movement of intestines	• increase fluid intake • increase fibre intake • increase activity level • medication review to support bowel movements
Anthropometric	unintentional weight loss, excessive weight gains	• improper preparation of formula leading to excessive or inadequate concentration of formula • excessive or inadequate feed volumes • change in metabolic demand • gastrointestinal complications limiting tolerance and volume administered	• review feed preparation, mixing, and recipe • address gastrointestinal complications to improve tolerance and intake • assess volume, concentration and metabolic needs • assess feed type or formula selection • review potential psychosocial factors
Mechanical Complications	tube blockages	• less than optimal feed duration or rapid feed administration	• flush tube before, in between and after giving medication

	CONCERN	POSSIBLE CAUSES	POSSIBLE PREVENTION AND SOLUTIONS
		• inadequate water delivery with medications • tube positioning • inappropriate tube size	• check that the feeding tube is not clamped or bent • fill a syringe with 5ml (NG/NJ) or 25ml (g-tube, j-tube) of warm water and gently push and pull on the syringe's plunger to unblock the tube • gently massage the tube using your fingers if the tube remains blocked. • if it can't be unblocked, seek medical attention.
Tube Site Care	• redness, granulation tissue, bleeding	• skin is wet and unclean • increased tube movement • infection • bleeding after tube change or if pulled	• clean skin more often, expose to air • check tube placement and secure as directed by home enteral nutrition program • seek medical attention
	• Leakage from the tube site	• Illness • Constipation • coughing -poor tube fit • incorrect tube placement	• check tube placement and balloon (as applicable) • keep skin clean and dry • use dressings as directed by nursing or physician • set up a bowel routine

(NSW Office of Kids and Families, 2016); (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015)

Refer to:

PEAS Tube Feeding

9.1.12 Establishing Home Enteral Nutrition (HEN)

The provision of enteral nutrition in the home setting is called Home Enteral Nutrition (HEN). HEN allows enterally fed hospital patients, who are otherwise medically stable, to be discharged into the community (ACI Nutrition Network, 2012); (Western Child Health Network, 2013).

The aims of HEN include provision of effective nutritional support, promotion of patient and family autonomy, ensuring safe maintenance of nutritional support, and maximizing the potential for improved lifestyle and optimized disease management (ESPGHAN Committee, 2010). When transitioning between care environments, consider how the enteral feeding plan is best communicated, ensure the enteral nutrition prescription and regimen is documented, and communicate the enteral nutrition regimen to the accepting care team (Boullata, et al., 2017).

Parent comfort, confidence, education and demonstration of appropriate administration of enteral feeds is paramount to a successful transition home. Parents need a clear understanding of the nutrition support plan including formula type, method of administration, feeding regimen, route, duration of therapy, information for reordering supplies, and how to contact their interdisciplinary team. They should be taught about their child's tube type, insertion technique, care for the feeding tube, tube related complications, and assessment skills to troubleshoot problems that may arise such as tube dislodgement (Sevilla & McElhanon, 2016) (Corkins, Balint, Bobo, Yaworski, & Kuhn, 2015).

Creating a positive feeding experience while administering enteral feeds is equally as important as with oral feeding. Normalize the tube feeding environment as much as possible to mimic a typical oral feeding situation.

Some examples:

- encourage parents to provide infant skin-to-skin care, hold and, or position their infant or child to facilitate social interaction at tube feeding times
- if tube feeding is a pleasant experience for the child, commence the tube feed at the start of the meal or oral experience to promote the association between satiation and positive oral experiences
- respond to signs of discomfort during tube feeding by giving the child a break, venting or stopping the feed
- if not distressing to the child, eat in front of them, so they are able to observe normal eating function
- if safe to do so, offer a drop of warmed expressed breastmilk, formula or puree on the infant's or child's lip to promote licking and sucking response during tube feeding to help the child organize for oral feeding

9.1.13 Additional Resources

AHS Policy: Safe Infant Sleep

Feeding Tube Awareness

9.2 TRANSITION FROM ENTERAL TO ORAL FEEDING

Transition from enteral to oral feeding may be considered as a management strategy in response to concerns regarding feeding safety, adequacy, feeding as a positive experience, development, and efficiency.

KEY MESSAGES

- Transitioning from enteral to oral feeding should be considered from the time enteral feeds are initiated. Setting a clear platform from the outset prevents enteral tubes from being used longer than required.
- Assess the safety and readiness of the child to begin or increase oral feeding and the readiness of families to work with their child and healthcare professionals toward oral feeding.
- Feeling comfortable with enteral feeding and/or being in a mealtime setting is essential before facilitating the development of feeding skills and working on oral desensitization.
- The approach to reducing enteral feeds will be different for each child.
- Transitioning from enteral to oral feeding is a process. At each stage of the transition process, it is important to identify a limited number of achievable, developmentally appropriate and measurable goals.
- Permanent removal of a feeding tube may be considered when the child is clinically stable, has safe and adequate oral intake to grow appropriately and meet nutrition needs.

9.2.1 Tube Weaning: Transition From Enteral to Oral Feeding

Successful tube feed weaning models have been demonstrated in inpatient, outpatient, and virtual health settings utilizing different approaches, with varying intensity and medical supervision (Lively, McAllister, & Doeltgen, 2019) (Marinschek, Pahsini, & Doeltgen, 2019) (Williams, et al., 2017) (Mirete, et al., 2018) (Lively, McAllister & Deltgen 2020). Results of these programs suggest that with appropriate support and monitoring, successful reduction or complete weaning from tube feeds is possible for certain children (Krom, de Winter, & Kindermann, 2017).

The approaches used to develop tube weaning programs regardless of setting can be characterized as behavioural, child- and family-centred, and biomedical (Lively, McAlister & Deltgen 2020).

- A behavioural approach focuses on the psychological aspect of feeding and unlearning the association between food, caregiver, and trauma. Feeding therapists support the child with oral sensorimotor skill building prior to manipulating appetite. Meals are provided by clinical staff during the early stages of weaning. Conditioning tools are used by feeding therapists and caregivers are brought into therapy when aversive behaviours are unlearned.
- A child- and family-centred approach focuses on the parent-child relationship, combining developmental, biological, and therapeutic aspects of feeding. Appetite manipulation is started early in the intervention to help the child learn feelings of hunger and regulation.
- A biomedical approach focuses on eating as a biological process combining intensive hunger provocation with a behavioural approach. The biomedical approach is often used in inpatient intensive weaning programs, may include medication, and requires close medical monitoring.

Outpatient or home-based tube weaning programs are recommended as first-line therapy to support a child-led approach, while intensive inpatient weaning programs may be used if outpatient weaning attempts are unsuccessful (Silverman, et al., 2013); (Slater, et al., 2021); (Clouzeau, et al., 2021); (Dipasquale, et al., 2021). Outpatient programs build oral sensorimotor skills and food acceptance over a longer period before enteral feed reduction is started. Intensity of therapy and hunger provocation are increased, and are implemented in the child's home, in-person, via telemedicine, or in an interdisciplinary clinic (Hartforff, et al., 2015); (Wiken, Cremer, Berry, & Bartmann, 2013); (Slater, et al., 2021).

