American Occupational Therapy Association

Earn .1 AOTA CEU
(one contact hour and 1.25 NBCOT PDU).
See page CE-8 for details.

CONTINUING EDUCATION ARTICLE

# Evaluation of Feeding, Eating, and Swallowing for Children With Cerebral Palsy

**Kate Barlow, OT, OTD, OTR**
Assistant Professor of American International College
Springfield, MA

**Kelsey Sullivan, OTS**
Occupational therapy student at MGH Institute of Health Professions
Boston, MA

This CE Article was developed in collaboration with **AOTA's Children & Youth Special Interest Section**

## ABSTRACT

Most children with cerebral palsy (CP) also have a pediatric feeding disorder (PFD). Evaluating feeding in children with CP is a highly complex process that is best done in a team environment. This article describes the prevalence of PFDs in children with CP and highlights the special clinical considerations of the occupational therapist in evaluating PFDs in children with CP.

## LEARNING OBJECTIVES

After reading this article, you should be able to:

1. Identify the elements of PFDs resulting from CP that require special consideration
2. Identify the typical phases of swallowing and the impact of CP
3. Describe the role of the occupational therapist in assessing each phase of swallow for children with CP.

## INTRODUCTION

Eating and swallowing are ADLs that individuals learn to master to independently function and take care of themselves (American Occupational Therapy Association [AOTA], 2020). Impairment in one's ability to properly and safely complete necessary ADLs may lead to a decreased perception of their quality of life (QoL) (Edemekong et al., 2020). When a child is born, they must rely on caregivers to complete basic ADLs; however, as they grow, children learn to complete these tasks for themselves. The motivation to do so is linked to an innate feeling of competence and satisfaction when successfully completed independently (Shepherd & Ivey, 2020). When a child is born with a disability, the capacity to perform certain ADLs may be impaired, thus interfering with feelings of autonomy, self-esteem, and self-determination (Shepherd & Ivey, 2020).

Children born with cerebral palsy (CP), the most commonly diagnosed motor disability in children, have "motor, cognitive, and perceptive impairments" that affect their ability to complete many ADLs (Erasmus et al., 2012, p. 409). Of importance, several studies suggest that children with CP have a particular difficulty in completing various tasks associated with feeding. Dysphagia, the impaired ability to swallow, is prevalent in more than half of all children with CP and is the "leading cause of death in individuals with CP" (Novak et al., 2020, p. 10). Additionally, children with CP are chronically classified as malnourished for reasons that include oral motor dysfunction, chewing disorders, and postural abnormalities (Inal et al., 2017).

The complexity of CP cases with comorbid conditions, particularly feeding disorders, requires a qualified team approach when evaluating and treating for various impairments during both volitional and reflexive phases of feeding and swallowing. The purpose of this article is to highlight the prevalence of feeding disorders in children with CP, and the role of the occupational therapist (OT) in evaluating children with CP who have feeding difficulties. Evidence-based evaluation and treatment considerations for this specific population will be reviewed.

## PREVALENCE OF CP IN THE UNITED STATES AND GLOBALLY

CP is the most common pediatric motor disability in the United States, affecting approximately 2 per 1,000 live births, or around 10,000 births a year (Poinsett, 2020). Furthermore, it is estimated that more than 750,000 children and adults have this motor disability. Globally, there are approximately 50 million individuals living with CP who require rehabilitation services (Cieza et al., 2020).

Although CP is the most commonly diagnosed motor condition in children, its exact cause has not been identified (Cerebral Palsy Alliance, 2015). Research has identified several risk factors associated with high rates of children with CP, including low birthweight and premature birth, multiple pregnancies, and maternal infection (Reidy et al., 2020). Additionally, higher rates of CP are diagnosed in males and non-Hispanic black children (Stavsky et al., 2017). A child with CP is diagnosed according to one of four main types, including spastic (80% to 86% of cases), dyskinetic, ataxic, or mixed (Stamer, 2016). Hallmark symptoms depend on type, but they commonly include reduced gross motor skills, poor postural control, and abnormal muscle tone, which all affect function (Labaf et al., 2015).

Although not considered hallmark features of the condition, feeding difficulties affect 70% to 80% of children with CP (Korth & Rendell, 2015). Additionally, drooling and swallowing difficulties were estimated to affect 44% and 50% of individuals with CP, respectively. Individuals with more severe forms of CP and increased impairment in functioning were found to have a higher prevalence of feeding problems. Furthermore, those who had difficulties with feeding showed increased rates of malnutrition and aspiration pneumonia, and an overall decrease in QoL.

## PEDIATRIC FEEDING DISORDERS

Pediatric feeding disorders (PFDs) affect up to 29% of all children in the United States (Silverman et al., 2020). Despite the prevalence of such conditions, there is a lack of awareness and universally accepted definition for PFDs. With influence from the World Health Organization's *International Classification of Functioning, Disability and Health*, the following definition is proposed: PFDs are "impaired oral intake that is not age appropriate and associated with medical, nutritional, feeding skill, and/or psychosocial dysfunction" (Goday et al., 2019, p. 124). With this definition in mind, PFDs are clearly complex in nature and require a holistic and collaborative approach to evaluation and treatment.

PFDs may encompass one or more impairments within the domains of medical, nutritional, feeding skills, and/or psychosocial dysfunction, thus requiring the child's physician to obtain further information from a range of medical specialists, including, but not limited to, an allergist, dentist, gastroenterologist, dietician, psychologist, speech-language pathologist (SLP), and OT (Marcus & Breton, 2013). These specialists aid in the comprehensive evaluation process and perform tests to assess feeding and swallowing ability, along with the potential for comorbid conditions.

When addressing the nutritional needs and potential dysfunction of this area, a registered dietitian (RD) is often needed. An RD will assess whether a child is obtaining the necessary calories, fluids, and other vital nutrients for optimal growth and functioning, as well as recommend a modified diet when appropriate (Marcus & Breton, 2013). This specialist has expertise in creating a well rounded and tolerated diet for the child and works collaboratively with SLPs and OTs for effective feeding skill development.

