

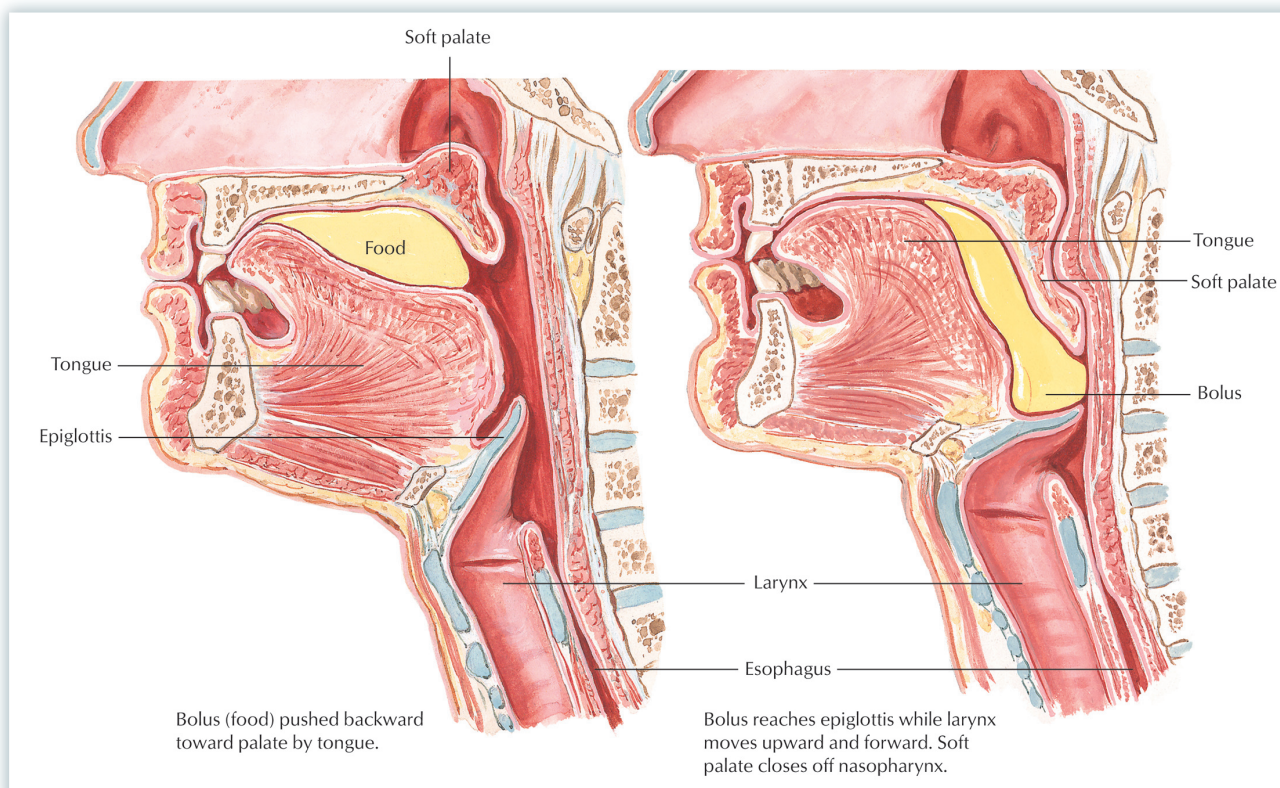
Managing Dysphagia Through Diet Modifications

Evidence-based help for patients with impaired swallowing.

Oscar Smith, age 68, suffered a stroke two days ago. Although he was quickly stabilized, his apparent difficulty swallowing (as evidenced by frequent coughing, drooling, and pocketing of meat chunks) caused concern among the nursing staff. (This case is a composite based on the authors' experiences.) As a result, his physician ordered his regular diet changed to one of pureed foods and nectar-thick fluids pending further testing by the speech-language pathologist. But his wife continues to offer him sips of her coffee and bites of his favorite get-well candies and cookies, not realizing that these are now extremely

dangerous for him. It's up to the nursing staff to explain the importance of dietary modification to the Smiths until the other members of the health care team, such as the dietitian, provide further counseling.