Few specific unique models for tube weaning exist. The Graz model of tube weaning incorporates all three approaches described above, however, with less intensity than an inpatient program. An interdisciplinary team supports the child and family over several weeks implementing hunger provocation (enteral feed reduction), daily play picnics, feeding therapy, music therapy, growth monitoring, and medical monitoring. This model has been successfully applied in a telemedicine format.

Oral stimulation (e.g. non-nutritive sucking or manual touch) prior to initiating oral or enteral feeding reduces time to transition preterm infants from tube to breast or bottle (Fucile, Wener, & Dow, 2021); (da Rosa Pereira, Levy, Procianoy, & Silveira, 2020); (Say, et al., 2019). Infants fed using a developmental and cue-based feeding protocol reach full oral feeding sooner and are often discharged from hospital sooner than those fed with a volume-based protocol (Morag, Hendel, Karol, Geva, & Tzipi, 2019).

Successful tube weaning models are tailored to the child, involve an interdisciplinary team, utilize a combination of approaches, and are characterized by:

- Readiness for oral feeding (safe swallow and oral sensorimotor skills)

- A positive feeding relationship
- Normalization of feeding and eating behaviours
- Use of behavioural technique to increase oral intake

9.2.2 Readiness for Oral Feeding

Readiness for oral feeding begins with clinical assessment ensuring a safe swallow. Assess the child and parent readiness to begin or increase oral feeding. Work with the child and family to understand their goals and their ability to work with their child and interdisciplinary team throughout the tube weaning process.

9.2.2.1 Child Readiness

Readiness is an internal phenomenon and therefore is difficult to objectively define. Parents and caregivers can provide encouragement and opportunities for the child to promote readiness, however, readiness is essentially child-led and directed. Healthcare professionals can assess and support parents to look for, and encourage, cues and signs that the child is interested in food and in eating. Consideration of the child's medical status including recent airway surgery, bolus and gastric feed tolerance, behaviour and functional skills will determine the starting point for any approach.

9.2.2.2 Parent Readiness

Using a family-centred approach will ensure the parents have prioritized the need to move towards oral feeding for their child. Healthcare professionals can work with parents to create a plan that allows for a child-led transition to oral feeding and identify potential barriers that may be encountered. It is important to assist parents in their transition from being 'the tube feeder' to the provider of food. Exploring child and parent anxiety during this process contributes to successful weaning.

9.2.3 Set Achievable Goals

Goal setting with the family and interdisciplinary team is essential to planning the enteral to oral transition approach. Defining success exclusively as 'full oral feeding and tube removal' can be counterproductive as this may not be achievable depending on the child's underlying diagnosis and ongoing medical issues. Placing pressure on families and the child to increase oral volumes, sometimes at the expense of pleasurable mealtimes, can result in a sense of failure rather than focusing on each small success throughout the process.

Occasionally despite a thorough assessment, it is not possible to identify the underlying feeding difficulty or issue impacting oral intake until a child starts to reduce tube feeds and show interest in eating. Consider the following factors when setting goals with families and the interdisciplinary team to move from tube to oral feeding:

- safety of swallow and health status
- adequacy of weight and growth
- ability to consume food or fluid by mouth safely
- ability to tolerate bolus/intermittent feeds
- skill and texture acceptance

- volume of food and fluid taken by mouth
- accepted food range or variety
- pleasure and social participation

At each stage of the transition process, it is important to identify the current goal and work toward it rather than trying to work on all goals at one time. Support children and their families to facilitate autonomy, enabling the child to develop skills that will support oral intake.

9.2.4 Establish a Positive and Responsive Feeding Relationship Between Child and Parent/Caregiver

- Acknowledge and respond to the child's cues. Transition takes time and patience which needs to be child-led for success.
- Create an environment that is free of stress, reduces anxiety, and supports a positive experience with food.
- Support social modeling through family-focused mealtimes with positive reinforcement and interactions.
- Offer foods within the child's developmental capacity to support the child to decide what and how much to eat (Krom, de Winter, & Kindermann, 2017).
- Support a child-led process. .Force feeding does not support responsive feeding; it is traumatic to the parent-child relationship.

9.2.5 Normalization of Feeding and Eating Behaviours

Feeling comfortable with tube feeding and/or being in a mealtime setting is favourable before facilitating the development of feeding skills and working on oral desensitization.

Strategies include:

- identify a safe oral feeding regimen
- create a positive feeding environment, and establish a mealtime routine
- transition continuous feeds to an intermittent or bolus schedule if possible
- coordinate oral feeding times with enteral feeds to help stimulate appetite (Boullata, et al., 2017)
- support children and families to learn about food in a positive way. Include exposures to new foods in everyday activities to increase access and familiarity with food. When food is part of the environment, children are better able to associate food with hunger
- support development of feeding skills through food exploration, making a mess, food play, play picnics, and role modeling. These strategies are used to improve oral sensorimotor function and to accommodate sensory preferences (Krom, de Winter, & Kindermann, 2017)

9.2.6 Use of Behavioural Technique to Increase Oral Intake, such as Hunger Provocation

- Enterally fed children may not understand what hunger is, feels like, or what it requires from them. Children need to learn how to address hunger and make a connection between hunger and food. Some experts propose that if food is not accepted, the link between eating orally and satisfying hunger is not made, and thus stimulating appetite by reducing tube feeds will not in itself lead to oral intake (Mason, Harris, & Blissett, 2005).

- Hunger provocation may be implemented short term or over many years as skills, volume, and variety of foods are improved. Some children may experience improvements in oral intake immediately, while others may experience weight loss and dehydration. Consider the individual needs of the child and family.
- Support tube weaning with an adjustment in enteral regimen. Bolus feeding may mimic hunger and satiety sensations, while continuous overnight feeding may allow oral experiences during the day (Toomy & Ross, 2011); (Dunitz-Scheer, et al., 2009). However, continuous tube feedings may not allow for development of normal biological rhythms (Senez, et al., 1996).
- When oral intake provides 60 percent of nutrition needs, consider adjusting the enteral feeding regimen to provide supplemental tube feeds during or after meals, or as cycled feeds overnight (Mason, Harris, & Blissett, 2005) (Boullata, et al., 2017).
- When a patient is consuming 75 percent or more of nutrition requirements by mouth for 3 days, consider discontinuing enteral feeding (Boullata, et al., 2017).
- There is limited evidence to support appetite stimulation with medication, e.g. cyproheptadine, amitriptyline, (Krom, de Winter, & Kindermann, 2017); (Davis, et al., 2016). It may be considered for those already engaging in oral intake.

9.2.7 Preparing to Wean Enteral Tube Feeds

Factors to consider before reducing tube feed volume include:

- interdisciplinary supports available
- timeframe for weaning
- current medical status and overall medical complexity
- type of tube used for feeding
- age, oral sensorimotor function, sensory preferences of the child
- oral intake and hydration monitoring – may need to set a minimum acceptable fluid intake, consider water via tube to replace feeds
- growth – set an agreed goal for acceptable weight loss or time frame before building up again
- energy levels and/or alertness during the day – is this related to medication, do they need a top-up bolus?
- family's ability to support the weaning process
- action plan for re-insertion if a tube is removed

Ongoing reassessment of swallow, feeding skills, nutrition, growth, hydration status, and respiratory status are recommended during the weaning process and after enteral feeds have been discontinued.