The role of OTs in pediatric feeding will be further discussed in detail in the following section; however, they play a crucial role, along with SLPs, in aiding a child with CP to properly develop the necessary skills to feed successfully.

Last, psychosocial dysfunction may present not only in the child with a PFD, but also in the parents, caregivers, and family members who tend to the child. A psychologist or psychiatrist may evaluate the child and caregivers' mealtime behaviors to identify strategies to increase positive feeding experiences and strengthen the parent–child relationship (Marcus & Breton, 2013). Each professional brings their valuable expertise to the team, but the focus must remain on the child and caregiver, to provide family-focused care in a collaborative treatment approach because of the complex and multi-contextual nature of PFDs.

## OCCUPATIONAL THERAPY'S ROLE IN PEDIATRIC FEEDING

Occupational therapy practitioners (OTPs) are specifically trained to enable and increase participation in ADLs, including feeding, eating, and swallowing (AOTA, 2017b). Furthermore, OTPs "have the education, knowledge, and skills necessary for the evaluation of and intervention with feeding, eating, and swallowing problems" (AOTA, 2017b, p. 1). The lifespan focus of occupational therapy enables practitioners to provide care to the youngest of patients and their caregivers, starting at breast and/or bottle feedings. As an infant grows, the OT's extensive knowledge of developmental milestones allows them to aid in the transition to complementary and solid foods and liquids when appropriate (AOTA, 2017b).

If a child is suspected of having difficulty swallowing or aspirating, a modified barium swallow study (MBSS), also referred to as a *videofluroscopic swallow study* (VFSS), may be ordered. An MBSS/VFSS examines the "physiological function of the swallowing mechanism" (Martin-Harris et al., 2020, p. 1079). During the swallow study examination, a child consumes solids and liquids of varying consistencies coated or mixed with barium sulfate for contrast while imaging. As a result, physicians and feeding therapists are able to visualize swallowing physiology to determine adequate function. The swallow study is able to reveal lip closure, chewing (mastication), bolus propulsion, tongue and epiglottis movement, and the path of liquids and solids from the oral cavity to the esophagus—or in the case of aspiration, to the larynx (Martin-Harris et al., 2020). While working in an interprofessional team, both OTs and SLPs with proper training can perform portions of this test (Paul & D'Amico, 2013).

Occupational therapy practioners are well equipped to provide care to pediatric patients and their caregivers at any point in the therapeutic process. According to AOTA (2017b), "Practitioners develop clinical reasoning skills to consider the interplay of physical, cognitive, emotional, environmental, and sociocultural factors in providing effective services for feeding, eating, and swallowing dysfunction" (p. 2). The multi-contextual nature of PFDs emphasizes the strength OTs possess to incorporate the aforementioned factors into treatment. Furthermore, this client- and family-centered practice requires practitioners to provide care not only to the child, but also to the caregiver, specifically in relation to the resulting stress from a child with a PFD.

In a study conducted to understand the effect of PFDs on caregivers and daily activities, including social participation, the researchers concluded that family-centered and occupation-based treatments improve the overall QoL for both the child and their families (Simione et al., 2020). This further supports the vital role Occupational therapy practioners have in treating and educating caregiver(s) and children with feeding disorders (Paul & D'Amico, 2013).

Incorporating meaningful and occupation-based treatments is an important part of the OT's role in caring for children with feeding disorders. OTs work to create safe, functional feeding habits and routines to increase the child's ability to participate in mealtimes. In a systematic review conducted by Howe and Wang (2013), interventions commonly implemented by OTs include behavioral, parent-directed and educational, and physiological. Children receiving behavioral interventions (e.g., differential attention, shaping, fading, escape extinction) increased food variety, mealtime behaviors, and self-feeding skills. Studies reviewing the effectiveness of education and relationship-based interventions (i.e., providing caregivers with information and recommendations relating to their child's feeding difficulties) produced improvements in a child's physical growth and development, as well as child and caregiver feeding competence.

Physiological interventions focused on the complexity of the developmentally acquired actions necessary for successful feeding: breathing, sucking, and swallowing. Interventions for this approach included preparatory behaviors (e.g., nonnutritive sucking, skin-to-skin contact), feeding skills (e.g., oral stimulation to elicit sucking and swallowing), and environmental supports (e.g., positioning devices and modified equipment such as a slow-flow nipple) (Howe & Wang, 2013).

The OT is also responsible for assessing and treating oral-sensory issues. Occupational therapy's unique understanding of the sensory system allows for developing strategies to increase the acceptance of food textures (Feeding Matters, n.d.). Occupational therapy's educational background equips practitioners with the tools necessary to treat such conditions, including "neuroscience, anatomy, and activity/environmental analysis to identify and treat occupational performance issues resulting from sensory modulation, sensory integration, motor, and psychosocial deficits" (AOTA, 2017a, p. 2). The Sequential Oral Sensory approach to feeding is an example of an evidence-based intervention that supports children's exploration of food through play, which leads to an increase in food acceptance (Toomey & Ross, 2013).

Occupational therapy's scope of practice includes knowledge on the use of low- and high-tech assistive devices (AOTA, 2015). An *assistive technology device* is defined under the Individuals with Disabilities Act of 1988 as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (AOTA, 2010, p. S46). Due to manifestation of CP, marked by a lack of volitional control over movements, positional devices are used to improve physical stabilization of the child, particularly by providing support for optimal alignment at key points of control, including the feet, knees, hips, trunk, and head (Hulme et al., 1987; Lino et al., 2020). Positional devices, also referred to as *adaptive seating devices*, maintain head and trunk in an upright, vertical plane. Position hips at greater than 90° of flexion to prevent posterior pelvic tilt and pelvic thrust.