Mealtime may normally be the least taxing part of a patient's day, but for someone with dysphagia—impaired swallowing—that seemingly innocuous tray of food becomes a stressful proposition. Difficulty swallowing isn't only inconvenient and embarrassing; over time, it can also lead to malnutrition,^{1,2} dehydration,² aspiration pneumonia,³⁻⁶ and even death.⁷



OVERVIEW: Dysphagia can lead to malnutrition, dehydration, aspiration pneumonia, and even death. The condition has diverse causes and symptoms vary widely. Nurses are likely to encounter patients with dysphagia in various settings, including acute care medical units, rehabilitation centers, and skilled nursing facilities. Dietary modification—altering the consistency of foods and liquids—is a fundamental aspect of dysphagia management. This article describes normal and impaired swallowing, discusses several types and levels of dietary modification, and offers readers a concise list of nursing considerations.

Keywords: dysphagia, impaired swallowing, dietary modification, malnutrition, aspiration pneumonia

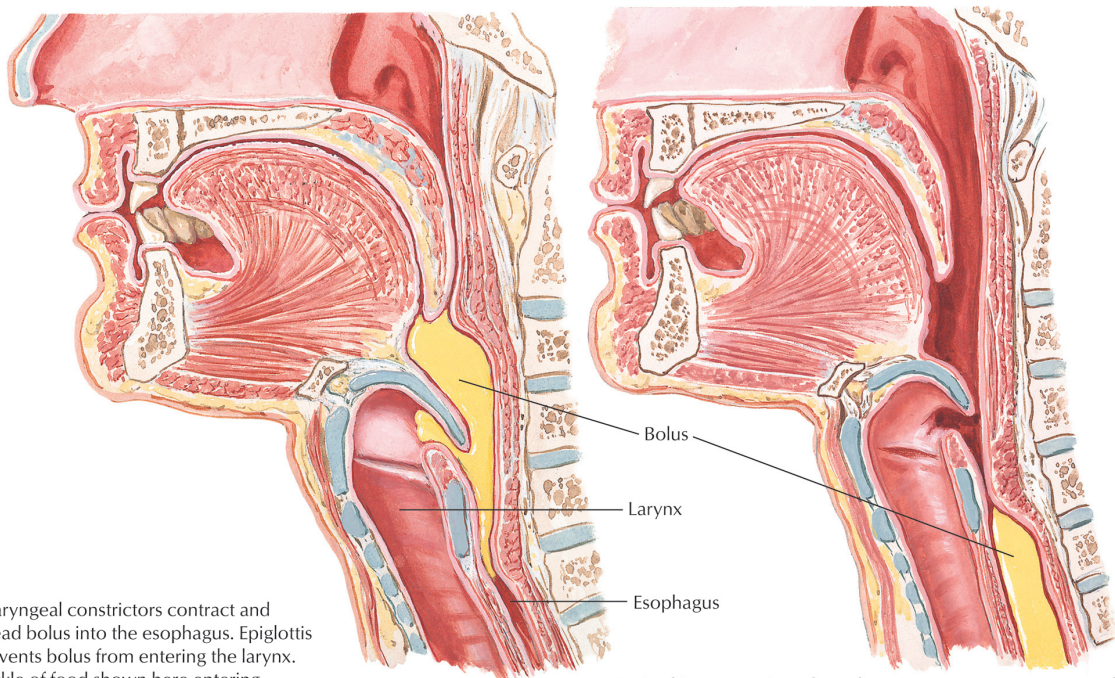
Because dysphagia has diverse causes, nurses are likely to encounter it in numerous settings, including acute care medical units, rehabilitation centers, and skilled nursing facilities. And while the management of dysphagia is multidisciplinary, it's the nurse who is most likely to be in frequent contact with the patient and can best observe and identify any swallowing difficulties.

WHO HAS DYSPHAGIA?

In a survey of primary care patients in a clinic waiting room, nearly 23% reported symptoms of dysphagia; the prevalence increased with age.⁸

Dysphagia may be oropharyngeal or esophageal. Oropharyngeal dysphagia—characterized by difficulty in safe transfer of a liquid or food bolus from the mouth to the esophagus—often occurs in patients who've had acute neurologic damage as a result of stroke or traumatic brain injury, or in those with progressive neurologic disease such as amyotrophic lateral sclerosis or Parkinson's disease. A recent study found that dysphagia in patients with acute stroke ranges from 51% to 55% (when using clinical testing) and

Figure 1. Normal Swallowing



Pharyngeal constrictors contract and knead bolus into the esophagus. Epiglottis prevents bolus from entering the larynx. Trickle of food shown here entering esophagus.

