Assessment and Intervention for Dysphagia in Infants and Children: Beyond the Neonatal Intensive Care Unit

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ABSTRACT

Over the last 10 years, the assessment and intervention for feeding and swallowing problems in infants and children have attracted increased attention on a national and international level. Increases in the population of children with dysphagia are due, in large part, to advances in medical and surgical management of at-risk term infants, improved medical support for viability of younger and smaller preterm infants, and increases in the number of children on the autism spectrum. Because of legislative initiatives, settings in which children are seen for assessment and intervention have shifted, with services provided more often in the natural environments of homes, daycares, preschools, and schools, as well as in hospitals and outpatient clinics in the United States. Assessment of infants and children with dysphagia continues to include clinical and instrumental evaluations with clinical assessment including a specific focus on the feeding environment. Speech-language pathologists are increasingly assuming consultative roles to support the needs of children in all settings. Areas for further research in the era of evidence-based practice include efficacy of oral exercises and other intervention strategies.

KEYWORDS: Pediatric, dysphagia, swallowing, feeding, assessment, intervention

Learning Outcomes: As a result of this activity, the reader will be able to (1) discuss major shifts in care of infants and children with dysphagia in the last 10 years, (2) incorporate new knowledge of clinical assessment and intervention into their practices, and (3) use information regarding populations, federal mandates, settings, and team relationships to enhance professional skills.


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In this article, we will focus on assessment of infants and young children and intervention for their dysphagia from the time they leave the neonatal intensive care unit (NICU) or newborn nursery through preschool. Changes in the field will be highlighted with evidence accrued in the last 10 years. The skills for children to ingest healthy nutrients safely, easily, and happily are of great importance to parents in their wishes for their children and their feelings of accomplishment as caregivers. Oral skills needed for successful drinking and eating evolve with age and the acquisition of other developmental skills, and in relation to the expectations and skills of others in the child’s environment. When oral feeding does not follow a typical path or timeline, it may have implications for caregivers, speech-language pathologists (SLPs), medical professionals, state and federal lawmakers, and adherence to recommendations from World Health Organization.1

Although recognition of feeding and swallowing problems has increased over the past decade, research on assessment and intervention for feeding and swallowing disabilities in infants and children continues to be limited. The paucity of data has resulted in many SLPs basing their practices on what is known about typical development or from information extrapolated from research conducted with adults with dysphagia. The latter approach is used despite differences in the anatomy and physiology of the developing versus mature system and between learning new versus previously acquired skills.

This population of infants, toddlers, and preschoolers with feeding difficulties is significant in number and the incidence is increasing. Manikam and Perman2 reported on studies that identified feeding disorders in 25% of typically developing children and 80% of children with developmental disabilities. Medical advances have sustained infants with extremely low birth weights and prematurity,3 and some of those children continue to exhibit feeding problems through school age. In addition, the incidence of children identified on the autistic spectrum has increased from 10 to 17% per year in the United States.4 These children often exhibit food refusal that is attributed to their perceptual and sensory processes or unidentified gastrointestinal (GI) conditions.5

The settings in which intervention occurs have also changed with implementation of a federal early intervention (EI) mandate, the Individuals with Disabilities Education Act (IDEA) of 1997, and its reauthorization in 2004.6 Sites for intervention in the United State now include homes, daycare facilities, preschools, and schools, as well as the more traditional medical settings. Implementation and funding of this mandate vary among states. IDEA mandates that services to children be provided in the least restrictive environment. Most EI services, including feeding and swallowing intervention in the first three years of life (Part C of IDEA), occur in the child’s home. From 3 through 5 years of age, children may receive therapy in preschools, center-based programs, integrated programs, daycare facilities, or family homes (Part B of IDEA). Further, IDEA Part B states that services should be provided only to support the child’s functioning for educational purposes. An argument can be made for oral feeding services if they promote adequate nutrition status that underlies health and brain growth, thereby supporting educational purposes. U.S. Supreme Court rulings support the need for nutritional maintenance at school, including cases of children maintained on non-oral feedings.7,8 Services in these community settings should be coordinated with assessment and intervention efforts performed in medical settings. In all settings, SLPs may assume a variety of roles: provider of direct intervention with the child, consultant to the family and other team members, and referral source. Over the last 10 years, SLPs have increasingly assumed the role of consultant. In addition, the SLP may also act as coordinator for a variety of services supporting the feeding skills in young children.