An example of an assistive device includes placing a small towel under a child's knees to increase the hip flexion (Hurley, 2012). Below the waist, positional devices maintain knees in 90° of flexion and ankles in neutral, and support bilateral feet placement (Hulme et al., 1987). Using positional devices for children with spastic, hypotonic, or mixed tone not only improved sitting posture, but also increased the ability to maintain food in the oral cavity and consume foods of enlarged texture (puree/blended to chopped/cut up) (Hulme et al., 1987).

Adaptive equipment (AE) frequently prescribed by OTs for clients with CP is found to improve participation in daily life activities, including components of feeding such as using a cup or cutlery (Lino et al., 2020). Adaptive feeding equipment may include cups with lids and straws of differing sizes, heights, and materials. Lino and colleagues (2020) concluded that using such adaptive cups increases independence in task completion, as the equipment enables a child with CP who has limited upper extremity control to drink independently.

AE to improve using cutlery improved independence in the task. Equipment used during interventions included angled-handled spoons, neoprene orthoses, and foam-grip tubing (Lino et al., 2020). Overall, positional devices and AE may be used alone or in combination to increase muscle tone, posture, trunk control, fine motor skills, and coordination (Feeding Matters, n.d.).

## ASSESSMENT

The most difficult part of the assessment process is evaluating oral motor skills and swallowing function. To date, there is not a comprehensive feeding and swallowing standardized assessment that includes all the complex areas of feeding, especially oral motor skills (Korth & Maune, 2020). Considering the phases of swallow and the four domains of PFDs is one systematic approach to observing and evaluating the process of eating and swallowing.

## PHASES OF SWALLOW

Swallowing is defined by the three phases of swallow: oral, pharyngeal, and esophageal (Marcus & Brenton, 2013; Ross, 2012; VitalStim Therapy, 2015). In some literature, the oral phase is divided into two: an anticipatory or oral prep phase, and an oral phase (Korth & Maune, 2020). Another way to view the phases of swallow is through the voluntary phases (anticipatory and oral) and the involuntary phases (pharyngeal and esophageal) (DINES, 2019). Each phase of swallow has a neural component, resulting in the high prevalence of children with CP with dysphagia (Bashar et al., 2015).

In the anticipatory, or oral prep phase, the sensory variables of the environment are considered, the food is introduced, the lips close, and a bolus is formed. Phase one intervention considerations for the OT include evaluating hunger, the environment, positioning, hand-to-mouth coordination, size of the bite, sensory concerns, AE, and behaviors; as well as improving the quality of chewing through improved oral motor skills of the lips, jaw, cheeks, and tongue. Approximately 80% of parents of children with CP report their child as having difficulty with chewing, and these children often have difficulty with the transition to solid food (Aggarwal et al., 2015).

Regardless of whether a child has a disability, children who do not properly master oral motor milestones will have difficulty chewing and are at an increased risk for negative feeding experiences. Children under the age of 4 years are still developing the correct oral motor patterns and coordination needed to safely and correctly chew typical foods. In addition, chewing is considered a learned behavior (Brackett, 2016). A child first learns to suck on a nipple to receive food; if a child is given solid food too early, they will simply just suck on the solid food. A child must be taught to chew and practice these skills. Without proper practice, a child is not able to properly break down the food, increasing their risk of choking.

For children with CP, maintaining proper positioning can also be problematic. Swallowing muscles work best in their neutral position, and poor posture can lead to decreased tone. The child should be properly positioned with hips, knees, and ankles at 90°, and head and neck in neutral to facilitate optimal conditions. An example of the dangers of poor position is neck hyperextension, which increases the risk of aspiration (Aggarwal et al., 2015). Another important factor is the internal motivation of the child; the food must be appealing for the child to successfully engage in the task (DINES, 2019).

Phase two is the oral phase, which is also under voluntary control, and is marked by the bolus propulsion into the pharynx by the tongue lifting against the hard palate (Korth & Rendell, 2015). Phase two interventions all target oral motor skills, such as tongue movements for retraction and lateralization and cheek strength (buccinators) to keep the food on the teeth and eliminate pocketing (narrowing of the cavity creates positive pressure).

Another key factor is making sure the mouth is closed. Lip closure is often a problem for children with severe disabilities and decreases the force of the bolus propulsion. "Lip seal, which is also a component of lip closure, is a predictor of drooling," which is also an area of concern for approximately 40% of children with CP (Reid et al., 2012, p. 1035). Strengthening the orbicularis and buccinator muscles will improve lip closure, as they act as a sling with the upper pharyngeal constrictor to create the positive pressure needed for bolus propulsion (VitalStim Therapy, 2015). The tongue must also have the appropriate range of motion and strength to push against the posterior pharyngeal wall with enough power to create the positive pressure needed for bolus propulsion. Observations of the oral phases include watching to ensure there is no spillage, pocketing, or nasal regurgitation, with the bolus propelled successfully in a single swallow (VitalStim Therapy, 2015).

Phase three is the pharyngeal phase, which begins the involuntary phases of swallow. Phase three begins with the initial swallow followed by hyolaryngeal excursion; the phase ends with the opening of the upper esophageal sphincter (UES) (Korth & Rendell, 2015). OTs must observe for signs and symptoms of aspiration, which can occur during this phase. VFSSs have indicated that children with CP have "pulmonary aspiration in 38% to over 70% of the cases" (Erasmus et al., 2012, p. 412). A slow-moving bolus, which is a pressure-generation problem, can increases the risk of aspiration (DINES, 2019). The "longer it takes for the swallowing reflex to trigger, the greater the chance of aspirating food, as the airway remains open and unprotected" (Lagos-Guimarães et al., 2016, p. 136).