Peristaltic contraction of esophagus moves bolus toward stomach, and epiglottis begins to return to resting position.

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from 64% to 78% (when using instrument testing).⁵ Other studies of patients with acute stroke echo these findings, with dysphagia present in 53% to 57%.^{9,10} And approximately 300,000 to 600,000 people with neurologic disorders develop dysphagia each year in the United States, according to a 1999 report by the Agency for Health Care Policy and Research (now the Agency for Healthcare Research and Quality).¹¹

Esophageal dysphagia—characterized by difficulty in passing food down the esophagus—is common in patients with a motility disorder, sphincter abnormality, or mechanical obstruction caused by a stricture.

Because the likelihood of stroke, as well as of other diseases associated with dysphagia, increases with age, dysphagia is most common among the elderly.^{12,13} In a survey of older adults living independently, 33% reported having problems swallowing.¹⁴ A Japanese study of community-dwelling older adults found that nearly 14% had dysphagia.¹⁵ The management of dysphagia is becoming increasingly important as the elderly population continues to grow. According to the U.S. Census Bureau, 20% of the population will be age 65 or older by 2050.¹⁶

NORMAL SWALLOWING

Swallowing requires well-coordinated timing of sensory and motor mechanisms to safely transport a bolus through the oral cavity, pharynx, and esophagus (Figure 1). Major components include:

- **Bolus preparation.** Although liquids need little or no preparation, initial containment within the oral cavity (lip closure to prevent leakage and tongue control to prevent spillage into the pharynx) is essential. Chewing consists of a series of neuromuscular actions that contribute to the preparation of a solid bolus and include adequate rotary, lateral jaw motion to enhance mastication, along with tongue control to manipulate the bolus. Bolus preparation is influenced by several factors including bolus consistency, bite size, and the ability to mix the bolus with saliva.
- **Propulsion of a bolus.** Motor control of the tongue is important to effectively control and transport the prepared bolus toward the back of the oral cavity.
- **The pharyngeal swallow,** which reflects a complex interaction of events. The patient's age and

the bolus type and volume all affect the temporal relationship of the following¹⁷:

- soft palate retraction and elevation to prevent material from entering the nasal cavity
 - hyoid and laryngeal elevation and anterior movement to enhance relaxation of the upper esophageal segment
 - laryngeal closure (thanks to the epiglottis, false vocal folds, and true vocal folds) to protect the airway from possible penetration or aspiration of the bolus
 - contraction of the three pharyngeal constrictors to help propel the bolus through the pharynx
 - movement of the base of the tongue toward the posterior pharyngeal wall, which applies additional pressure to move the bolus
 - opening of the upper esophageal segment to allow the bolus to enter the esophagus
- **Continued propulsion and clearance.** In this final phase, the bolus passes through the esophagus until it's cleared into the stomach.

IMPAIRED SWALLOWING

Detecting dysphagia. Symptoms of impaired swallowing vary greatly.¹⁸ For example, patients who have difficulty with bolus preparation and propulsion may show signs such as drooling, leakage of liquid or food while eating, or having food stuck in the mouth (often described as “pocketing”). Coughing while drinking or

eating (before, during, or after the pharyngeal swallow) is always a concern; this may be a result of numerous problems, including a slow swallow response, poor laryngeal closure to protect the airway, or ineffective bolus clearance by the pharyngeal constrictors. It's important to note that nearly 55% of patients who aspirate don't cough or show any overt symptoms of aspiration (described as “silent aspirators”).¹⁹

Some patients may feel that food or pills are getting “stuck” in their throat. Others may exhibit a noticeable change in their voice (which may sound “wet” or hoarse) when eating or drinking.

Complications of untreated dysphagia. Aspiration occurs in about half (43% to 54%) of patients who've had a stroke, 37% of whom develop pneumonia, which results in death for about 4%.³ In a recent study, 72% of patients with aspiration pneumonia acquired in continuing care facilities had a neurologic

Patients with dysphagia have a longer hospital stay than nondysphagic patients; in addition, they're more likely to be discharged to other care facilities (as opposed to home).

