*Editor's Note: Publication of this paper does not constitute an endorsement of the Frazier Free Water Protocol by ASHA or by Special Interest Division 13.*

# The Frazier Free Water Protocol

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## *Introduction*

Morbidity, hospitalization, and mortality associated with aspiration pneumonia are chief among the concerns of clinicians and researchers working with individuals with dysphagia. Conventional wisdom continues to hold that aspiration of any material into the lungs can lead to aspiration pneumonia. While many questions remain regarding the pathogenesis of aspiration pneumonia, a number of studies have suggested that pulmonary aspiration of differing materials may not present an equal risk for the development of aspiration pneumonia. Olson (1970) found that aspiration of water in the rabbit lung is less injurious to the pulmonary system than milk or a 5% glucose solution in water. Later, Splaingard, Hutchins, Sulton, and Chaudhuri (1988) suggested that pulmonary aspiration in humans is common and usually well tolerated. Schmidt, Holas, Halvorson, and Reding (1994) reported aspiration of thicker fluids and semi-solids was predictive of aspiration pneumonia and death. In that study, the odds ratio was 5.6 times greater for the development of aspiration pneumonia and 9.2 times greater for death in those who aspirated thickened liquids or more solid consistencies when compared to those who did not aspirate or who aspirated thin liquids only. Similarly, Holas, DePippo, and Reding (1994) reported that aspiration pneumonia risk was significantly greater if thick liquid or more solid consistencies were aspirated. Feinberg, Kneble, Tully, and Segall (1990) stated that aspiration of water was benign. Later, Feinberg, Kneble, and Tully (1996) reported that the frequency of aspiration pneumonia did not differ significantly between patients who aspirated thin liquids and those who did not aspirate.

In a landmark study, Langmore and colleagues (1998) reported on the risk factors for aspiration pneumonia acquisition in geriatric adults with neurologic disease. The authors concluded that dysphagia and aspiration are necessary, but not solely responsible for the development of aspiration pneumonia. The authors suggested that aspiration must be present, but will result in pneumonia only if the aspirated material is pathogenic to the lungs and host resistance to the aspirated material is compromised. In that study, the strongest predictors of aspiration pneumonia development were dependence for feeding, dependence for oral care, number of decayed teeth, tube feeding, more than one medical diagnosis, number of medications prescribed, and smoking. Of these, dependence for feeding was the single strongest predictor of aspiration pneumonia development.

This small sampling of the literature may suggest that there is not a direct relationship between aspiration and the development of aspiration pneumonia. Unfortunately, this paints a confusing picture for the clinician who holds the conventional view that aspiration of food, liquid, or secretions leads to the development of aspiration pneumonia.

## *Dehydration*

In addition to aspiration pneumonia, dehydration is a serious and common problem encountered in health care, particularly in the elderly patient with dysphagia. Normal aging is associated with changes in body composition, thirst perception, renal function, and the hormonal regulatory mechanisms required to maintain the balance of water and sodium in the body. Dehydration is the most common fluid and electrolyte disturbance in the geriatric population, with high rates of morbidity and mortality (Chernoff, 1994; Sansevero, 1997). Estimates of the incidence of dehydration and malnutrition in nursing home residents range from 35-85%. In fact, a portion of the general population may be chronically dehydrated (Kleiner, 1999). Xiao, Barber, and Campbell (2004) reported the potential for reduction in health care spending related to avoidable hospitalizations in dehydrated patients was as much as $1.14 billion in 1999. Additionally, dehydration is often overlooked and untreated due to inadequate staff training in recognizing its causes and symptoms (Copeman, 2000; Vogelzang, 1999). It has been reported that institutionalized geriatric patients are not offered enough fluid outside of medication administration times (Chidester & Spangler, 1997).

Dehydration can lead to a variety of negative health conditions, including changes in drug effects, infections, poor wound healing, pressure sores, decreased urine volume, urinary tract infections, confusion, lethargy, constipation, altered cardiac function, acute renal failure, weakness, and declining nutritional intake (Copeman, 2000; Gross et al., 1992.; Kleiner, 1999). Patients experiencing these difficulties will generally not be able to fully participate or progress well in rehabilitation therapies. This may result in decreased functioning and quality of life.