In addition to a VFSS, which is the most recommended assessment for aspiration in children (Lagos-Guimarães et al., 2016), therapists can take several objective measures to determine whether aspiration is occurring, such as using a pulse oximeter to monitor oxygen saturation (Smith et al., 2000), taking temperatures (Karagiannis et al., 2011), and performing cervical auscultation (Frakking et al., 2019). Although none of these alternative measures is a standalone assessment, they offer critical information that may assist other observations, such as coughing, watery eyes, and irritability during mealtimes. Observations of coughing is critical, as this is always indicative that a child is in distress (DINES, 2019). Children under 3 years and children with CP are at an increased risk for choking during mealtimes. Using the fingernail of the child's fifth digit as a guide to bite size is recommended to help reduce choking (Cichero et al., 2017).

The fourth phase of swallow is the esophageal phase, which begins and ends with the bolus entering the UES (also known as the *pharyngoesophageal sphincter* in adult practice) and leaving through the lower esophageal sphincter (LES). The opening of the UES relies on the movement sensation of the hyolaryngeal excursion and the pharyngeal shortening (DINES, 2019). Both of these motor movements are involuntary with a neurological component; therefore, opening the UES can be problematic for children with neurological disorders. Gastroesophageal reflux (GER) occurs with unwanted opening or relaxation of the LES. GER is estimated to occur in approximately half of children

with CP (Erasmus et al., 2012). Although some researchers have reported the prevalence to be as high as 77% in children with CP, contributing factors include the frequency of supine positioning and scoliosis, which can cause the LES to stretch (Fernando & Goldman, 2019). It is important to note that scoliosis can worsen during puberty, and therefore dysphagia symptoms can also worsen (Arvedson, 2013).

Many children with CP also have an elevated rib cage, shallow breathing, and an increased respiratory rate (Stamer, 2016). The clinician should always observe the child eating in the natural environment, and in as many environments as possible. Consider the school cafeteria seating or the lack of a feeding chair in many homes. The child's posture may be negatively affecting breathing and the ability to successfully self-feed and/or swallow. In the school setting, a child with CP sometimes may not be communicating at lunch with peers because of the effort required to eat, or conversely, may not be eating because of the effort needed to communicate.

Nutritional concerns for children with CP have been reported to be as high as 90% (Inal et al., 2017). Because nutritional recommendations, such as supplements, are not within the occupational therapy scope of practice, it is critical to refer to other professionals when necessary. A new four-question *Feeding and Nutrition Screening Tool for Cerebral Palsy*, developed by Bell and colleagues (2019), is freely available for occupational therapy practitioners and other professionals to use. This tool results in a score indicating whether to refer for other services.

Education on safe foods for a child to eat needs to match their skill level (versus their chronological age) and is one of the most important steps in the evaluation process. If the child needs a modified diet or thickened liquids for a safe swallow, consulting a physician and the registered dietician is recommended. The new International Dysphagia Diet Standardization Initiative provides a universal definition for consistency of liquids and food textures on one continuous scale (Cichero et al., 2017). This is critical for the child transitioning between environments.

Psychosocial factors is another domain within the PFD's definition, and it refers to both the child and the caregiver (Goday et al., 2019). When a child has a PFD, there may be a disruption in the bonding process between child and caregiver, which is why "many researchers view feeding disorders as a relationship disorder" (Didehbani et al., 2011, p. 86). Insecure attachment and difficulty bonding are concerns for children with CP, because of the child's limited abilities to communicate their needs to the caregiver (Barthel et al., 2016).

Given that the prevalence of feeding difficulties in children with CP can range as high as 100% depending on the classification system (Lagos-Guimarães et al., 2016), clinicians need to include psychosocial concerns in their evaluation process. Although not yet widely used across all practice settings, including a maternal mental health screen as part of the evaluation process is recommended as best practice (Sepulveda et al., 2020). Free maternal mental health screens are available online, such as the Edinburgh Postnatal Depression Scale (https://psychology-tools.com/epds/) and the Postpartum Social Support Screening Tool (https://artemisguidance.com/pssst/). Treating the child–caregiver dyad, especially when focusing on feeding difficulties, can result in improved outcomes when both the child and caregiver are engaged (Barlow & Sepulveda, 2020; Sepulveda, 2019).

Feeding difficulties can impair social relationships, not only between the caregiver and child, but also between peers as children age. As mentioned previously, in the school cafeteria the child with CP may be sitting unsupported at a table. Proper positioning is critical not only for optimal swallowing results, but also for facilitating positive behaviors and communication with caregivers and peers (Bashar et al., 2015). One of the oral motor deficit areas that affects the child's ability to make friends is drooling. Drooling occurs in up to 58% of children with CP and can have a negative effect on a child's mental health and peer interactions (Erasmus et al., 2012).

The final domain to consider in the evaluation of PFDs is the child's feeding skills, which include not only the oral motor skills necessary for a safe swallow, but also sensory functions, posture, and hand-to-mouth coordination. Children with CP do not always mouth toys like typically developing children do, delaying the gag reflex from moving to the posterior third of the tongue, as well as delaying tongue lateralization. The delayed integration of reflexes affects a child's motor skills, social skills, and feeding skills.

It is also critical to consider the amount of time a child takes to eat, and the energy spent when a child is eating. If mealtimes are limited to 20 minutes in a school environment, clinicians need to consider how many calories the child was able to consume versus expend. When children take longer than 30 minutes to eat a meal—referred to as *inefficient oral feeding*—a modified diet or consultation to a nutritionist should be considered (Goday et al., 2019).