Table 1. Food Textures that Affect the Management of Dysphagia²⁶

Food Texture	Description	Example
Adhesiveness	Effort required to overcome the adhesion of the food to the palate	Removing peanut butter from the palate requires more effort than removing marshmallow fluff
Cohesiveness	Whether food is deformed or sheared when compressed	Pudding is more cohesive than a gelatin dessert
Firmness	Force needed to compress a semisolid food	Cream cheese requires greater effort to compress than whipped cream
“Fracturability”	Force required to break a solid food	In response to a bite, peanut brittle fractures into pieces while a corn muffin crumbles
Hardness	Force required to compress a food to attain a certain deformation	Chewing a hot dog just prior to shearing
Springiness	Rate or degree that a food returns to its original shape after being compressed	Spring of marshmallow released in the mouth
Viscosity	Rate of flow per unit of force	Thickness of water vs. a milk shake
Yield Stress	Minimum shear stress applied before flow begins	Effort of ketchup to flow from a bottle vs. water

disease that resulted in dysphagia, and 24% of all patients with aspiration pneumonia (acquired in community or in continuing care facilities) died.⁶

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Dysphagia can also affect a patient's quality of life and emotional well-being. A multinational European survey of 360 patients found that dysphagia made life less enjoyable for 55% of respondents. In addition, 41% reported experiencing anxiety or panic during meals, and 36% said they tended to avoid having meals with others because of their symptoms. Half of the respondents reported eating less, and one-third said they stopped eating even though they still felt hungry. The authors concluded that “patients attributed their increased sense of isolation and loss of self-esteem to swallowing difficulties.”²¹ Other researchers concur on the importance of eating and drinking to quality of life. Humbert and Robbins suggest that “dysphagia is becoming a national health care burden and concern.”¹³

MANAGEMENT

If dysphagia is suspected, the physician, typically in collaboration with the speech-language pathologist, will run a series of tests. Evaluation often consists of a clinical assessment conducted by the speech-language pathologist; this may be followed by instrumental measures such as a modified barium swallow,

conducted with the participation of a radiologist. If dysphagia is confirmed, a management plan needs to be instituted.

Multidisciplinary management of dysphagia is recommended for both children and adults and may include a number of interventions. Some measures seek to improve the physiology of the patient's swallow while others strive to redirect bolus flow. For example, the speech-language pathologist may recommend a change in the patient's head position, such as a head rotation or a chin-down position, in order to direct bolus flow away from the airway entrance.²¹ The pathologist may also suggest “double or repeat swallow,” which requires the patient to use additional swallows to help clear any remaining bolus from an unprotected airway.²² The nursing staff should ensure the consistent implementation of these interventions.

Dietary modification—altering the consistency of foods and liquids—is a fundamental aspect of dysphagia management. Dietary modification is most effective when implemented by a team, including a nurse, physician, speech-language pathologist, dietitian, and occupational therapist. However, each professional's role may vary according to the standards of various health care facilities and the licensure requirements of each state.

The nurse is essential to the team, as she or he is in closest contact with the patient and can best monitor the diet's implementation as well as any ensuing problems; the speech-language pathologist typically makes treatment recommendations to the patient's

physician that may include texture modifications to food and/or drink; the dietitian ensures that those clinical recommendations are balanced with the nutritional needs of the patient and monitors the patient's caloric and nutritional intake, selects the specific foods and liquids best suited to the patient's dietary needs, and manages the staff that prepares the food; and the occupational therapist helps to improve eating and drinking by considering the patient's motor and sensory skills and adapting the environment to the patient's needs.

The degree of dietary modification should be based on each patient's swallowing capacity and must be regularly evaluated and adjusted. Recommended methods of fluid and food modification are numerous and often vary from one care setting to another. Concerns over the lack of standardization led to the formation of the National Dysphagia Diet Task Force, and to the publication in 2002 of the National Dysphagia Diet (NDD) by the American Dietetic Association. While this publication has gone a long way to standardize dietary modification for dysphagia, additional peer-reviewed studies are needed to support its recommendations.

In this article we use the terms and labels defined by the NDD, while acknowledging that they may be different from those defined by other dysphagia diets.

Altering solids. Texture represents the composition of a food item. Bourne defined textural properties to include a "group of physical characteristics that arise from the structural elements of the food, are sensed primarily by the feeling of touch, are related to the deformation, disintegration, and flow of the food under a force, and are measured objectively by functions of mass, time, and distance."²³ It's estimated that in nursing homes, food textures are modified for 31% to 48% of patients.^{24,25}

The NDD identifies food textures that should be taken into consideration when deciding how to modify diet for a patient with dysphagia.²⁶ These include

adhesiveness, cohesiveness, firmness, "fracturability," hardness, springiness, viscosity, and yield stress (see Table 1²⁶).