In this population, feeding and swallowing interventions usually occur during three distinct, but overlapping time periods and settings, each of which typically coincides with unique developmental periods: (1) the transition period after coming home from the hospital when the focus is on consolidation and refinement of suck–swallow–breathe patterns, (2) home-based environment when the
focus is on advancing to textured foods, and (3) transition from home to preschool programs, when the focus is on generalization of previously learned skills to a wider range of social environments. Developmental patterns addressed during each time period and setting are determined by the skills of the child, parents’ expectations, cultural norms surrounding the family, and medical and health care needs. In this article, the term early intervention will be used to describe services for infants and toddlers from birth through 2 years of age and preschool programs to describe services for children 3 through 5 years old.

TRANSITION: HOME FROM THE HOSPITAL
The idyllic image of a well-fed infant and happy parents arriving home after birth is one possible scenario, but probably not the one that is likely to require direct interventions for feeding and swallowing problems. Infants requiring ongoing intervention are often those who spent time in a NICU and whose caregivers are now faced with trying to nourish an infant who may have difficulty with suck–swallow–breathe coordination or weight gain. Infants born without any obvious risk factors may develop feeding difficulties and require similar assessments and interventions as those for whom the possibility of dysphagia could have been predicted during the neonatal period.9,10

Professionals need to be supportive of caregivers’ needs as well as those of children because the experiences and skills of each will influence the other.11–13 Parents may be in a period of grieving that must be respected. Professionals may need to help caregivers learn new skills because caregivers will be in charge of following through with intervention recommendations. Conversely, SLPs also may need to develop skills to support and coach caregivers.14

Assessment during Transition Home from the Hospital
Assessment begins with a history and observation of present feeding patterns with particular scrutiny centered on the reasons for referral. Although there is no standardized assessment tool, varied checklists and formats are available to provide guidelines for obtaining a history and pertinent current information, observing feeding (oral-motor, sensory aspects, swallowing, and respiratory coordination), and initiating possible medical referrals for additional evaluations.15,16

SLPs recommend an instrumental assessment, such as the videofluoroscopic swallow study (VFSS), when there are concerns regarding the pharyngeal phase of swallowing and possible aspiration in an infant or child.17 Clinical indicators for use of instrumentation in assessment and intervention have been previously published.18,19 The SLP prepares the child for a meaningful and reliable study by maximizing the child’s likelihood of participating in the evaluation, and prepares the caregivers by explaining the reasons for referral and what may be learned.

Intervention during Transition Home from the Hospital
Both breast- and bottle-fed infants may demonstrate ongoing or new concerns about adequate intake and weight gain. Breastfeeding is often difficult to establish with preterm or medically fragile infants. Although the number of mothers choosing to offer breast milk to their preterm infants is increasing, many do not sustain that effort for a variety of reasons.20 Expressed breast milk via tube or nipple may provide infants with critical nutrition that is readily digestible and offers immunological protection. Breastfeeding support may be provided by SLPs working with a lactation consultant to assist mother and infant dyads.

Whether infants are breast or bottle fed, coordination of suck–swallow–breathe requires exquisite timing. This coordination has been described in multiple sources.21,22 Interventions to improve suck–swallow–breathe patterns have been described with limited evidence. Common interventions focus on environmental modifications, oral–motor stimulation, and feeding routine modifications (Table 1). Adults should strive for a calm environment that will support the infant’s focus on eating, and ability to have a pleasurable and nonstressful feeding experience.12 Interventionists observe the infant’s...
reactions and assist caregivers in making appropriate adaptations.

Feeding-routine modifications may focus on positional needs, selection of nipples and bottles, alterations in the characteristics of the breast milk or formula, and pacing of feeding (Table 1). Some changes in position influence coordination of respiration and swallowing.\textsuperscript{23,24}