For assessing dysphagia in preschool children with CP, the Schedule Oral Motor Assessment and the Dysphagia Disorders Survey have been recognized as having the "strongest clinical utility to support clinical decision-making" (Benfer et al., 2012, p. 794). The *Rehabilitation Guideline for the Management of Children With CP* recommends that OTs use the Eating and Drinking Ability Classification System (www.EDACS.org), which was developed for children with CP ages 3 years and older (Humanity & Inclusion, 2018). A survey of more than 450 pediatric feeding therapists (OTs and SLPs), however, found that most clinicians used a non-standardized assessment tool to evaluate feeding skills, followed by VFSSs and the Beckman Oral Motor Protocol (Barlow & Rabaey, 2020). Feedingflock.com provides clinicians with several free assessment tools, such as the Child Oral and Motor Proficiency Scale, Family Management Measure of Feeding, and the Pediatric Eating Assessment Tool. Feeding Matters also has a free screening tool available on its website (https://questionnaire.feedingmatters.org/questionnaire). Regardless of which assessment tool you choose, it is important that all domains of a PFD are considered and evaluated when appropriate.

## TREATMENT

A good assessment is the key to successful treatment. It is not possible to cover every treatment scenario, but consider a few key points. An open mouth posture is prevalent in 93% of children with CP (Inal et al., 2017). Training for straw drinking can begin at 6 months (Bahr, 2010); this is critical, as research has shown approximately 80% of children with CP who can use a straw do not drool (Reid et al., 2012). In addition to drooling, oral motor exercises have been shown effective in improving tongue lateralization, lip closure, and swallowing evaluation results (Siğan et al., 2013).

Understanding the phases of swallow, and what is occurring in each phase, should guide your clinical reasoning as to why your client is having swallowing difficulty. Given that children with CP often have decreased strength of their oral motor musculature, and that swallowing muscles are mostly type II muscle fibers, interventions must be focused on increasing workload to increase strength. Therapeutic interventions must be consistently challenging, such as with increased resistance, to activate the type II muscle fibers. Repeating the same exercises 10 times each session for 6 weeks will not activate type II fibers, only type I. Neuromuscular electrical stimulation (NMES) activates type II muscle fibers first and is a great therapeutic tool for increasing the strength of swallowing muscles for children with CP (Song et al., 2015).

Free continuing education webinars on treating oral motor skills are available on several websites, including Therapro (www.therapro.com/Information-Items/Webinars/), Ages and Stages (www.agesandstages.net/courses.php), and OT OER (https://libguides.aic.edu/OT_OER/webinars). Beckman Oral Motor (www.beckmanoralmotor.com/) and Talk Tools (https://talktools.com/) have continuing education courses that focus on oral motor skills, and are highly recommended.

## EVALUATION

A team approach is always recommended for a feeding evaluation; however, for a child with CP, this is especially true. Respiratory concerns, along with vision, sensory, cardiopulmonary, nutritional, and digestive factors, should be considered in the evaluation process (Stamer, 2016). Depending on the age of the child and individual interactions, the various environments also need to be considered, such as day care, school, and home settings. The complexity of the feeding evaluation for a child with CP lends itself to the team approach, given the expertise needed for a comprehensive evaluation.

Examining the four domains of PFDs specific to CP, beginning with the medical domain, is a recommended systematic approach. For example, constipation and respiratory rate are two common concerns. Constipation, due to neuromuscular factors and decreased mobility, is common, with a prevalence of 26% to 74% in children with CP (Trivi & Hojsak, 2018). Asking caregivers how often the child has a bowel movement and the consistency of the stool can provide important clues in determining hunger, eating habits, and behavior.

## CONCLUSION

Occupational therapy practioners are always focused on the whole child and providing family-centered care. In treating CP, the primary goal of intervention must be to improve the life of the child and the family (Aggarwal et al., 2015). The complexity of the feeding evaluation for the child with CP requires a commitment to continued learning and involving the members of an interdisciplinary team for optimal outcomes.

## REFERENCES

Aggarwal, S., Chadha, R., & Pathak, R. (2015). Feeding difficulties among children with cerebral palsy: A review. *International Journal of Health Sciences and Research, 5*, 297–308. https://www.ijhsr.org/IJHSR_Vol.5_Issue.3_March2015/43.pdf

American Occupational Therapy Association. (2010). Specialized knowledge and skills in technology and environmental interventions for occupational therapy practice. *American Journal of Occupational Therapy, 64*(Suppl.), S44–S56. https://doi.org/10.5014/ajot.2010.64S44

American Occupational Therapy Association. (2015). *Occupational therapy's role with providing assistive technology devices and services* [fact sheet]. https://www.aota.org/-/media/Corporate/Files/AboutOT/Professionals/WhatIsOT/RDP/Facts/AT-fact-sheet.pdf

American Occupational Therapy Association. (2017a). *Occupational therapy using a sensory integration-based approach with adult populations* [fact sheet]. https://www.aota.org/-/media/Corporate/Files/AboutOT/Professionals/WhatIsOT/PA/Facts/SI-and-Adults-Fact-Sheet.pdf

American Occupational Therapy Association. (2017b). The practice of occupational therapy in feeding, eating, and swallowing. *American Journal of Occupational Therapy, 71*(Suppl. 2), 7112410015. https://doi.org/10.5014/ajot.2017.716S04

American Occupational Therapy Association. (2020). Occupational therapy practice framework: Domain and process (4th ed.). *American Journal of Occupational Therapy, 74*(Suppl. 2), 7412410010. https://doi.org/10.5014/ajot.2020.74S2001

Arvedson, J. (2013). Feeding children with cerebral palsy and swallowing difficulties. *European Journal of Clinical Nutrition, 67*, S9–S12. https://doi.org/10.1038/ejcn.2013.224

Bahr, D. (2010). *Nobody ever told me (or my mother) that! Everything from bottle and breathing to healthy speech development*. Sensory World.

Barlow, K., & Rabaey, R. (2020). *Investigation of assessment tools in the area of pediatric feeding evaluation*. [Unpublished manuscript]. Division of Occupational Therapy, American International College.