Levels of texture modification. Food texture is often modified according to a patient's oral motor control. The NDD prescribes four levels of modification, with level 1 for patients with significant impairment in control, levels 2 and 3 for patients with some ability to chew, and level 4 for patients able to eat an unrestricted, regular diet (for details, see Table 2²⁶).

Some researchers have speculated that certain diets (particularly those consisting of pureed foods) may be visually unappealing and lacking in taste. These foods may also feel unpleasant in the mouth.²⁴ Efforts to overcome these unappealing qualities have had inconsistent results: for example, some studies have shown that "molding" food into familiar shapes may help improve eating,^{27,28} while others have found that such measures have little effect.^{29,30}

The NDD encourages the use of standardized recipes to ensure that foods are modified in a consistent manner. For example, without a standard recipe, mashed potatoes may end up being too dry or too sticky from one meal to the next, causing difficulties for the patient with dysphagia.

Additional factors that may contribute to the need for dietary modification include problems with teeth or dentures, mental or behavioral disorders, and post-surgical care.

Altering liquids. The fast transit of thin liquids such as water, coffee, or juice creates risks for some patients, particularly those with poor motor skills who are unable to contain fluids in their mouths, those with slow or irregular pharyngeal response, those with compromised airway protection, and those with reduced cognitive awareness. When modifying liquids, the objective is to create a consistency that matches, as much as possible, the patient's capacity for swallowing.

The NDD includes standard labels and suggested ranges for various liquid consistencies. Measured in

Table 2. The Levels of Dietary Modification as Defined by the National Dysphagia Diet²⁶

Dietary Modification	Description
Level 1: Pureed	Pureed, homogenous, and cohesive (pudding-like) foods, not those that require bolus formation, controlled manipulation, or mastication
Level 2: Mechanically Altered	Moist, soft-textured foods that are easily formed into a bolus; meats that are ground or minced (pieces no larger than one-fourth of an inch) but are moist with some cohesion; level 1 food items are also allowed
Level 3: Advanced	Nearly all textures except for hard, sticky, or crunchy foods; foods still need to be moist and bite-size
Level 4: Regular	All foods

units of viscosity called centipoises (cP), these consistencies are classified as follows: thin (1 to 50 cP), nectar-like (51 to 350 cP), honey-like (351 to 1,750 cP), and spoon thick (greater than 1,750 cP).²⁶

Although some modified fluids are available for purchase in a ready-to-serve form (such as prethickened water or orange juice), only one-third of facilities use these exclusively; others rely to some extent on thickeners that are mixed with a fluid to achieve a target level of consistency.³¹ Commercially available thickening agents (ready-to-serve, powdered, or gel thickeners) don't specify viscosity ranges, meaning that target levels of consistency may or may not fit the suggested ranges of the NDD even when prepared to specification.³²⁻³⁴

thicken in a different manner when mixed with starch than water and apple juice do. Because orange juice has pulp, it naturally results in a slightly thicker drink. It also contains acid that can bond with the starch particles, rapidly thickening the juice, but causing the bonds to break down over time (hours or days). Gums, in contrast, are more stable.²⁶ Their masses of strands capture fluid between them, and they are less likely to interact with the base fluid.³³ However, some drinks, such as adult nutritional beverages, contain ingredients that may interact with the gum thickener and form clumps.

Achieving the target level of thickness is further complicated by preparation. Labels with unclear guidelines may lead to variable results.³⁶ Furthermore, many health care providers aren't formally instructed

Thickeners may negatively affect the flavor and texture of drinks, making them less appetizing to patients. It's therefore essential that fluids be modified to the appropriate consistency and according to each patient's swallowing capacity.

Starch-based thickeners. When preparing modified liquids, it's important to note whether the thickening agent is starch- or gum-based. Starch particles expand like a balloon by capturing the fluid, meaning that fluids prepared with starch-based thickeners often keep absorbing more liquid and get thicker after their initial preparation.³³⁻³⁵ Consequently, a modified drink prepared with a starch-based thickener 20 to 30 minutes prior to mealtime may be much more viscous by the time it's consumed. Additionally, when refrigerated, fluids modified with starch thickeners may become too thick because starch interacts with temperature.³⁴

Prethickened fluids have been shown to be consistently thicker than those modified with an instant thickener.³²