9.2.8 Planned Permanent Removal of a Surgically Placed Feeding Tube

Permanent removal of a gastrostomy type feeding tube may be considered when the child is clinically stable and able to consume adequate oral intake to grow appropriately and meet nutrition needs. The time frame for removing the tube is variable

and needs to be decided on an individual basis. Consideration should be given to the child's underlying condition, nutritional status, and possible future needs for nutrition support (Collins, Gaffney, Tan, Roberts, & Nyulasi, 2013). Removal of the tube should be considered permanent; a reversal of the decision to reinstate tube feeds following tube removal will require further surgical intervention.

A child who is stable and growing appropriately without the need for tube feeding for three to six months (depending on underlying medical condition) should be considered for tube removal. There is no urgency to remove a tube in less than three months if the child's ability to tolerate an intercurrent infection and maintain nutrition and hydration is not assured. Equally there is an unnecessary cost to maintaining a tube that is not being used for longer than six months.

When considering permanent tube removal, the following questions should be considered (Collins, Gaffney, Tan, Roberts, & Nyulasi, 2013):

- is the child clinically stable?
- can the child eat and drink safely and adequately?
- can essential medications be taken orally?
- what are the child's likely future healthcare needs that could impact their ability to meet nutritional requirements?
- does the child (as appropriate) and family understand the implications of tube removal and the process including risks of reinsertion if required?

In most cases, when a gastrostomy tube is no longer needed, it can simply be removed through the stoma following deflation of the balloon. PEG-type tubes will need to have the mushroom cut off or removed endoscopically at the direction of the surgeon. The site will usually close on its own over a period of about two to four weeks. Barrier cream and gauze can be used around the site to protect the skin from any leakage in the meantime. Spontaneous closure of the gastrostomy tube site is less likely to occur the longer the tube has been in place, although this is highly unpredictable and can vary from many months to years. Referral to a pediatric surgeon is recommended if the child has persistent issues with tube leakage after two to four weeks (Alshafei, Deacy, & Antao, 2017); (Khan, et al., 2015).

9.2.9 Additional Resources

Feeding Tube Awareness

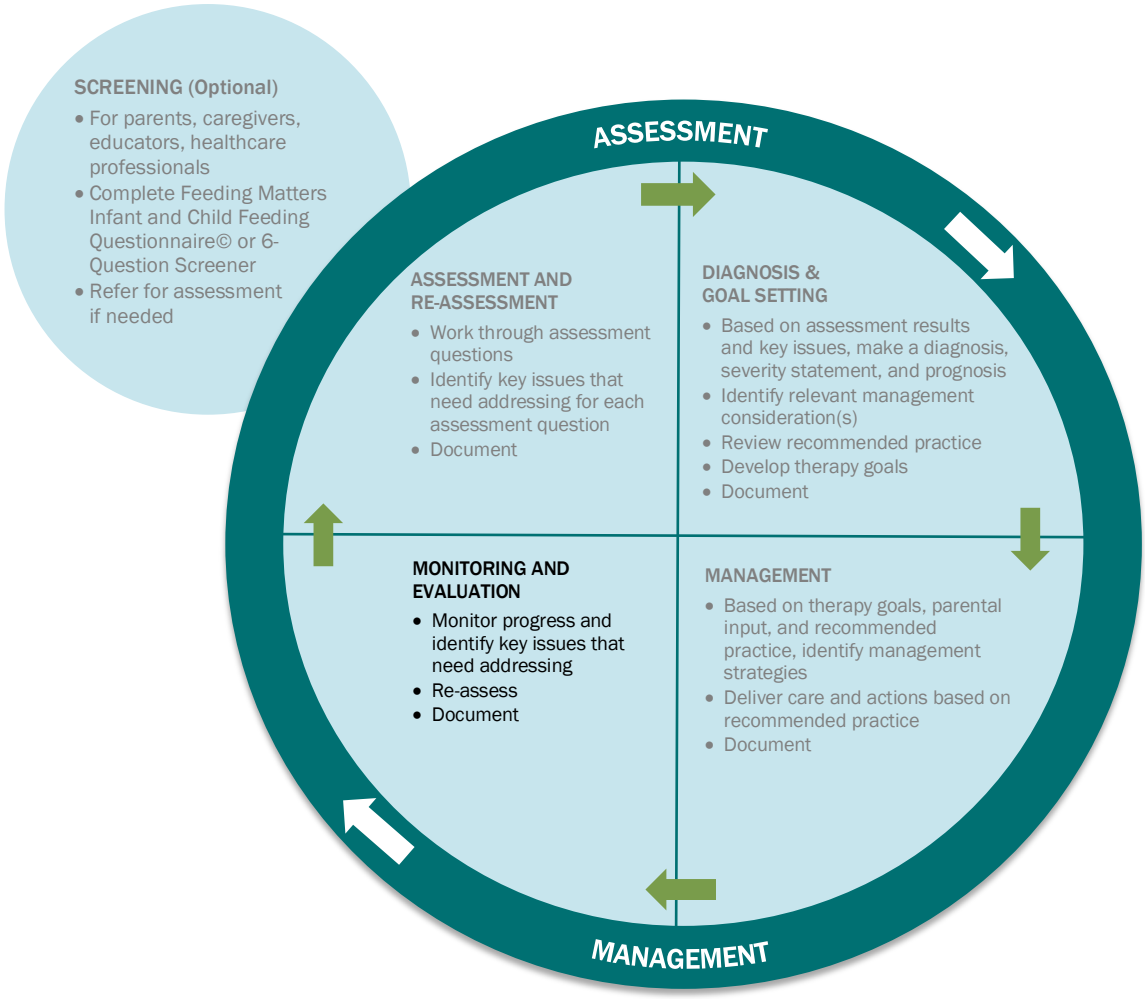
The Oley Foundation

10 Monitoring and Evaluation

Pediatric feeding care continues with monitoring and evaluation. The purpose of monitoring and evaluation is to measure the amount of progress made for the intervention(s) and determine whether the related goals or expected outcomes are being met. This is depicted in the Pediatric Feeding Care Cycle (Figure 13).

Figure 13: Pediatric Feeding Care Cycle

(NSW Office of Kids and Families, 2016).



Monitoring and evaluation will vary dependent on the child and family needs, program requirements, and goals and interventions selected. The timeframe and frequency of monitoring and evaluation will be patient-dependent. For children with more acute issues, follow-up may occur more frequently with phone follow-ups and in-person visits, e.g. every one to two months, whereas children with more stable needs may be seen less frequently, e.g. every three months (Mascarenhas, Zemel, & Stallings, 1998). For children receiving multiple assessment and feeding therapies, overlapping follow-up by other members of the interdisciplinary team may be necessary.

11Transition

Children with pediatric feeding disorder (PFD) experience multiple transition points throughout their lives. An interdisciplinary and collaborative approach between the interdisciplinary team and the child and family is needed to provide adequate support, and to ensure safe, successful transitions occur from hospital to home, pediatric to adult services, and off Eating Feeding Swallowing programs entirely.