Barlow, K., & Sepulveda, A. (2020). The promotion of positive mental health for new mothers during Covid-19. *World Federation of Occupational Therapists Bulletin, 76*, 86–89. https://doi.org/10.1080/14473828.2020.1822577

Barthel, K., Cayo, C., Gellert, K., & Tarduno, B. (2016). The practice of occupational therapy from a neuro-developmental treatment perspective. In J. Bierman, M. Franjoine, C. Hazzard, J. Howle, & M. Stamer (Eds.), *Neuro-developmental treatment: A guide to NDT clinical practice* (pp. 308–324). Thieme.

Bashar, M. K., Iqbal, S., Chowdhury, M. A., Das, D., & Iqbal, M. (2015). Developmental outcome of children with cerebral palsy after feeding and seating intervention. *Chattagram Maa-O-Shishu Hospital Medical College Journal, 14*(1), 11–14. https://www.banglajol.info/index.php/CMOSHMCJ/issue/view/1346

Bell, K., Benfer, K., Ware, R., Patrao, T., Garvey, J., Arvedson, J., … Weir, K. (2019). Development and validation of a screening tool for feeding/swallowing difficulties and undernutrition in children with cerebral palsy. *Developmental Medicine & Child Neurology, 61*, 1175–1181. https://doi.org/10.1111/dmcn.14220

Benfer, K., Weir, K., & Boyd, R. (2012). Clinimetrics of measures of oropharyngeal dysphagia for preschool children with cerebral palsy and neurodevelopmental disabilities: A systematic review. *Developmental Medicine & Child Neurology*, 784–795. https://doi.org/10.1111/j.1469-8749.2012.04302.x

Brackett, K. (2016). *The long road of learning to chew*. http://pediatricfeedingnews.com/the-long-of-road-of-learning-to-chew-part-1/

Cerebral Palsy Alliance. (2015). *What is cerebral palsy?* https://cerebralpalsy.org.au/our-research/about-cerebral-palsy/what-is-cerebral-palsy/

Cichero, J., Lam, P., Steele, C., Hanson, B., Chen, J., Dantas, R., … Stanschus, S. (2017). Development of international terminology and definitions for texture-modified foods and thickened fluids used in dysphagia management: The IDDSI framework. *Dysphagia, 32*, 293–314. https://doi.org/10.1007/s00455-016-9758-y

Cieza, A., Causey, K., Kamenov, K., Hanson, S. W., Chatterji, S., & Vos, T. (2020). Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019: A systematic analysis for the Global Burden of Disease study 2019. *Lancet, 396*, 2006–2017. https://doi.org/10.1016/S0140-6736(20)32340-0

Didehbani, N., Kelly, K., Austin, L., & Wiechmann, A. (2011). Role of parental stress on pediatric feeding disorders. *Children's Health Care, 40*, 85–100. https://doi.org/10.1080/02739615.2011.564557

DINES. (2019). *Vital Stim® Therapy and Beyond. Career Improvement & Advancement Opportunities (CIAO)*. https://www.ciaoseminars.com/home/vitalstim/

Edemekong, P. F., Bomgaars, D. L., Sukumaran, S., & Levy, S. B. (2020). Activities of daily living. *StatPearls*. https://pubmed.ncbi.nlm.nih.gov/29261878/

Erasmus, C., van Hulst, K., Rotteveel, J., Willemsen, M., & Jongerius, P. (2012). Clinical practice: Swallowing problems in cerebral palsy. *European Journal of Pediatrics, 171*, 409–414. https://doi.org/10.1007/s00431-011-1570-y

Feeding Matters. (n.d.). *Evaluation & treatment: Feeding skill*. https://www.feedingmatters.org/what-is-pfd/feeding-skill/

Fernando, T., & Goldman, R. (2019). Management of gastroesophageal reflux disease in pediatric patients with cerebral palsy. *Canadian Family Physician, 65*, 796–798. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6853361/pdf/0650796.pdf

Frakking, T., Chang, A., David, M., Orbell-Smith, J., & Weir, K. (2019). Clinical feeding examination with cervical auscultation for detecting oropharyngeal aspiration: A systematic review of the evidence. *Clinical Otolaryngology, 44*, 927–934. https://doi.org/10.1111/coa.13402

Goday, P. S., Huh, S. Y., Silverman, A., Lukens, C. T., Dodrill, P., Cohen, S. S., … Phalen, J. A. (2019). Pediatric feeding disorder: Consensus definition and conceptual framework. *Journal of Pediatric Gastroenterology and Nutrition, 68*, 124–129. https://doi.org/10.1097/MPG.0000000000002188

Howe, T.-H., & Wang, T.-N. (2013). Systematic review of interventions used in or relevant to occupational therapy for children with feeding difficulties ages birth–5 years. *American Journal of Occupational Therapy, 67*, 405–412. https://doi.org/10.5014/ajot.2013.004564

Hulme, J. B., Shaver, J., Acher, S., Mullette, L., & Eggert, C. (1987). Effects of adaptive seating devices on the eating and drinking of children with multiple handicaps. *American Journal of Occupational Therapy, 41*, 81–89. https://doi.org/10.5014/ajot.41.2.81

Humanity & Inclusion. (2018). *Rehabilitation guideline for the management of children with cerebral palsy: Occupational therapy guideline*. USAID.

Hurley, D. (2012). Positioning for feeding success. In K. VanDahm (Ed.), *Pediatric feeding disorders: Evaluation and treatment* (pp. 77–96). Therapro.

Inal, Ö, Serel Arslan, S., Demir, N., Tunca Yilmaz, Ö., & Karaduman, A. A. (2017). Effect of Functional Chewing Training on tongue thrust and drooling in children with cerebral palsy: A randomised controlled trial. *Journal of Oral Rehabilitation, 44*, 843–849. https://doi.org/10.1111/joor.12544

Karagiannis, M., Chivers, L., & Karagiannis, T. (2011). Effects of oral intake of water in patients with oropharyngeal dysphagia. *BMC Geriatrics, 11*, Article 9. https://doi.org/10.1186/1471-2318-11-9

Korth, K., & Maune, N. C. (2020). Assessment and treatment of feeding, eating, and swallowing. In J. C. O'Brien & H. Kuhaneck (Eds.), *Case-Smith's occupational therapy for children and adolescents* (8th ed., pp. 212–238). Elsevier.