Gum-based thickeners interact with the liquid in a different manner. Thickening by forming "nets" that trap liquids, gum thickeners typically require careful preparation; they must be vigorously shaken or blended with the base fluid to appropriately thicken it. Otherwise, the patient is served a mixed consistency (thin fluid with thicker, moistened gum strands intermixed). However, if mixed properly, gum-based thickeners will maintain relatively stable viscosity over time.³³

The base liquid and the way it interacts with the thickening agent are other factors to consider when modifying liquids. Starches are more prone to chemical interactions when mixed with certain fluids.³³ This helps to explain why drinks such as orange juice may

in preparation.^{31, 37} A recent study showed that most health care providers were unable to consistently prepare modified liquids that were within the NDD range for nectar- or honey-like thickness.³⁷ In fact, 75% didn't prepare any samples that fit the NDD range for honey thickness, and about one-third (31%) didn't do so for nectar thickness. This means that many patients are receiving liquids that are too thick or too thin (usually too thick), putting them at higher risk for medical complications such as aspiration pneumonia. Aspiration of an overly thickened fluid can increase the risk of pneumonia for some, as it may be more difficult to clear from the airway.³⁸ In addition, thickeners may negatively affect the flavor and texture of drinks,^{39, 40} potentially making them less appetizing to patients. It's therefore essential that fluids be modified to the appropriate consistency and according to each patient's swallowing capacity. This will ensure that patients aren't needlessly receiving highly modified fluids that are unacceptable to them.⁴¹

Some facilities have implemented the Frazier Free Water Protocol, which permits patients who normally aren't allowed to consume thin liquids to drink plain water between meals. It's been suggested that consuming plain water by itself is less dangerous than consuming it with food or other liquids, because if aspirated it's less likely to cause problems. Consequently, aggressive oral care and hygiene is an important aspect of the protocol's use. This protocol evolved from concerns about patient compliance with thickened fluids

and patients' desire to consume thin fluids regardless of their aspiration risk.⁴² However, some researchers have cautioned that the evidence in support of the protocol has been primarily based on a single institution's data.⁴³

The use of thickened liquids has become a common intervention in dysphagia management. In some settings, thickened fluids are recommended for one-fourth to three-fourths of adult patients.³¹ In a study of 252 skilled nursing facilities, 92% served thickened liquids to residents with dysphagia.⁴⁴

What You Can Do

When caring for a patient with dysphagia, consider the following:

- Educate and inform patients, their loved ones, and caregivers about the importance of dietary modifications. Bear in mind that the attitudes of nurses and other caregivers about patients' diet can influence patients' consumption.
- Become well-informed about modification practices at your facility. Although this article focused on the National Dysphagia Diet (NDD), know that labels and descriptions tend to vary from one care setting to another.
- Recognize that some consistencies are simply less safe than others. For example, thin fluids such as coffee or juice may be the most dangerous consistency for a patient with dysphagia. Similarly, some food textures, including those that are noncohesive or that easily separate (such as rice and chunky soup), as well as "sticky" foods (such as peanut butter or dry mashed potatoes), may be harmful.²⁶
- Remember that not all thickening agents are the same. Ask the speech-language pathologist and the dietitian about the thickening products served to patients. Make sure that fluids are thickened appropriately and prepared in a manner consistent with product guidelines. Bear in mind that thicker is *not* necessarily better for patients with impaired swallowing.
- Training is essential. It's been shown that when implementing the NDD, ongoing training in dysphagia management, including how liquids should be thickened, results in higher caloric intake by patients, greater acceptance of some foods, and fewer calls questioning the diet modifications.⁴⁵
- Monitor a patient's status and advocate for systematic reevaluation. Maintain communication with other members of the dysphagia team to determine if, and when, additional assessment or modifications are indicated. The nursing staff can help to ensure that patients receive liquids and foods appropriate to their needs.
- Be an active part of the dysphagia team. The ability to eat and drink greatly contributes to a patient's physical and emotional well-being.

For a short list of nursing considerations when taking care of patients with dysphagia, see *What You Can Do*.^{26, 45}

REVISITING MR. SMITH

It's evident that the get-well treats Mr. Smith is eating are unsafe. His favorite caramels are very adhesive (or sticky) and firm (requiring more effort to compress). Consequently, as he tries to chew the caramel, he needs to apply more force to create a cohesive bolus, which may be difficult for him because of his compromised oral motor skills. Because the caramel also tends to adhere to his palate, Mr. Smith, who has limited strength and range of tongue movement, may have trouble transporting it safely to the back of his mouth. His favorite cookie—a gingersnap—also taxes his mastication skills and oral control because of its hardness and fracturability (its tendency to break into parts with each bite). A part of the cookie could easily slip into his pharynx, putting him at risk for aspiration. In addition, sips of his wife's coffee may lead to aspiration because Mr. Smith can't control the oral flow as he did before his stroke.