11.1 TRANSITION HOME AND FROM PROGRAM WHEN ON ORAL FEEDS

For infants, children, and youth on oral feeds, the transition to home continues to require a collaborative, interdisciplinary approach. The child's primary medical team (community physician) works with the feeding team and parents and caregivers to provide support, and is ultimately responsible for the child's follow-up care. Each program may have its own criteria for admission or discharge to the program. When possible prior to discharge, the original goals of care and intervention should be reviewed. If a mutual understanding between family and caregiver determines that all goals have been sufficiently met, then the child or family may be discharged from the program.

11.2 TRANSITION HOME AND FROM PROGRAM WHEN ON ENTERAL FEEDS

For infants, children, and youth on enteral feeds, the transition to home continues to require a collaborative, interdisciplinary approach. The child's primary medical team works with the home enteral nutrition support program to provide support, and is ultimately responsible for the child's enteral nutrition follow-up care. Each Eating Feeding Swallowing program may have their own criteria for admission or discharge to the program. When possible prior to discharge, the original goals of care and intervention should be reviewed. If a mutual understanding between family and caregiver determines that all goals have been sufficiently met, then the child/family may be discharged from the program. With respect to home enteral nutrition support programs, this may occur when the enteral tube is removed. For nasoenterically-fed children, there may be a grace period to ensure that the tube can remain out to confirm that program service is no longer required. With gastrostomy type tubes, discharge may occur at the time of removal, or once the stoma has closed. If a child is exclusively consuming a formula by mouth, they also will be discharged from the home enteral program. See Table 18.

TABLE 18: SAMPLE CHECKLIST FOR PREPARATION OF TRANSITION HOME FOR PEDIATRIC PATIENTS RECEIVING HOME ENTERAL NUTRITION

Patient assessment	• medically stable to transition home • exhibits tolerance to current feeding regimen • anticipate tolerance to home progression of feeds • family willingness to continue HEN • suitable home environment to provide safe enteral feeding care, e.g. clean water supply, area for preparation, a means to communicate with care team and order supplies • language considerations
Caregiver education	• identification of caregivers • development of training schedule • completion of stay in hospital for 48-72 hours (to demonstrate care) • education on feeding tube care and troubleshooting • education on assessment of feeding tolerance • education on formula preparation and feeding schedule • education on use of feeding pump if applicable
Planning for transition home	• identification of primary physician to manage enteral nutrition for regular follow-up • communication with primary physician of clinical status • initial post-transition home appointment set • family knows who to contact with which issues and has appropriate contact information • coordination of clinic appointments, home care, early intervention, school services, and therapies as applicable

Adapted from (Sevilla & McElhanon, 2016)

11.3 FEEDING CARE PLAN

A feeding care plan requires consideration of many factors that precede, occur during, and follow the actual act of eating, feeding, and swallowing. Having a clearly defined feeding care plan is an important part of safely managing pediatric feeding disorder (PFD). It is an essential part of communicating, and implementing safe and successful strategies across multiple care settings, e.g. grandparents, daycare, and school. A feeding care plan is also a useful means for documenting interventions that may also require extra caution and attention, e.g. related to aspiration risk, allergies.

Consider addressing the following components in the child's feeding care plan:

- child and family information, e.g. DOB, age, medical condition
- emergency contacts
- medications and equipment, e.g. wheelchair
- precautions, including emergency procedures, e.g. identification of personnel with training in abdominal thrusts
- diet and nutrition prescription, e.g. food, fluids, quantity and texture, enteral feeds
- description of child's feeding abilities and difficulties
- techniques that support safe and adequate intake

- supports needed to promote safe independence, e.g. equipment and method of delivery for fluid, food, and enteral feeding preparation and administration
- positioning during feeding
- environment in which the child can be safely fed
- sensory preferences that may support the child's regulation
- resources to support staff training for personnel implementing the plan, e.g. attach an AHS resource that may offer additional information
- plan for evaluating the feeding care plan safety, progress, and effectiveness and revising it accordingly

Refer to:

Pediatric Oral Feeding Care Plan
Pediatric Tube Feeding Care Plan

11.4 TRANSITION FROM PEDIATRICS TO ADULT SERVICE

Transitioning a child from pediatric to adult services requires a collaborative approach to care to ensure that families of children with complex care needs obtain the support they need. When transitioning a child with pediatric feeding disorder, including an enterally-fed child, to an adult program, consider the following:

- Identify appropriate adult eating or dysphagia programs.
- Start the process as early as 12 years of age, to allow sufficient time to consider options and all aspects involved in transitioning to an adult program. This may include advanced care planning, review of guardianship, insurance coverage, program applications, letters to support transfer of care, funding applications, obtaining information for formula and supplies. A social worker or designate is often needed to guide this process.
- Consider that there may be different requirements, including admission requirements, between pediatric and adult programs. Reviewing and updating the care plan accordingly to ensure no gaps in service, formula or supplies is important.
- Support family awareness of the Transition Roadmaps and Transition Readiness Checklist. Offer family reminders closer to the desired time for transition.
- Identify additional transition support needs of the family. Consider and explore whether there is anxiety with this transition and connect the child and family with the necessary supports.

Refer to:

Well on Your Way
AHS Transition to Adult Healthcare Roadmap
AHS Transition to Adult Healthcare Guideline for Dependent Youth
AHS Transition to Adult Healthcare Guideline for Independent Youth

12 Appendices

APPENDIX 1: DEFINITIONS AND TERMS

Aspiration: "Entry of secretions, food, or any foreign material into the airway that travels below the level of the true vocal folds. Aspiration may occur before, during, or after the pharyngeal phase of swallowing. It can also occur from reflux of gastric contents." (American Speech, Language, & Hearing Association, 2020)

Brain Architecture: Neurological structures and physiology that support brain function. The term brain architecture is a metaphor by the Harvard Center on the Developing Child to describe the complex development of the brain.

Parent-Child Relationship: The relationship between the parent and child that nurtures the physical, emotional, and social development of the child. It is a unique bond that every child and parent can enjoy and nurture. This relationship lays the foundation for the child's personality, life choices and overall behaviour.

Parent Responsiveness: Sensitive awareness with active monitoring and appropriate responses to the child's verbal and non-verbal communication and physiological needs. It includes acknowledgment of the child's temperament, preferences and pace in feeding, and support of the child's regulation.

Regulation: Individual's capacity to sustain optimum health while shifting between sleep and wake cycles and maintain a calm and attentive state (feeling "just right") during the awake cycle (Lillas & Turnbull, 2009). It is the ability to manage energy, emotions, behaviour, and attention in a socially acceptable way to support relationships and learning. (Shanker, 2012).

> **Co-Regulation:** The supportive process between caring adults and children, youth, or young adults that fosters self-regulation development is called 'co-regulation' (Rosanbalm & Murray, 2017). Other terms in the literature for the same process: interactive or mutual regulation. Refer to: Co-Regulation From Birth Through Young Adulthood
>
> **Self-Regulation:** The ability to maintain one's own optimal state of arousal (Lillas & Turnbull, 2009).

Responsive Feeding: A caregiver response in a prompt, emotionally supportive, and developmentally appropriate way to a child's hunger and fullness cues (DiSantis, Hodges, Johnson, & Fisher, 2011).

Sensory Integration: The process by which people register, modulate, and discriminate sensations received through the sensory systems to produce purposeful, adaptive behaviours in response to the environment (Ayres, 2005).