Korth, K., & Rendell, L. (2015). Feeding intervention. In J. Case-Smith, & J. C. O'Brien (Eds.), *Occupational therapy for children and adolescents* (7th ed., pp. 389–414). Mosby.

Labaf, S., Shamsoddini, A., Hollisaz, M. T., Sobhani, V., & Shakibaee, A. (2015). Effects of neurodevelopmental therapy on gross motor function in children with cerebral palsy. *Iranian Journal of Child Neurology, 9*(2), 36–41. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4515339/pdf/ijcn-9-036.pdf

Lagos-Guimarães, H. N. C., Teive, H. A. G., Celli, A., Santos, R. S., Abdulmassih, E. M. d. S., Hirta, G. C., & Gallinea, L. F. (2016). Aspiration pneumonia in children with cerebral palsy after videofluroscopic swallowing study. *International Archives of Otorhinolaryngology, 20*, 132–137. https://doi.org/10.1055/s-0035-1566093

Lino, T. B., Martinez, L. B. A., Boueri, I. Z., & Lourenço, G. F. (2020). Effects of the use of assistive technology devices to promote independence in daily life activities for a child with cerebral palsy. *Revista Brasileira de Eduçacão Especial, 26*(1), 17–32. https://doi.org/10.1590/s1413-65382620000100003

Marcus, S., & Breton, S. (2013). *Infant and child feeding and swallowing: Occupational therapy assessment and intervention*. AOTA Press.

Martin-Harris, B., Canon, C. L., Shaw Bonilha, H., Murray, J., Davidson, K., & Lefton-Greif, M. A. (2020). Best practices in modified barium swallow studies. *American Journal of Speech-Language Pathology, 29*(2S), 1078–1093. https://doi.org/10.1044/2020_AJSLP-19-00189

Novak, I., Morgan, C., Fahey, M., Finch-Edmondson, M., Galea, C., Hines, A., … Badawi, N. (2020). State of evidence traffic lights 2019: Systematic review of interventions for preventing and treating children with cerebral palsy. *Current Neurology and Neuroscience Reports, 20*, Article 3. https://doi.org/10.1007/s11910-020-1022-z

Paul, S., & D'Amico, M. (2013). The role of occupational therapy in the management of feeding and swallowing disorders. *New Zealand Journal of Occupational Therapy, 62*(2), 27–31.

Poinsett, P. M. (2020). *Cerebral palsy facts and statistics*. https://www.cerebralpalsyguidance.com/cerebral-palsy/research/facts-and-statistics/

Reid, S., McCutcheon, J., Reddihough, D., & Johnson, H. (2012). Prevalence and predictors of drooling in 7- to 14-year-old children with cerebral palsy: A population study. *Developmental Medicine & Child Neurology, 54*, 1032–1036. https://doi.org/10.1111/j.1469-8749.2012.04382.x

Reidy, T. G., Coker-Bolt, P. C., & Naber, E. (2020). Neuromotor conditions: Cerebral palsy. In J. C. O'Brien & H. M. Kuhaneck (Eds.), *Case-Smith's occupational therapy for children and adolescents* (8th ed., pp. 764–785). Elsevier.

Ross, E. (2012). Development of feeding progression. In K. VanDahm (Ed.), *Pediatric feeding disorders: Evaluation and treatment* (pp. 35–53). Therapro.

Sepulveda, A. (2019). A call to action: Addressing maternal mental health in pediatric occupational therapy practice. *Annals of International Occupational Therapy, 2*, 195–200. https://doi.org/10.3928/24761222-20190813-02

Sepulveda, A, Barlow, K., Demchick, B., & Flanagan, J. (2020). Children's mental health: Promoting mental health through early screening and detection. *OT Practice, 25*(4), 10–14.

Shepherd, J., & Ivey, C. (2020). Assessment and treatment of activities of daily living, sleep, rest, and sexuality. In J. C. O'Brien & H. Kuhaneck (Eds.), *Case-Smith's occupational therapy for children and adolescents* (8th ed., pp. 267–314). Elsevier.

Sığan, S., Uzunhan, T., Aydinli, N., Eraslan, E., Ekici, B., & Çaliskan, M. (2013). Effects of oral motor therapy in children with cerebral palsy. *Annals of Indian Academy of Neurology, 16*, 342–346. https://doi.org/10.4103/0972-2327.116923

Silverman, A., Berlin, K., Linn, C., Pederson, J., Schiedermayer, B., & Barkmeier-Kraemer, J. (2020). Psyochometric properties of the infant and child feeding questionnaire. *Journal of Pediatrics, 223*, 81–86. https://doi.org/10.1016/j.jpeds.2020.04.040

Simione, M., Dartley, A. N., Cooper-Vince, C., Martin, V., Hartnick, C., Taveras, E. M., & Fiechtner, L. (2020). Family-centered outcomes that matter most to parents: A pediatric feeding disorders qualitative study. *Journal of Pediatric Gastroenterology and Nutrition, 71*, 270–275. https://doi.org/10.1097/MPG.0000000000002741

Smith, H., Lee, S., O'Neill, P., & Connolly, M. (2000). The combination of bedside swallowing assessment and oxygen saturation monitoring of swallowing in acute stroke: A safe and humane screening tool. *Age and Aging, 29*, 495–499. https://doi.org/10.1093/ageing/29.6.495

Song, W. J., Park, J. H., Lee, J. H., & Kim, M. Y. (2015). Effects of neuromuscular electrical stimulation on swallowing functions in children with cerebral

# Continuing Education Article

**Earn .1 AOTA CEU** (one contact hour and 1.25 NBCOT PDU). See page CE-8 for details.

**CE Article, exam, and certificate are also available ONLINE.**
Register at http://www.aota.org/cea or call toll-free 877-404-AOTA (2682).


palsy: A pilot randomized controlled trial. *Hong Kong Journal of Occupational Therapy, 25*, 1–6. https://doi.org/10.1016/j.hkjot.2015.05.001

Stamer, M. (2016). Examination. In J. Bierman, M. R. Franjoine, C. Hazzard, J. Howle, & M. Stamer (Eds.). *Neuro-developmental treatment: A guide to NDT clinical practice* (pp. 74–118). Thieme. *he intentional relationship: Occupational therapy and use of self*. F. A. Davis.