Although Mrs. Smith is well-intentioned, these get-well treats are dangerous to her husband. It's up to the nursing staff to counsel her about his dysphagia and to help her implement the recommended dietary changes.

REEVALUATION, OFTEN OVERLOOKED

One concern for patients who receive modified diets is that as their swallowing improves, their diet isn't always readjusted to a less restrictive level. It's been shown that many nursing home residents remain at the same level for extended periods of time without systematic reevaluation of their status.²⁴ Reevaluation of these residents revealed that 91% received a more restrictive diet than they could tolerate. ▼

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REFERENCES

1. Ekberg O, et al. Social and psychological burden of dysphagia: its impact on diagnosis and treatment. *Dysphagia* 2002;17(2):139-46.
2. Whelan K. Inadequate fluid intakes in dysphagic acute stroke. *Clin Nutr* 2001;20(5):423-8.

3. Doggett DL, et al. Prevention of pneumonia in elderly stroke patients by systematic diagnosis and treatment of dysphagia: an evidence-based comprehensive analysis of the literature. *Dysphagia* 2001;16(4):279-95.
4. Langmore SE, et al. Predictors of aspiration pneumonia in nursing home residents. *Dysphagia* 2002;17(4):298-307.
5. Martino R, et al. Dysphagia after stroke: incidence, diagnosis, and pulmonary complications. *Stroke* 2005;36(12):2756-63.
6. Reza Shariatzadeh M, et al. Differences in the features of aspiration pneumonia according to site of acquisition: community or continuing care facility. *J Am Geriatr Soc* 2006;54(2):296-302.
7. Hinchev JA, et al. Formal dysphagia screening protocols prevent pneumonia. *Stroke* 2005;36(9):1972-6.
8. Wilkins T, et al. The prevalence of dysphagia in primary care patients: a HamesNet Research Network study. *J Am Board Fam Med* 2007;20(2):144-50.
9. Crary MA, et al. Dysphagia and nutritional status at the time of hospital admission for ischemic stroke. *J Stroke Cerebrovasc Dis* 2006;15(4):164-71.
10. Runions S, et al. Practice on an acute stroke unit after implementation of a decision-making algorithm for dietary management of dysphagia. *J Neurosci Nurs* 2004;36(4):200-7.
11. ECRI Evidence-based Practice Center. *Diagnosis and treatment of swallowing disorders (dysphagia) in acute-care stroke patients*. Rockville, MD: Agency for Health Care Policy and Research; 1999 Jul. AHCPR Publication No. 99-E024. Evidence report/technology assessment No. 8. <http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=erta8>.
12. Davis LA, Spicer MT. Nutrition and dysphagia in older adults. *Top Geriatr Rehabil* 2007;23(3):211-19.
13. Humbert IA, Robbins J. Dysphagia in the elderly. *Phys Med Rehabil Clin N Am* 2008;19(4):853-66.
14. Roy N, et al. Dysphagia in the elderly: preliminary evidence of prevalence, risk factors, and socioemotional effects. *Ann Otol Rhinol Laryngol* 2007;116(11):858-65.
15. Kawashima K, et al. Prevalence of dysphagia among community-dwelling elderly individuals as estimated using a questionnaire for dysphagia screening. *Dysphagia* 2004;19(4):266-71.
16. Vincent GK, Velkoff VA. The next four decades. The older population in the United States: 2010 to 2050. *Current population reports, Series P-25. Population estimates and projections*. 2010(1138). http://www.aoa.gov/AoARoot/Aging_Statistics/future_growth/DOCS/p25-1138.pdf.
17. Mendell DA, Logemann JA. Temporal sequence of swallow events during the oropharyngeal swallow. *J Speech Lang Hear Res* 2007;50(5):1256-71.
18. Matsuo K, Palmer JB. Anatomy and physiology of feeding and swallowing: normal and abnormal. *Phys Med Rehabil Clin N Am* 2008;19(4):691-707.
19. Garon BR, et al. Silent aspiration: results of 2,000 video fluoroscopic evaluations. *J Neurosci Nurs* 2009;41(4):178-85.