Patients with restricted intake of thin liquids may find it difficult to consume the daily recommended intake of six to eight cups of fluid via thickened liquids (Whelan, 2001). Anecdotally, dysphagia cli-

nicians are familiar with patients reporting that thickened liquids are not palatable. Often, these same patients refuse to drink them. Finestone, Foley, Woodbury, and Green-Finestone (2001) quantified fluid intake in patients with dysphagia subsequent to stroke. They found that patients receiving thickened liquids failed to meet fluid intake requirements. Theoretically, patients who consume foods with high water content can improve their hydration. However, many individuals with dysphagia have decreased appetite and fail to take in an adequate volume of food necessary to attain hydration, especially when textures are altered. As we age, our thirst perception may also be altered, with a resultant inability to sense the need for fluids (Kositzke, 1990). Davis & Sherer (1994) reported that xerostomia, which can affect nutrient intake significantly and negatively, affects more than 70% of the geriatric population. Cognitive and communicative impairments often interfere with a patient's ability to express a need for liquids and food (Copeman, 2000). Additionally, compromised mobility, dexterity, and visual acuity can lead to decreased fluid intake (Copeman; Hoffman, 1991; Vogelzang, 1999).

## *Compliance*

Patient compliance with safe-swallowing instructions and diet modifications when unsupervised or when discharged to home merits consideration. Compliance is less likely to occur if recommendations are generally preventative in nature. If the intervention does not offer immediate relief from pain or other complications, patients are less prone to comply (Meyer, Levanthal, & Gutman, 1985). The longer a patient is asked to comply with a recommendation, the less likely he or she is to continue to comply with it (MacDonald, MacDonald, & Phoenix, 1977; Marlatt & Gordon, 1984). Compliance decreases as the complexity of a recommendation increases (Stone, 1979). This is particularly true when lifestyle changes are recommended. Recommendations designed to address dysphagia certainly bear some of the characteristics that can lead to non-compliance. An interesting and relevant study by Leiter and Windsor (1996) found that dysphagia clinicians' predictions of compliance with safe-swallowing instructions were significantly higher than actual compliance in a population of elderly individuals with dysphagia. The clinicians estimated that patients would have a 71.9% rate of compliance with safe-swallowing instructions. The actual rate of patient compliance was 35.6%. These results were obtained while patients were observed during a meal in a quiet setting. The subjects were generally able to state the safe-swallowing instructions, but not all agreed they were necessary.

## *Quality of Life*

When recommending an altered diet, clinicians should always consider the patient's quality of life. While balancing safety, hydration, and nutrition with quality of life can be a struggle, many clinicians, patients, and caregivers have expressed concern that long-term orders for thickened liquids or tube feedings without an option for water or ice chips denies a very primitive and basic drive to refresh the senses.

## *Safety*

The safety of allowing patients who aspirate thin liquids to drink water has long been, and will likely continue to be, debated. Currently, there is no published research that will give dysphagia clinicians a definitive scientific basis for the safe delivery of water to patients with dysphagia.

## *Fluid Absorption*

The ability of the lungs to rapidly absorb water is well known. The pulmonology literature describes the safety of the bronchoalveolar lavage procedure (Martin et al., 1987). During this procedure, saline solution is initially injected into the lungs. An amount that is smaller than that which was injected is removed via suction at the conclusion of the procedure. It should be noted, however, that during the lavage procedure the sterile saline solution is delivered through a clean instrument channel and sterile conditions are maintained throughout the procedure, conditions that do not replicate the aspiration of water taken orally.

The mucous membranes of the lungs quickly absorb aspirated water. Effros (1997) reported the discovery of aquaporin water channels in the lungs as the mechanism for water absorption. Aquaporins act like a sieve. When water enters the alveoli, it is taken up into the blood vessels. Water is then carried out to the bloodstream fairly rapidly.