Sensory Modulation: The capacity to balance the flow of sensory signals in a way that is appropriate to context (Lillas & Turnbull, 2009). The ability to self-organize and regulate reactions to sensory inputs in a graded and adaptive manner (Champagne, 2011).

Sensory Preference: Information that provokes a response of pleasure, enjoyment, or calm, thereby naturally promoting self-regulation (Lillas & Turnbull, 2009).

Sensory Processing: The capacity to receive, translate, associate, and elaborate sensory signals within and across sensory modalities in a developmentally appropriate way (Lillas & Turnbull, 2009). The ability of the individual's neurological system to interact, interpret, and respond to their environment (Alberta Health Services, 2022).

Sensory Trigger: Information that provokes a response of dislike or distress (Lillas & Turnbull, 2009).

Serve and Return: Metaphor developed by Harvard Center on the Developing Child to explain the back and forth verbal and non-verbal and emotional reciprocity between a dyad of child and parent or caregiver.

Refer to:
Serve and Return
From Best Practices to Breakthrough Impacts

State of Arousal: A cluster of physiological and behavioural signals (sensory-motor transformations) that regularly occur together and reflect the degree and type of response to internal and external sensory stimuli (Lillas & Turnbull, 2009); (Barnard, 1999). The chart below presents descriptions of the calm alert state and four adaptive stress responses.

Refer to: Sleep Wake States Arc

Toxic Stress Patterns:

- over-reactivity: stress responses that occur too frequently and too quickly
- repeated reactivity: can't adapt to "normal" challenges and transitions
- extended reactivity: prolonged stress responses that take too long to recover (more than 10 to 20 minutes)
- dampened recovery: can't recover from stress response back to baseline health (healthy sleep cycle, healthy awake state) (Lillas & Turnbull, 2009); (MacEwan, 2002).

APPENDIX 2: COMPONENTS OF CLINICAL DECISION MAKING

AHS (Alberta Health Services, 2017a) states there are ten consistent elements essential to clinical decision making across rehabilitation disciplines. These components are embedded in each of the four aspects of moving knowledge to action. They were determined based on a collation of regulatory guidelines, AHS guidelines, and clinical input. Dynamic integration of all elements based on critical thinking and collaboration is required. They are as follows:

1. **Screening:** Critical clinical appraisal of available initial information to identify individual, family, and community needs.
2. **Consent:** Obtain informed consent to assess, treat, or disclose information.
3. **Assessment:** Get to know the patient through critical inquiry with a variety of assessment methods and analysis to further identify and validate individual and group needs or diagnosis.
4. **Critical Evaluation and Risk Identification or Stratification:** Reflection on risk, condition, environment, and one's own knowledge and skill and determination of next steps.
5. **Evidence-informed Approach:** Seek and evaluate relevant research, literature, and expert opinion to ensure evidence-informed decision making across all elements.
6. **Goal Setting and Care Planning:** Collaboratively establish goals, integrated plan of care, assignment of tasks or activities, and discussion of expected outcomes with the individual, family, community, and other care providers.
7. **Implementation:** Implement evidence-informed integrated plan of care that is supportive of individual, family, and community goals.
8. **Transition Support:** Collaborate to support transition planning to enable service access within or across streams of care, giving consideration of individual, family, and community needs, supports and environmental context.
9. **Evaluation:** Ongoing critical clinical evaluation of relevant information and measures, including individual, family and community perspective, to adjust integrated plan of care as needed.
10. **Capacity Building:** Information sharing to enhance the skills and abilities of the patient, family, their community, and care providers to support successful health outcomes.

APPENDIX 3: NIPPLE FLOW RATES

TABLE 19: NIPPLE FLOW RATES

Listed from slowest to fastest

FEATURES	NIPPLE BRAND AND TYPE	MEAN FLOW RATE mL/minute (Range)
Extra Slow	Philips Avent Natural First Flow	0.86 (0.15-1.19)
	Philips Avent Natural 0mos +	2.25 (1.49-2.74)
	nfant Labs Extra Slow	3.30 (2.6-3.77)
	Dr. Brown's UltraPreemie	4.92 (4.09-5.73)
Slow	nfant Labs Slow	5.99 (5.10-6.62)
	Dr. Brown's Preemie	7.22 (4.35-8.37)
	Playtex Ventaire Full Sized	7.35 (5.65-10.29)
	Playtex Ventaire Breastlike	7.37 (6.10-9.86)
	Similac single-use Slow Flow	8.04 (6.59-13.28)
	Dr. Brown's Newborn (0+ mos)	9.21 (8.42–9.90)
	Playtex Baby Naturalatch 0-3m	9.47 (7.66-12.88)
	Comotomo Slow Flow (0-3 mos)	9.76 (6.05-12.49)
	nfant Labs Standard	10.32 (9.12-11.79)
Medium	Enfamil single-use Slow Flow	13.24 (9.93-17.39)
	Gerber First Essentials	13.26 (9.85-20.17)
	Dr. Brown's Level 1 (0+ mos)	13.31 (11.51-14.59)
	Dr. Brown's Level 1 wide neck	13.31 (11.51-14.59
	Evenflo Classic Slow Flow 0m +	13.63 (10.66-20.64)
	MAM Anti-colic 0mos +	13.83 (13.04-15.68)
	Dr. Brown's Level 2 (3+ mos)	14.96 (13.75–15.80)
	NUK Wide Slow Flow (0–6 mos)	15.12 (11.99–22.90)
	Tommee Tippee Closer to Nature 0m +	15.90 (14.05-17.08)
	Tommee Tippee Anti-colic 0m +	16.23 (11.28-20.30)
Fast	Philips Avent Anti-colic 0mos +	17.44 (16.31-18.5)
	Similac single-use Standard Flow	18.49 (10.55-26.61)
	Enfamil single-use Standard Flow	19.14 (14.09-21.78)
	Similac single-use Premature	19.17 (13.53-26.82)
	Medela Wide-Base Slow Flow	22.03 (17.97-25.61)
Very Fast	Medela Calma	37.61 (35.54-39.96)

(Pados, Park, & Dodrill, 2018) (Pados B. F., Park, Thoyre, Estrem, & Nix, 2016)