Stavsky, M., Mor, O., Mastrolia, S. A., Greenbaum, S., Than, N. G., & Erez, O. (2017). Cerebral palsy: Trends in epidemiology and recent development in prenatal mechanisms of disease, treatment, and prevention. *Frontiers in Pediatrics, 5*. https://doi.org/10.3389/fped.2017.00021

Toomey, K., & Ross, E. (2013). *The S.O.S. sequential oral sensory approach to feeding*. Sensory Processing Disorder Foundation.

Trivić, I., & Hojsak, I. (2018). Evaluation and treatment of malnutrition and associated gastrointestinal complications in children with cerebral palsy. *Pediatric Gastroenterology, Hepatology & Nutrition, 22*, 122–131. https://doi.org/10.5223/pghn.2019.22.2.122

VitalStim Therapy. (2015). *VitalStim Therapy specialty program training manual*. Career Improvement & Advancement Opportunities (CIAO). https://www.ciaoseminars.com/home/vitalstim/


## How to Apply for Continuing Education Credit

A. To get pricing information and to register to take the exam online for the article **Evaluation of Feeding, Eating, and Swallowing for Children With Cerebral Palsy,** go to http://store.aota.org, or call toll-free 800-729-2682.

B. Once registered and payment received, you will receive instant email confirmation.

C. Answer the questions to the final exam found on pages CE-8 & CE-9 by **March 31, 2024**

D. On successful completion of the exam (a score of 75% or more), you will immediately receive your printable certificate.

# Final Exam

**Article Code CEA0321**

## Evaluation of Feeding, Eating, and Swallowing for Children With Cerebral Palsy

**To receive CE credit, exam must be completed by March 31, 2024**

**Learning Level:** Learning Level: Intermediate to advanced

**Target Audience:** Occupational Therapy Practitioners

**Content Focus:** Domain: Client Factors; OT Process: Occupational Therapy Evaluation and Intervention

**1. Which of the following phases of swallow is involuntary?**

- A. Oral prep phase
- B. Anticipatory phase
- C. Oral phase
- D. Esophageal phase

**2. In which of the following phases of swallow can aspiration occur?**

- A. Oral prep phase
- B. Oral phase
- C. Pharyngeal phase
- D. Esophageal phase

**3. In which of the following phases of swallow can reflux occur?**

- A. Oral prep phase
- B. Oral phase
- C. Pharyngeal phase
- D. Esophageal phase

**4. Gastroesophageal reflux occurs:**

- A. During the unwanted opening or relaxation of the upper esophageal sphincter
- B. During the unwanted opening or relaxation of the lower esophageal sphincter
- C. When hyolaryngeal excursion is unsuccessful
- D. When the pharyngeal shortening is unsuccessful

**5. Which of the following is the most recommended assessment to detect aspiration in children?**

- A. Videofluroscopic swallow study
- B. Pulse oximeter to monitor oxygen saturation
- C. Taking temperatures
- D. Cervical auscultation

**6. Which three muscles work together as the muscular sling responsible for bolus propulsion?**

- A. Orbicularis, buccinators, and styloglossus
- B. Orbicularis, buccinators, and upper pharyngeal constrictor
- C. Upper pharyngeal constrictor, styloglossus, and geniohyoid
- D. Geniohyoid, mylohyoid, and stylohyoid

**7. Due to the known difficulties of attachment and bonding for children and caregivers with feeding concerns, the occupational therapist can include which of the following in their assessment?**

- A. The Feeding and Nutrition Screening Tool for Cerebral Palsy
- B. The Schedule Oral Motor Assessment
- C. The Child Oral and Motor Proficiency Scale
- D. Edinburgh Postnatal Depression Scale

# Continuing Education Article

**Earn .1 AOTA CEU** (one contact hour and 1.25 NBCOT PDU). See page CE-8 for details.

**8. Which of the following exercises has been shown to prevent drooling?**

- A. Tongue lateralization exercises
- B. Tongue range of motion exercises
- C. Straw drinking
- D. Jaw strengthening exercises

**9. Which of the following is NOT true regarding the muscles involved in swallowing?**

- A. Most muscles involved in swallow are Type I muscle fibers.
- B. Most muscles involved in swallow are Type II muscle fibers.
- C. Neuromuscular electrical stimulation targets Type II muscle fibers first.
- D. Exercises for swallow must consistently challenge the patient with an increased workload.

**10. Which of the following is NOT true regarding lip closure?**

- A. It predicts drooling
- B. It creates positive pressure for bolus propulsion
- C. It creates negative pressure for bolus propulsion
- D. Oral motor exercises have been proven effective in the treatment of lip closure

**11. Which of the following is NOT true regarding the buccinator muscle?**

- A. It narrows the oral cavity, creating positive pressure
- B. It narrows the oral cavity, creating negative pressure
- C. It is part of the muscular sling involved in bolus propulsion
- D. It keeps the food on the teeth while chewing

**12. The gag reflex affects feeding in what way?**

- A. Its integration facilitates social interactions for speech production
- B. Its integration facilitates children chewing on toys for tongue lateralization
- C. Its integration facilitates children chewing on toys for lip strength
- D. Its integration facilitates bilateral hand coordination for pacifier use

Now that you have selected your answers, you are only one step away from earning your CE credit.

*Click here to earn your CE*