Schwartz, Wynne, Gibbs, Hood, and Kuck (1980) addressed the fact that the quantity and type of aspirate that can be safely tolerated by the lungs had not been clearly defined. They found that a volume of 25 ml of highly acidic contents carries more risk than pH neutral fluids of the same volume. Crossley and Thum (1989) reported that clear liquids do not pose an aspiration pneumonia risk unless the pH is very high or very low or if the quantity is great enough to cause asphyxiation. Most municipal tap water is a nearly neutral in pH and very close to the pH of bodily fluids (pH=7.2). For this reason, the presence of water in the pulmonary system should not cause a chemical injury to the mucosa of the lungs.

## *Pathogens in Tap Water*

Tap water and well water can be contaminated by bacteria in some locales. Pathogens including Cryptosporidium, Escherichia coli, Giardia and cyclospora can cause public health problems especially in infants, the elderly, and individu-

als who are immunocompromised (Whitmire, 2000). Reportedly, water-filtering devices that are rated for "cyst reduction" are adequate for filtering out these pathogens (Whitmire). Legionella pneumophila, which can cause Legionnaires' disease, has also been found in some water sources in North America and Japan (Kool, Carpenter & Fields, 1999; Venezia, Agresta, Hanley, Urquhart, & Schoonmaker, 1994). Bottled water purchased off the retail shelf is often tap water (Whitmire). Since 1997, the U.S. Food and Drug Administration (FDA) has mandated labelling on bottled water to identify the water source. Municipalities' water programs are required to conduct ongoing water quality analyses. Public drinking water contaminant and analysis reports are required by the Environmental Protection Agency (EPA) and are available to the public. Medical institutions are likely to have current water quality analyses on record.

An obvious source of pathogens is the mouth itself, as any liquid or solid that is aspirated must pass through the oral cavity and may be contaminated by pathogenic bacteria in colonized orpharyngeal secretions. Aspiration of secretions containing pathogens can lead to pulmonary infection. Aspiration of water would carry this same risk of delivering these pathogens to the pulmonary system. Preventive measures to promote oral and dental health may reduce the likelihood of pathogenic bacteria being present in the oral cavity. Preventive activities may include the provision of aggressive oral hygiene, dental treatment to address suspected dental disease, and medication adjustments to increase salivary flow when xerogenic medications are given (Langmore et al., 1998; Yoneyama et al., 2002).

## *Evidence Base for Water Protocol*

To date, the only published research related to the consumption of water by patients with dysphagia was conducted by Garon, Engle, and Ormiston (1997). Twenty patients with a history of stroke and aspiration of thin liquids during a videofluoroscopic swallow study were studied. Subjects were randomly assigned to two groups. The control group received thickened liquids, while the experimental group received thickened liquids and water between meals. Water was placed out the patients' reach and was given to patients upon request. Prior to drinking water, patients were required to pre-rinse in an effort to reduce the volume of bacteria in the oral cavity. No patients in either group developed aspiration pneumonia or dehydration during the conduction of the study or during a 30-day follow-up period. A significant difference in thickened fluid intake per day was found between the groups, with the control group taking more. The experimental group patients drank more fluids overall, with a mean amount of 1318 cc/day including a mean amount of 463 cc/day of water. The mean amount of daily liquid intake in the control group patients was 1210 cc. Mean days from onset of stroke to end point of no thin liquid aspiration was 39 days for the control group and 33 days for the experimental group. Patients allowed water reported a high degree of satisfaction and reported that thickened liquids did not quench thirst. None of the patients in the control group reported satisfaction with thickened liquids, and all reported a desire for water or ice chips to quench thirst. Subsequent to the study, the authors reported allowing water to patients who refused thickened liquids or who were noncompliant. The reader must consider that the small population size and relative good health and function of the patients in the study by Garon and colleagues may limit the clinician's ability to extrapolate these findings to patient populations that may be more debilitated due to comorbidity and those with a more severe degree of dysphagia.