APPENDIX 4: INTERNATIONAL DYSPHAGIA DIET STANDARDISATION INITIATIVE (IDDSI) TERMINOLOGY

TABLE 20: IDDSI TERMINOLOGY

IDDSI TERMINOLOGY	AHS DIET TERMINOLOGY AND GUIDE	COMMON TERMS FOR TEXTURE MODIFIED FOODS FOR CHILDREN WITHOUT DYSPHAGIA
Liquidized (level 3): blended foods. Has a smooth texture with no lumps, or other particles.	**Balanced Fluid:** nutritionally adequate fluids able to pass through a straw.	**Blenderized or blended diet:** food or fluids blended to a consistent smooth thick liquid texture.
Pureed (level 4): smooth textured foods with no lumps, may hold its shape on a spoon, and is not sticky. Liquid does not separate from solids. Includes 'no mixed consistencies', moist, pre-gelled or slurried breads. Included as part of all IDDSI texture modified diets.	**Pureed diet:** pureed to consistency of pudding, including bread. Solids are thick enough to spoon 7.5-10 mL onto a teaspoon. Liquid does not separate from solids. Includes 'no mixed consistencies'.	**Thin, runny or smooth puree:** may vary in thickness between mildly, moderately and extremely thick consistencies.
Minced and moist (level 5): soft and moist with no liquid leaking from food. Biting is not required and minimal chewing. Easily mashed. Lumps are 2 mm in size. Bread is pureed, pre-gelled or slurried. No mixed consistencies.	**Minced diet:** minced, grated, or finely mashed foods approximately 6 mm in size. Pureed if cannot be safely prepared in a minced format. Soft, moist bread. Mixed consistencies if tolerated.	**Textured puree or soft mashed:** graded up from smooth thick puree to assist with chewing and oral motor development. The consistency is a cohesive spoonful that requires only minimal chewing or munching.
Soft and bite-Sized (level 6): soft, tender and moist with no thin liquid leaking from the food. Ability to chew bite-sized pieces is required for safe swallow. Pieces < 8mm. Fork mashable.	**Dysphagia soft:** soft, moist foods 1 cm diced, fork mashable. Chewing required.	**Soft solid, diced or finger food:** easily broken down in the mouth with minimal chewing or munching and is easily swallowed.
Mixed consistency: thin liquid and solid in the same bolus, e.g. cereal with milk.	**Mixed consistency:** thin liquids and solids in the same mouthful.	**Mixed Consistency:** thin liquid and solid in the same bolus, e.g. fruit cocktail.
Easy to chew (level 7): everyday foods requiring teeth for biting or chewing. Avoid hard, fibrous textures.	**Easy to chew:** easy to chew softer food. Avoid dry, crispy, or stringy pieces.	**Finger foods or firm solid foods:** require more chewing as they do not break down as easily as soft finger foods.
Transitional foods: food that starts as one texture and changes into another texture specifically when moisture is added, or with a change in temperature, e.g. ice cream or wafers. Reduced effort to chew. Less likely to fatigue.	n/a	**Bite and dissolvable foods:** dissolve with saliva only. No or minimal intraoral pressure required to dissolve, e.g. baby biscuits/crackers, ice-blocks, chocolate.
Regular diet (level 7): everyday foods of various textures. Requiring teeth for biting or chewing.	**Regular diet:** No texture modification, provides a balanced, nutritionally adequate diet.	**Hard munchables:** will not break apart easily in the mouth; in early stages are for exploration, not consumption, e.g. raw carrot or dried fruit sticks, beef jerky.

Refer to: AHS Diet Terminology & Guide (AHS Staff Login required)(Alberta Health Services, 2022) (IDDSI, 2023)

APPENDIX 5: FEEDING EQUIPMENT

Adapted from (NSW Office of Kids and Families, 2016)

TABLE 21: FEEDING EQUIPMENT

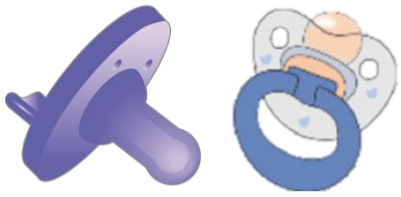
There is a broad range of specialized feeding equipment on the market including nipples and soothers, cleft palate nipples and bottles, cut away cups, etc. Below is a list of the feeding equipment discussed within the CPG including features and examples of the identified items.

Sensory and oral motor

When selecting sensory and oral sensorimotor items, consider the following:

- stimulates a more active sucking pattern
- works towards reducing hypersensitivity in the mouth
- increases tolerance for food textures
- reduces the strength of the tonic bite reflex
- increases acceptance of objects in close proximity to the face and mouth
- increases oral experience and exploration for the purposes of addressing tongue, lip, and jaw movements
- Increases oral organization

FEATURES	EXAMPLES
Sensory awareness toys Some toys build simple awareness of sensations in the mouth	
Sensory discrimination toys Other toys offer more complex sensory opportunities including variations in textures, smell, sound, or light	
Chewing practice Toys for chewing or mesh food bag for chewing on foods safely and increasing food exploration	

FEATURES	EXAMPLES
Pacifier/Soother When selecting a soother, consider the following: • The size and shape of the child's mouth • Same or similar shape as the preferred bottle nipple (if infant has difficulty making sensory transitions) • Has an outer shield that is molded to the shape of the lips • Accommodates other equipment on the child's face (e.g. oxygen or enteral tubing)	
Nipples Considerations when selecting nipples may include: • Correct fit for the size and shape of the infant's mouth • Flow rate needs to be appropriate for the consistency of the liquid, the infant's abilities, and positioning • Firmness of the nipple to match the infant's sucking strength.	
Bottles Considerations when selecting bottles may include: • Bottle size (i.e., holds the appropriate amount of fluid) • Accommodates nipples with the recommended flow rates • Free of bisphenol A (BPA). • Ease of availability in the community or cost of bottle if lost or damaged	

Cups

When selecting, consider whether the cup:

- encourages optimum head position when drinking (e.g., can be tipped to get liquid at the lip without tipping the child's head back)
- does not shatter or break
- gives the feeder a clear view of the child's mouth
- provides a thick or rolled lip for extra stability
- provides a graded control of liquid flow
- is easy to hold and regulate liquid flow when held by an adult
- provides an appropriate physical shape and means of holding for a self-feeder
- is visually interesting to the child.
- option of single or dual handles

FEATURES	EXAMPLES
Cup and mug holders	
Cups with handles/grips	
Cut out rims	
Cups with spouts/lids Some cups have internal valve that can be adjusted to reduce flow	

Straws

Considerations when selecting straws may include:

- the amount of suction required to draw the liquid
- a one-way valve to prevent the liquid from flowing back down the straw between sips
- length and width
- can be cut, bent, or adjusted to accommodate child's skills
- does not shatter or break if the child chews or bites on it

FEATURES	EXAMPLES
Squeeze straw cups (e.g. Honey Bear) **These types of straw cups allow for the straw to be loaded without suction, thereby reducing the amount of suction required to extract the fluid**	
One-way straws	
Extendable straws	

Spoons

Considerations when selecting spoons may include:

- the bowl size for appropriate amount of food
- the bowl shape to best match and promote optimal oral motor skills
- metal spoons are covered, coated, or have a plastic bowl for the child who is hypersensitive to the temperature or taste, or has a bite reflex
- the spoon does not shatter or break if the child bites it
- the length of the handle is appropriate for the feeder's hand for dependent feeding and appropriate for the child's hand for independent feeding
- adaptive handle to facilitate the child holding it independently
- appropriate weight and a pleasing texture for the infant or child to hold
- colour and design to maintain the child's attention
- moulded handles to promote secure grip handle
- angled spoons to accommodate a variety of movement patterns

FEATURES	EXAMPLES
Shallow, flat or narrow bowls	
Handles which are textured, contoured, curved, built-up or looped	
Angled handles (left- and right-handed)	

FEATURES	EXAMPLES
Weighted spoons	
Shallow, flat, or narrow bowls	
Plastic coating	

Other Cutlery

Considerations when selecting cutlery may include:

- adaptive handles facilitate a child's grip. Some handles may include a ridge to prevent hand slipping forward towards the spoon's head
- if maintaining a grip on the handle is an issue, a hand strap with a slot to hold the handle
- the length of the handle is appropriate for the feeder's hand for dependent feeding and appropriate for the child's hand for independent feeding
- appropriate weight and a pleasing texture for the infant to hold
- colour and design to maintain the child's attention