<table>
<thead>
<tr>
<th>Focus</th>
<th>Intervention</th>
<th>Potential Benefit</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modifications of environment and prefeeding conditions</td>
<td>* Introduce arousal or calming techniques as appropriate</td>
<td>* May help infant remain awake/alert and take an active role in feeding (Note: Infant may be more alert if awakens spontaneously)</td>
<td>* Gently rock baby</td>
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<td></td>
<td>* Position w/head above hips + head/neck in neutral posture</td>
<td>* May improve behavioral organization</td>
<td>* Softly speak near either ear</td>
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<td>* Position to contain extremities</td>
<td>* May support “optimal” breathing patterns</td>
<td>* Dim lighting</td>
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<tr>
<td>Oral-motor stimulation/support</td>
<td>* Elicit reflexes</td>
<td>* May provide comfort for organization of skills</td>
<td>* Swaddle infant</td>
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<td></td>
<td>* Stimulate non-nutritive sucking</td>
<td>* May increase alertness</td>
<td>* Stroke infant’s cheek to elicit rooting reflex</td>
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<tr>
<td>Feeding routine modifications</td>
<td>* Provide chin/cheek support</td>
<td>* May assist active tongue movement during sucking</td>
<td>* Stroke tongue</td>
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<tr>
<td></td>
<td>* Select appropriate nipples/bottles</td>
<td>* Supports jaw stability</td>
<td>* Gently introduce finger or pacifier into mouth</td>
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<tr>
<td></td>
<td>* Modify viscosity of fluid</td>
<td>* May enhance bolus expression from nipple in some preterm infants</td>
<td>* Place one finger under chin and two fingers on cheeks</td>
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<tr>
<td></td>
<td>* Introduce pacing techniques</td>
<td>* Adjusts rate of fluid flow</td>
<td>* Use nipples w/specific flow rates (Caution: Avoid enlarging nipple holes use x-cut or specialized available nipples)</td>
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<tr>
<td></td>
<td></td>
<td>* May slow flow rate</td>
<td>* Cautious introduction of thickened fluids</td>
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<tr>
<td></td>
<td></td>
<td>* May enable infant to coordinate suck/swallow/breathe sequences</td>
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<tr>
<td></td>
<td></td>
<td>* Adjusts flow and regulates rate of bolus delivery for swallowing</td>
<td>* Insert pauses into feeding by tipping bottle to slow/stop fluid flow</td>
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<tr>
<td></td>
<td></td>
<td>* May prevent premature leakage of bolus or apneic event</td>
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Table 1 Common Interventions for Infants with Feeding and Swallowing Disorders
Clinicians need to assess carefully the impact of changes in position on ease of breathing. The best position for breathing is often the best position for feeding, although this may need to be verified by an instrumental study.¹⁸

Two recent studies reported positive outcomes in supporting oral feeding in infants who were treated with passive oral-motor exercises including stroking the cheeks, lips, gums, and tongue.²⁵,²⁶ Replication of these data, in carefully controlled clinical trials, is needed to support use of these techniques and the relationships between specific types of oral-motor stimulation and definable feeding outcomes.

Temporal aspects of feeding and control of bolus flow from the mouth through the esophagus may be modified by pacing during breast or bottle feeding.²⁷ Specific nipples and bottles and fluid characteristics may also affect the timing of swallowing. For some infants, thickened feedings may be recommended to facilitate better airway protection. There is no consensus about how or how much to thicken liquid. Various thickening agents are available, including rice cereal and commercial thickening products. Prethickened formulas are also available. Viscosity recommendations vary depending on the agent used and the rationale for thickening.²⁸,²⁹ An instrumental swallowing evaluation is often needed to determine the impact of changes in liquid viscosity on swallowing.¹⁷,¹⁸ Additionally, medical and dietary input is necessary before implementation of any changes in the characteristics of breast milk or formula.

**THE HOME-BASED ENVIRONMENT**

Older infants, who had difficulty with feeding in the first few weeks of life, often continue to have problems when they transition to textured foods in the second half of the first year of life.⁹ Others, NICU graduates and term infants, who managed oral feeding relatively well during the first few months of life may develop problems when it is time to increase the volume of fluid intake or transition to spoon or finger feeding. Children referred to EI in the United States enter at an average of 15.7 months of age, although parents usually began voicing concerns by 7.4 months.³⁰

Common concerns include, but are not limited to, not eating enough to sleep through the night, failure to accept pureed food at expected times, and difficulty managing chewable foods.

These children frequently present with multiple problems. Interventions need to first target the most critical medical problems. Even in the absence of major problems, there may be several minor problems.³¹ Although each minor problem alone may not interfere with successful feeding, the cumulative impact of multiple problems may affect a child’s willingness to eat or accept new textures. Clinicians may need to address each area of concern. Funding sources and local legislation will have an impact on therapeutic options.

**Assessment in a Home-Based Environment**

An understanding of underlying diagnostic conditions and their impact on a child’s ability to learn to eat is a critical factor in the assessment process. There are a variety of assessment tools available,³²–³⁴ although no standardized clinical methods are available for the assessment of tone, strength, and range of movement of the speech and swallowing musculature.³⁵ In addition, clinicians need to be mindful of skills needed immediately versus those that should develop in the future because the latter may require prerequisite practice.