## *History of Water Protocol*

The facility where I work, the Frazier Rehabilitation Institute, is a 135-bed acute rehabilitation facility in Louisville, KY. Comprehensive rehabilitation services are provided to patients of all ages and physical disabilities. The water protocol was implemented in 1984 as a response to patients who were non-compliant with recommendations for no thin liquids and who were covertly consuming thin liquids or refusing to drink thickened liquids. It appeared to us that these patients were not developing aspiration pneumonia, despite evidence of aspiration on videofluoroscopy. In 1984, there was very little research available to assist clinicians in identifying patients with risk factors for the development of aspiration pneumonia. We held the conventional views of many clinicians practicing in a medical setting in 1984: We considered all patients who aspirated to be at risk for developing aspiration pneumonia. At that time, clinicians treating individuals with dysphagia generally recommended thickened liquids along with compensatory maneuvers and behaviors for their patients who aspirated thin liquids. Thickened liquids as a dysphagia intervention continue to be highly recommended. Castellanos, Butler, Gluch, and Burke (2004) surveyed the prevalence of thickened liquid use in 252 randomly selected skilled nursing facilities across the U.S. Approximately 20% of freestanding skilled nursing facilities nationally and 25,470 residents were studied. A mean of 8.3% (range 0% to 28%) of residents were receiving thickened liquids. Thickened water was provided to residents in 91.6% of the institutions.

In 1984, we observed that many patients who chose to take thin liquids against our recommendations did not develop pneumonia. Thus, we felt the need to alter our approach to strict dysphagia intervention. The Frazier Water Protocol was developed through the

multidisciplinary cooperation of physicians, speech-language pathologists, and a dietitian.

In the time since the implementation, we have seen a very low incidence of aspiration pneumonia at Frazier. In the early 1990s, over an 18-month period, we conducted a retrospective chart review of 234 inpatients with dysphagia who received thickened liquids during their admissions. Two of the 234 patients developed aspiration pneumonia, and both of these individuals were suspected of aspirating solid foods.

Our clinicians recommend dysphagia interventions based on instrumental exam findings, review of patients' medical histories, current medical condition, and clinical observations. Thickened liquids are recommended and provided, but water is permitted between meals. Intervention to minimize aspiration of water, as well as thickened liquids and foods, is provided therapeutically. Compensatory maneuvers and behaviors are taught to patients, families, and staff as is deemed appropriate for each patient. It is our belief that the water protocol offers patients with dysphagia an additional opportunity to reduce the likelihood of the development of dehydration.

Clinicians who decide to pursue allowing patients who aspirate thin liquids to drink water should be aware of the risks and benefits and be prepared to make informed recommendations. At a minimum, the clinician should be sure that the water source is safe. Our facility's internal water test meets, and in most cases exceeds, the strict requirements enacted by the EPA. This information gives us a high degree of comfort with the safety of the water the patients are receiving in our facility. The clinician also must make an independent consideration of the relative health of the patient population that they serve. A team of Frazier speech-language pathologists practices at an acute-care hospital where the patient population is less robust than the population that is being treated at the rehabilitation hospital. The speech-language pathologists recommend water for these patients on a case-by-case basis and require physician orders for the initiation of the water intake. In our practice, ice chips are more likely to be the first step toward allowing water in the acute care environment.

## Water Protocol Guidelines

The guidelines have been tailored to meet the needs of the patients in our facility. In Frazier's acute rehabilitation environment, patients are generally out of bed much of the day. The acute rehabilitation population is generally upright, mobile, and relearning to manage functional activities. Patients typically can tolerate 3 hours of therapy each day.

A doctor's order is not required to implement the free water protocol. Any patient receiving tube feedings or on thickened liquids may have water. For patients who are eating orally, water is allowed between meals only. This practice has worked well since the protocol's inception.

Following are the guidelines:

- All patients referred to speech-language pathology are screened with water on the initial bedside visit to the patient. The purpose of the screening is to determine if patients are demonstrating signs and symptoms of dysphagia, to check for level of alertness and presence of impulsivity, and to decide if further dysphagia evaluation is warranted.
- Instrumental swallow examinations to determine pathophysiology of dysphagia are conducted on nearly all dysphagic patients referred to speech-language pathology. Results of the exams guide treatment planning for dysphagia intervention. Patients exhibiting impulsivity or excessive coughing and discomfort will be restricted to water taken under supervision. Patients with extreme choking may not be permitted oral intake of water due to the physical discomfort of coughing. This is a rare occurrence. Occasionally, a physician may order strict NPO for a patient and water or ice chips will not be permitted.
- For patients on oral diets, water is permitted between meals. Water intake is unrestricted prior to a meal and allowed 30 minutes after a meal. The period of time following the meal allows spontaneous swallows and gravity to clear pooled solid or thickened liquid residues.
- NPO patients are permitted water any time.
- Patients who are thin liquid restricted wear yellow bands to communicate the liquid restrictions to all staff. Typically, the band reads, "No thin liquids except water between meals." The wording on the band is individualized as appropriate when specific compensations are recommended. For example, a band may read "No thin liquids except water by teaspoon between meals." All rehab staff are oriented to the yellow bands and check for bands before offering liquids to patients.
- Water is freely offered to patients according to the guidelines documented on the yellow arm band throughout the day.
- Patients for whom compensations, i.e. chin tuck, head turn, etc., have proven to be successful are encouraged to use compensations while drinking water. This information is also included on the yellow bands.
- Aggressive oral care should be provided to those patients who are unable to clean their own teeth

and mouths so that pathogenic bacteria are less likely to contaminate secretions.

- Medications are never given with water. Pills are given in a spoonful of applesauce, pudding, yogurt or thickened liquid.
- Family education includes emphasis on the rationale for allowing water intake. The speech-language pathologist, dietitian, and nurse repeat the guidelines for water intake during the education process. Written material is provided as well. Education is documented in the medical record.

## *Staff/Family Training*

Teamwork and communication have been the keys to what we consider our success at Frazier with allowing patients with dysphagia to consume water. All staff are oriented to the water protocol to ensure consistency across disciplines and in any environment the patient and family may encounter while at Frazier. The water protocol rationale and guidelines are a part of nursing competencies. Therapeutic recreation reinforces the protocol on outings and at events. Lapses in following the guidelines of the protocol are occasionally noted, which makes us realize that educational emphasis is needed in a specific area or with a group or individual. Families are generally cooperative and appear to understand the water protocol. The guidelines are very clear and easy to teach. The water protocol is thoroughly taught at each family teaching session with printed handout material provided. Emphasis is placed on the guidelines, the difference between water and other thin liquids, and how water is the only thin liquid to be taken. During family education sessions, nurses reinforce that medications are never given with water.

## *Conclusion*

Clinicians from around the world have shared their methods of allowing water to patients in their various health-care settings. However, a large randomized controlled study is necessary to empirically determine the safety of water in the diets of individuals with dysphagia. Barring successful completion of such a study, clinicians need to continue to look at all aspects of patients' health and functioning, their personal preferences, and their environments. We feel that the Frazier Water Protocol has worked well for our patients these 20 years. Our clinicians feel that quality of life has been improved for the patients who have been permitted water. On a regular basis, our patients report to the clinicians their strong satisfaction with being allowed water to drink. The water protocol that we follow may not be workable in all settings and with all patients, but there are variations that can be adapted according to environment and specific patient conditions and needs.

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## *Continuing Education Questions*

**1. The rationale for the Frazier Water Protocol includes all of the following except:**

a. Tap water is an alkaline pH and is compatible with the 7.4 pH of body fluids.

b. Tap water is nearly bacteria free.

c. The mucous membranes of the lungs quickly absorb clear liquids.

d. Aspirated water obstructs the airway.

**2. Estimates of dehydration and malnutrition in nursing home residents range from**

a. 10-35%.

b. 20-60%.

c. 35-85%.

d. 50-75%.

**3. Dehydration can lead to a number of health conditions including all except**

a. changes in drug effects.

b. infections.

c. weight loss.

d. increasing nutritional intake.

**4. Langmore and colleagues (1998) found the best predictors of aspiration pneumonia included**

a. dependence for feeding, dependence for oral care, and dysphagia.

b. dependence for feeding, dependence for oral care, and dependence for dressing.

c. dependence for feeding, dependence for oral care, and decayed teeth.

d. dependence for feeding, tube feeding, and dysphagia.

**5. The Frazier Water Protocol**

a. permits water any time.

b. permits water between meals.

c. permits water 15 minutes after a meal.

d. does not permit NPO patients to ever have water.

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