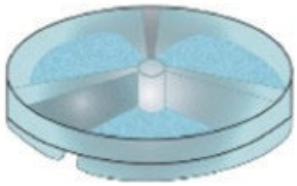
FEATURES	EXAMPLES
Handles which are textured, contoured, curved, built-up or looped	
Angled handles (left- and right-handed)	
Elastic straps (either integral to the design or as a separate item)	

Plates/Bowls

Considerations when selecting plates and bowls may include:

- weight (e.g., a heavier plate is less likely to slip)
- a slip-resistant mat or built in suction cup to help to stabilize a plate or bowl
- a plate guard or lip to assist with the loading of the food

FEATURES	EXAMPLES
High-sided plates and bowls	

FEATURES	EXAMPLES
Portioned plates	
Plate guards	
Slip resistant bowl	

Refer to:

PEAS Equipment List

APPENDIX 6: TYPICAL DEVELOPMENT REFLEXES

TABLE 22: DEVELOPMENTAL AND ORAL MOTOR SKILLS ASSOCIATED WITH FEEDING PROGRESSION AND NORMAL ORAL REFLEXES

The following is a guide reflecting typical development. Not all children will progress systematically though each age group.

AGE GROUP	PROGRESSION OF LIQUID AND FOOD	ORAL SENSORIMOTOR FUNCTION	DEVELOPMENT SKILL	REFLEX
0 to 4 months	• thin liquid (e.g. breastmilk, formula)	• suckle on nipple • forward-backward tongue movement • adaptive oral reflexes e.g. rooting, sucking	• head control acquired	Rooting (32-37 weeks gestation to 3-6 mos.) Sucking (18 weeks gestation to 4-5 mos.) Tongue Protrusion (38-40 weeks gestation to 4-6 mos.) Transverse Tongue (28 weeks gestation to 6-9 mos.) Phasic bite (28 weeks gestation to 9-12 mos.) Gag (26-27 weeks gestation and through life) Cough (35-40 weeks gestation and through life)
4 to 6 months	• thin purees (e.g. rice cereal, pureed fruits)	• suckle off spoon • separation of tongue and jaw movements • transition from reflexive suckle to suck (up-down) tongue pattern	• gross motor control of head and neck, trunk control • sitting balance • hands midline	
7 to 8 months	• thick purees (e.g. pureed potato, rice, cereal, fruit) • textured purees or soft mashed (e.g. banana, potato, pasta)	• some protective oral reflexes desensitized • cup drinking • vertical munching	• hand-to-mouth play • reach, pincer grasp • starts to assist with spoon- feeding	
8 to 9 months	• bite and dissolve foods (e.g. baby biscuits) • soft finger foods – early chewing foods (e.g. pasta, soft fruit and vegetables, bread) • hard munchables for exploration	• emerging lateral tongue movements • unsustained bite pattern	• core stability developing	
9 to 12 months	• hard finger foods (e.g. biscuits, par-cooked vegetables, fresh fruit) • harder or chewy finger foods (breads, pasta, eggs, deli meats)	• cup drinking, independent emerging rotary chewing • graded bite through harder or chewy food	• refines pincer grasp - finger feeding • grasps spoon with whole hand	
12 to 18 months	• complete range of textures with some modification, including mixed texture (e.g. lasagna, minestrone)	• lateral tongue action established • straw drinking	• increased independence for feeding • scoops food, bring to mouth	
18 to 24 months	• more chewable food (e.g. steak, raw vegetables, hard fruits)	• mature rotary chewing • emerging or controlled sustained bite on hard foods		
24 months and above	• complete range of textures or family foods	• ongoing refinements of oral skills • controlled sustained bite	• total self-feeding, increased use of fork, cup drinking (open & straw), no spillage	

(NSW Office of Kids and Families, 2016)

APPENDIX 7: EARLY INFANT FEEDING AND SWALLOWING DIFFICULTIES

TABLE 23: EARLY INFANT FEEDING AND SWALLOWING DIFFICULTIES: WHERE TO START WHEN PROBLEMS ARISE

DIFFICULTY	PRESENTATION	WAYS TO CORRECT AT BREAST	WAYS TO CORRECT ON BOTTLE
Fast flow	• choking • gulping • milk spilling from mouth • coughing • pulling off of the nipple • wet, gurgly voice	• laid back or high football position • pump through let-down prior to latching (pump for 2 minutes)	• try slower flow nipple • swaddle • hold close to body • elevated side-lying position
Poor pacing	• sucking without breath breaks • apneic events • gulping • milk spilling from mouth	• pace externally by un-latching • allow babe to recover and try again	• pace externally (remove bottle from mouth) • allow babe to recover and try again • try slower flow nipple • swaddle • hold close to body • elevated side-lying position
Poor latch	• milk spilling from mouth • mouth not sealing on nipple • clicking sounds with suck • shallow latch (not enough breast tissue in mouth, nipple only) • pulling off and on the nipple • baby fussy • discomfort/pain for mom	• breast shaping to ensure deeper latch • repositioning Mom and babe, with supports • ensure proper latch and position: align nose to nipple and ensure wide open gape prior to latching	• ensure optimal position as above • if nipple appears small in mouth, trial larger nipple base bottle
Poor milk transfer	• baby fussy • pulling off and on the nipple • few/no evident swallows • blanching of lips • poor weight gain • low/decreasing milk supply • refusing to latch	• ensure mom and babe calm prior to latching • ensure proper latch and position as above • breast compressions with sucking • assess milk supply	• trial faster flow nipple • ensure optimal position as above

APPENDIX 8: SENSORY SYSTEMS

TABLE 24: 7 SENSORY SYSTEMS

SENSORY SYSTEMS	PROVIDES SAFETY INFORMATION	DETAIL
Touch (Tactile)	if something is too hot, cold, sharp, or will cause us harm; how much food is in the mouth	the feel of the spoon in our hand or mouth; food on our face or textures in our mouth; someone handling you during mealtimes or providing hand-over-hand assistance
Vision (Visual)	if something looks unusual or unappealing; if we are sitting up; if something is rushing towards us, we need to move out of the way	size, shape, or texture of food; colour or consistency of food or drink; where our utensils are on the table
Hearing (Auditory)	about activities happening in our environment that may affect us	the crunch or slosh of food; the sound of someone's voice providing directions
Taste (Gustatory)	if something doesn't taste right	salty, bitter, sweet, sour, spicy
Smell (Olfactory)	if something doesn't smell right	the smells of food and food cooking can start the preparation sequence for mealtimes, for example, salivation
Movement (Vestibular)	does it feel like I am falling over or tripping?	am I sitting still, does my body move as I lift my arm to feed myself?
Body position (Proprioception)	feedback about pressure and stretch; protect our muscles and joints; quantity of food in the mouth	chew, scoop food with a spoon and bring it to our mouth, manipulate finger foods; provides detailed information on the properties of objects in our mouth: density, size, and stretch ability of food

(NSW Office of Kids and Families, 2016)