SLPs need to advocate for referrals to the appropriate specialists when specific aspects of feeding and swallowing problems are not within the purview of the SLP. Common issues that usually require the expertise of other specialists may include, but are not limited to dental problems; vomiting, regurgitation, or reflux; constipation or diarrhea; or exacerbation of respiratory problems. It is the SLP’s responsibility to determine how to request a referral in a specific setting.

**Intervention in a Home-Based Environment**

Airway safety and adequate nutrition and hydration status are top priorities for all children
with oropharyngeal dysphagia. All interventions must support these goals (Table 2). Oral-motor interventions for skills underlying eating and drinking are modeled on what is known about the typical development of oral-motor skills. Introduction of spoon feeding requires maturation of lingual movements, sufficient postural support, and an ability to tolerate intake of pureed foods.33,36 Some children may require specialized positioning such as a firm seat that supports the trunk, hips, and feet and allows for stability. The need for optimal positioning is more critical if a child has severe cerebral palsy, or if an instrumental swallowing evaluation has demonstrated safer swallowing in a specific position.23,24

Transition to chewing may be particularly challenging for children with developmental delays or disorders. These children are likely to have experienced non-nutritive stimulation that differs from stimulation experienced by typically developing children. For example, some may have needed medical interventions that resulted in painful or invasive experiences in or around their mouths and others may have had limited ability to explore the environment because they were unable to bring their hands to their mouths. In contrast, typically developing young children explore their worlds by putting a variety of objects into their mouths as they chew on their fingers, crib rails, and anything else they get their hands on. This “oral play” is thought to result in a diminution of a gag response, increased strength, acceptance of varying sensory stimuli, and practice of chewing movements. Whereas most typically developing children learn these skills quickly, children with feeding or swallowing problems and particularly those with neurodevelopmental delays may require more trials over a longer time to develop comparable skills. Ideally, key elements of eating and drinking should be established by the time services are transitioned outside the home so that efforts in a preschool environment can be directed toward generalizing previously learned skills to wider social environments. Nonetheless, careful monitoring of children with chronic swallowing dysfunction is critical for ensuring adequate nutrition and hydration, and promoting optimal motor, cognitive, language, and affective development. Long-term problems will require ongoing support; hence, SLPs often assume an

**TRANSITION TO PRESCHOOL PROGRAMS**

Ideally, key elements of eating and drinking should be established by the time services are transitioned outside the home so that efforts in a preschool environment can be directed toward generalizing previously learned skills to wider social environments. Nonetheless, careful monitoring of children with chronic swallowing dysfunction is critical for ensuring adequate nutrition and hydration, and promoting optimal motor, cognitive, language, and affective development. Long-term problems will require ongoing support; hence, SLPs often assume an
Table 2 Common Interventions for Children with Feeding and Swallowing Disorders

<table>
<thead>
<tr>
<th>Phase</th>
<th>Intervention</th>
<th>Potential benefit</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modifications of environment and prefeeding conditions</td>
<td>• Introduce calm/relaxed environment</td>
<td>• Reduction in distractions may allow for improved focus on mealtime activities</td>
<td>• Position child in quiet area</td>
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<td></td>
<td>• Coordinate meals with appropriate social interactions</td>
<td>• Provides models for tasting and eating foods, exposure to new foods</td>
<td>• Turn off TV or radios</td>
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<td>• Position seated upright or trunk slightly reclined with head/neck in neutral or slightly flexed posture</td>
<td>• Provides trunk support and stability</td>
<td>• Eat with family, at school, in restaurant</td>
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<td>• Provide foot support if possible</td>
<td>• May support optimal breathing patterns</td>
<td>• Adapt home seating (e.g., towel rolls)</td>
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<td></td>
<td>• Use suitable utensils</td>
<td></td>
<td>• Use specialized seating equipment, if available</td>
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<tr>
<td>Oral-motor stimulation/support</td>
<td>• Provide non-nutritive exercise, if appropriate</td>
<td>• Adapted utensils, dinnerware, or cups may assist in independent feeding</td>
<td>• Use built-up spoons, bowls with nonskid base, cut-out cups as appropriate</td>
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<tr>
<td></td>
<td></td>
<td>• May provide practice for motor skills</td>
<td>• For spoon feeding, stroke tongue with spoon</td>
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<tr>
<td></td>
<td>• Introduce textures appropriate to developmental skill</td>
<td>• May reduce potential for choking or gagging</td>
<td>• For chewing, introduce appropriate utensil on molar surfaces or between cheek and tongue</td>
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<td></td>
<td>• Modify taste, color, temperature, flavor of foods</td>
<td>• Exposes child to new foods &amp; tastes</td>
<td>• Gradual changes in one component at a time, as tolerated by individual child</td>
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<tr>
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<td>• Manipulate shape and size of solid bolus</td>
<td>• Allows child to develop or express preferences</td>
<td>• Slow introduction of difficult to chew items (e.g., apples may be cooked, dried, placed in gauze)</td>
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<tr>
<td></td>
<td>• Place food on molar surfaces</td>
<td>• May promote more effective &amp; efficient chewing</td>
<td>• Cautiously place small stick-like shapes (e.g., cheese, pretzel, cooked carrot) on the side of the mouth</td>
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</table>
important role facilitating safe and efficient feeding in preschool-aged settings.\textsuperscript{39}