20. Katzan IL, et al. The cost of pneumonia after acute stroke. *Neurology* 2007;68(22):1938-43.
21. Suiter DM, Easterling CS. Update on current treatment and practice patterns for dysphagia. *Top Geriatr Rehabil* 2007;23(3):197-210.
22. Logemann JA, et al. What information do clinicians use in recommending oral versus nonoral feeding in oropharyngeal dysphagic patients? *Dysphagia* 2008;23(4):378-84.
23. Bourne M. *Food texture and viscosity: concept and measurement*. 2nd ed. San Diego: Academic Press; 2002.
24. Groher ME, McKaig TN. Dysphagia and dietary levels in skilled nursing facilities. *J Am Geriatr Soc* 1995;43(5):528-32.
25. Steele CM, et al. Mealtime difficulties in a home for the aged: not just dysphagia. *Dysphagia* 1997;12(1):43-50.
26. National Dysphagia Diet Task Force. *National dysphagia diet: standardization for optimal care*. Chicago: American Dietetic Association; 2002.
27. Cassens D, et al. Enhancing taste, texture, appearance, and presentation of pureed food improved resident quality of life and weight status. *Nutr Rev* 1996;54(1 Pt 2):S51-S54.
28. Germain I, et al. A novel dysphagia diet improves the nutrient intake of institutionalized elders. *J Am Diet Assoc* 2006;106(10):1614-23.
29. Ballou Stahlman L, et al. Comparison ratings of pureed versus molded fruits: preliminary results. *Dysphagia* 2000;15(1):2-5.
30. Stahlman LB, et al. Perceptual ratings for pureed and molded peaches for individuals with and without impaired swallowing. *Dysphagia* 2001;16(4):254-62.
31. Garcia JM, et al. Thickened liquids: practice patterns of speech-language pathologists. *Am J Speech Lang Pathol* 2005;14(1):4-13.
32. Adeleye B, Rachal C. Comparison of the rheological properties of ready-to-serve and powdered instant food-thickened beverages at different temperatures for dysphagic patients. *J Am Diet Assoc* 2007;107(7):1176-82.
33. Garcia JM, et al. Viscosity measurements of nectar- and honey-thick liquids: product, liquid, and time comparisons. *Dysphagia* 2005;20(4):325-35.
34. Garcia JM, et al. Serving temperature viscosity measurements of nectar- and honey-thick liquids. *Dysphagia* 2008;23(1):65-75.
35. Dewar RJ, Joyce MJ. Time-dependent rheology of starch thickeners and the clinical implications for dysphagia therapy. *Dysphagia* 2006;21(4):264-9.
36. Steele CM, et al. The rheology of liquids: a comparison of clinicians' subjective impressions and objective measurement. *Dysphagia* 2003;18(3):182-95.
37. Garcia JM, et al. Quality of care issues for dysphagia: modifications involving oral fluids. *J Clin Nurs* 2010;19(11-12):1618-24.
38. Robbins J, et al. Comparison of 2 interventions for liquid aspiration on pneumonia incidence: a randomized trial. *Ann Intern Med* 2008;148(7):509-18.
39. Lotong V, et al. Texture and flavor characteristics of beverages containing commercial thickening agents for dysphagia diets. *J Food Sci* 2003;68(4):1537-41.
40. Matta Z, et al. Sensory characteristics of beverages prepared with commercial thickeners used for dysphagia diets. *J Am Diet Assoc* 2006;106(7):1049-54.
41. Niedert KC. Position of the American Dietetic Association: Liberalization of the diet prescription improves quality of life for older adults in long-term care. *J Am Diet Assoc* 2005;105(12):1955-65.
42. Panther K. The Frazier Free Water Protocol. *Perspectives on Swallowing and Swallowing Disorders (Dysphagia)* 2005;14(1):4-9.
43. Wagner LCB. Ethical and legal implications of the Frazier Free Water Protocol. *Perspectives on Swallowing and Swallowing Disorders (Dysphagia)* 2005;14(1):21-4.
44. Castellanos VH, et al. Use of thickened liquids in skilled nursing facilities. *J Am Diet Assoc* 2004;104(8):1222-6.
45. McCallum SL. The National Dysphagia Diet: implementation at a regional rehabilitation center and hospital system. *J Am Diet Assoc* 2003;103(3):381-4.