APPENDIX 9: ORGANIC RED FLAGS – ORAL SENSORIMOTOR PATTERNS

TABLE 25: RED FLAGS/FACILITATING TYPICAL ORAL SENSORIMOTOR PATTERNS

RED FLAG	INTERVENTION
Poor jaw stability or low tone	• provide supportive positioning with hip flexion and midline flexion • provide firm, constant external facilitation or support of the jaw and cheek with fingers or hand while mouthing and feeding
Excessive jaw movement	• provide supportive positioning with hip flexion and midline flexion • provide external facilitation or support of the jaw and cheek to reduce or limit jaw movement with fingers or hand while mouthing and feeding
Poor lip seal/poor cheek stability	• provide supportive postural positioning • encourage lip closure by providing facilitative support of lower lip, cheek or jaw with thumb and index finger
Tongue retraction	• provide supportive postural positioning with midline flexion of shoulders or try a well-supported side lying position with head elevation • stimulate the rooting reflex prior to all mouthing or feeding activities • once rooting reflex elicited practice non-nutritive sucking on finger, gradually moving the contact deeper along the palate • work finger onto the top of the tongue • try jiggling, tapping, or stroking the tongue to encourage forward and down placement of the tongue. Do not exceed the infant's threshold
Tongue thrust/protrusion	• provide supportive postural support • apply firm tapping or touch pressure to the midline of the tongue – start at the tip of the tongue and move to the midline • if spoon feeding, use a firm plastic spoon, apply downward pressure on the mid-tongue as the food is tipped off the spoon • encourage lip closure by providing facilitative support of lower lip, cheek, or jaw with thumb and index finger • minimize feeding equipment that may exacerbate tongue thrusting patterns (e.g. nipples and spouts)
Lack of central grooving in tongue	• stimulate the rooting reflex prior to all mouthing or feeding activities • once rooting reflex elicited, practice non-nutritive sucking (NNS) on finger, gradually moving the contact deeper along the palate • wWhen NNS cycle complete, bend the finger so that the knuckle places pressure on the tongue • slowly rotate finger so that the pad is now on top of the tongue, apply gentle downward pressure, slowly removing finger from mouth
Nasopharyngeal regurgitation	• this is indicative of palatal dysfunction and should be further investigated by a speech-language pathologist, plastic surgeon or Ear, Nose, & Throat (ENT) specialist

(NSW Office of Kids and Families, 2016)

APPENDIX 10: TUBE FEEDING SCHEDULES/REGIMENS FOR ENTERAL FEEDING

There are different types of feeding schedules used. The choice of enteral feeding regimen is based on assessment of the child or infant's needs. Enteral feeds can be administered by continuous, cycled, intermittent, or bolus methods, or a combination of these.

TABLE 26: CONTINUOUS FEEDING

Defined as feeding for 24 hours continuously via an enteral feeding pump which allows for an accurate, slow, and steady infusion.

ADVANTAGES:	DISADVANTAGES:
• can improve feeding tolerance and reduce complications (e.g. diarrhea, vomiting, abdominal distension, bloating, and gastroparesis) • can increase feeding tolerance for patient with volume sensitivity that manifests as discomfort or retching • enhanced absorption for patients with decreased absorptive surface area • decreased risk of aspiration • preferred method when transpyloric feeding is required • preferred in patients with significant vomiting and high risk for aspiration, with jejunal tube to prevent aspiration and achieve maximum caloric intake • for older children using ready-to-use closed systems, there is less handling of the formula and pump	• psychosocial impact of 24-hour continuous feeding in the home setting on not only the parent or caregiver but also the family dynamic • reduced mobility for some children due to physical attachment to the feeding apparatus • difficulty managing and supervising overnight feeds; disruption to sleep • can be difficult with children who are mobile during the day • expense of equipment (pump, feeding containers or bags) • pumps require a power source or charged battery • more equipment to maintain and clean than bolus feeding; physically demanding • continuous feed interruption when maximum safe hang times for feeds are reached; potential risk of formula contamination if hang time is exceeded • hunger suppression that may limit oral feeding progression

(NSW Office of Kids and Families, 2016); (Alberta Health Services, 2013a)

TABLE 27: CYCLED FEEDING

Defined as continuous infusion delivered over a shorter period or periods of time during the day and or night, usually ranging from eight to 18 hours. Can be given by feeding pump for consistent rate of delivery. Volume provided will vary, depending upon the child's requirements and the duration of infusion.

ADVANTAGES:	DISADVANTAGES:
• allows greater patient mobility • allows breaks for physical activity • administration of medications that are incompatible with feeds • encouraging oral intake if applicable • can be flexible to suit the child and/or parent's lifestyle and improve quality of life • may be more psychologically acceptable • useful in the transition from continuous to bolus feeding, or from tube feeding to oral intake • beneficial to supplement bolus feeding in children with smaller gastric capacity and increased risk of gastroesophageal reflux	• expense of equipment (pump, feeding containers or bags) • more equipment to maintain and clean than bolus feeding • potential risk of formula contamination if maximum safe hang times are exceeded • larger hourly volumes or higher infusion rate, when compared to continuous feeding, may be poorly tolerated in some children • may increase risk of reflux, aspiration, abdominal distension, diarrhea, and nausea due to higher infusion rate • pumps require a power source or charged battery

(NSW Office of Kids and Families, 2016)

TABLE 28: INTERMITTENT/BOLUS FEEDING

Defined as rapid administration of a measured amount of feed/water by syringe or gravity bag.

May be administered via feeding pump when a more consistent rate of delivery is required for tolerance if gravity has been trialed first.

Bolus or intermittent feeds are given at intervals throughout the day, usually over 15 to 60 minutes each. Slow transition from full volume continuous feeds to intermittent feeds allows optimal tolerance, e.g. progression from continuous feeds to every two hours, then every three hours, etc. to a desired feed schedule is appropriate.

Bolus feeding is generally only administered via the stomach, which has the reservoir capacity to tolerate a large volume. The child must have a competent esophageal sphincter and be able to protect their airway adequately to minimize the aspiration risk associated with larger feed volumes and faster administration rates.

ADVANTAGES:	DISADVANTAGES:
• more physiologically similar to a typical eating pattern • allows greater patient mobility • convenient for gastrostomy feeding • can be used to supplement oral intake • can be used in conjunction with other administration methods • can be flexible to suit the child's lifestyle • may facilitate transition to oral intake • less expensive as a pump and gravity sets are not required • lower risk of microbiological contamination • power source is not required • can be administered by syringe	• generally not suitable for transpyloric feeding as may induce diarrhea or dumping syndrome • may be more time intensive for parents or caregivers compared to continuous pump feeding • highest risk of aspiration, reflux, abdominal distension

(NSW Office of Kids and Families, 2016)

TABLE 29: GRAVITY ADMINISTRATION OF FEEDING

Gravity feeds can be used to administer small volume bolus, or intermittent feeds.

This method involves estimating the drip rate and adjusting it to administer the desired volume of feed in a desired amount of time.

ADVANTAGES:	DISADVANTAGES:
• power source is not required • feeding pump is not required	• less accurate measurement and control of feeding rate • potential reduced mobility due to physical attachment to the formula bottle, container, or bag

Estimated Drip Rates

mL/hour	Drips/minute
20	4
60	16
80	20
100	24
120	28
140	32
160	36
200	46

For example:

To calculate the drip rate to deliver 1200 mL over 14 hours (840 minutes).

Infusion sets are calibrated for a drop factor of 14.

(NSW Office of Kids and Families, 2016), (McGill University Health Centre, 2013)

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