Assessment in Preschool Programs
Many preschool children with feeding disorders have identified diagnostic conditions and intervention plans by the time they enter school-based programs, particularly if they were followed when younger. In contrast, some children may be identified at older ages when they are evaluated for other delays, most notably speech and language deficits. Regardless of when children are identified as having problems, assessments may be needed to develop new or modify previously established interventions.

Table 2 (Con’t)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Intervention</th>
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<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeding routine modifications</td>
<td>• Modify rate of fluid delivery</td>
<td>• May improve flow rate</td>
<td>• Apple juice thickened with applesauce</td>
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<td></td>
<td>• Offer 3 meals and 2–3 snacks daily as tolerated</td>
<td>• Smaller, more frequent meals and snacks may accommodate children’s intake patterns</td>
<td>• See USDA guidelines for children re: quantities and food groups*</td>
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<td>• Offer easier textures as the child tires</td>
<td>• May reduce fatigue and risk of aspiration</td>
<td>• Begin with chewy texture then move to puree</td>
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<td></td>
<td>• Alternate dry/wet and soft/solid textures</td>
<td>• May facilitate clearance of food</td>
<td>• Alternate sips of liquid with tastes of pureed (e.g., applesauce) or solid foods (e.g., chicken, crackers)</td>
</tr>
<tr>
<td></td>
<td>• Modify bolus for airway protection as determined by instrumental assessment</td>
<td>• May promote safe swallowing</td>
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Because of the emphasis on functional abilities in EI and preschool programs, evaluations are usually performed as part of a multidisciplinary team. Teams typically include a special educator and an occupational or physical therapist, as well as a SLP. The funding agency often prescribes the use of evaluation tools, which may not include assessment of feeding and swallowing skills. When children present with concerns that were not addressed during routine evaluations, the SLP needs to find appropriate means for assessing feeding and swallowing function. The SLP may be the professional to observe lengthy and arduous oral feedings, exhausted caregivers and intractable food refusal, and bring this information to the
attention of the team. A feeding and activity diary that documents a child’s intake, trajectory of weight gain, and energy level may be helpful in establishing the need for supplemental nutrition. A clinical feeding assessment may be sufficient, unless there are indications of a pharyngeal phase problems that may include a risk of aspiration. A VFSS or other medical referral may be needed.

Parents participate in the development of goals for Individualized Education Plans along with school staff. Ethical considerations may be raised when the family and professionals have conflicting goals and different views regarding safe oral feeding.

**Intervention in Preschool Programs**

Current practices strongly favor inclusion of preschool children with disabilities in typical classrooms and for mealtimes and intervention services to be provided within the classroom. A multi- or transdisciplinary team approach to intervention is logical in this setting. Mealtimes can be structured as social occasions for promotion of developmentally appropriate interactive skills. Children on the autism spectrum may benefit particularly from exposure to new foods and social interactions. Adaptive feeding equipment should be tailored to the individual child’s size and developmental needs. In addition, the SLP may devise opportunities for children with swallowing dysfunction to practice functional therapeutic activities (Table 2).

**SUMMARY**

During the past decade, the number of children with feeding and swallowing problems has increased. Practice patterns for assessment and management of infants and children with dysphagia have changed as a result of shifts in service settings, legislative initiatives, and the population of children needing these services. Despite these changes, limited data are available to guide clinicians in the care of this population. This article reviewed assessment and intervention considerations for infants and young children from the time they transition home from the NICU or newborn nursery through enrollment in preschool settings.

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