Clinical Concepts

Dehydration in the Older Adult

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ABSTRACT
Dehydration affects 20% to 30% of older adults. It has a greater negative outcome in this population than in younger adults and increases mortality, morbidity, and disability. Dehydration is often caused by water deprivation in older adults, although excess water loss may also be a cause. Traditional markers for dehydration do not take into consideration many of the physiological differences present in older adults. Clinical assessment of dehydration in older adults poses different findings, yet is not always diagnostic. Treatment of dehydration should focus on prevention and early diagnosis before it negatively affects health and gives rise to comorbidities. The current article discusses what has most thoroughly been studied; the best strategies and assessment tools for evaluation, diagnosis, and treatment of dehydration in older adults; and what needs to be researched further. [Journal of Gerontological Nursing, 41(9), 8-13.]

Water is the most essential nutrient required for the maintenance of every body system. It is vital for the removal of waste products as well as function of the lymphatic, cardiac, gastrointestinal, and urinary tract systems, and more. Unfortunately, with age, total body water naturally decreases, causing these systems to be less effective. By age 70, total body water decreases to 40% as compared to 60% in a younger adult (O’Donnell, 2013). Due to a multitude of factors, including physical limitations, poor accessibility, polypharmacy, and cognitive impairments, older adults do not consume the recommended amount of daily water intake. The World Health Organization (WHO; 2009) recommends 2.2 to 2.9 liters for older women and older men, respectively; yet, in reality, the average individual older than 70 drinks less than 1.5 liters per day (Thomas et al., 2008). With decreased total body water and poor water intake, dehydration is a

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common condition in older adults and is often overlooked and not treated. An estimated $5.5 billion of Medicare costs is spent annually for dehydration hospital admissions (Xiao, Barber, & Campbell, 2004).

Current clinical tools for assessments are generalized for all ages and do not take into consideration differences in older adults. The American Medical Directors Association (AMDA; 2009) has updated dehydration guidelines to include older adults in long-term care with reinforcement that dehydration cannot be clinically diagnosed. The current article focuses on studied clinically significant findings in dehydrated older adults, although the research is limited. The health, safety, and quality of life for older adults is impacted by dehydration and its prevention, assessment, and correction must take priority in preventive care.

**PATHOPHYSIOLOGY**

Dehydration begins with water loss or decreased water intake. **Hypertonic dehydration**, defined by a serum osmolality level >300 mOsm/kg, is an increased sodium concentration in the extracellular fluid, which is often a result of diuretic therapy or inadequate fluid intake. In attempts to balance osmolality, which is the measure of the body’s electrolyte–water balance, fluid is drawn from the intracellular to extracellular fluid. This shift increases the osmolality in the intracellular fluid, which yields cell shrinkage and dehydration (Olde Rikkert, Melis, & Claassen, 2009).

**Isotonic dehydration**, defined by a serum osmolality between 285 and 295 mOsm/kg (which is considered normal range), results from an equal excess loss of water and electrolytes. Isotonic dehydration is seen in approximately 80% of dehydration cases (Cheuvront, Kenefick, Charkoudian, & Sawka, 2013) and is often caused by fluid loss through diarrhea, vomiting, or inadequate fluid intake. In all forms of dehydration, the body innately increases the thirst mechanism. In hypovolemic dehydration, where there is a decrease in total body fluid, the renin–angiotensin system is activated and the kidneys start to retain water and produce concentrated urine, and the thirst sensation is also increased (Olde Rikkert et al., 2009). Although forms of dehydration other than those presented in the current article exist, isotonic and hypertonic dehydration are the two most common among older adults (Thomas et al., 2008).

*Mild dehydration*, categorized as water loss equivalent to 1% of body weight, can cause symptoms of headache, fatigue, weakness, dizziness, and lethargy. **Moderate dehydration** may cause dry mouth, poor urine output, rapid heart rate, and decreased skin elasticity (AMDA, 2009). As dehydration progresses to a severe state, the body loses the ability to control its temperature. With reduced hydration and blood flow to the skin, the body is unable to sweat or dissipate heat, usually presenting as fever. Decreased fluid volume can cause cardiac stress to maintain blood distribution to vital organs. Decreased blood supply to the brain often causes confusion and impaired cognitive and coordination function. Decreased blood supply to the kidneys in conjunction with little to no urination often result in kidney failure and urinary tract infections (Sands, 2009).

**Age-Related Changes**

Many natural changes occur in the body that are an inevitable part of aging. Instead of hydration homeostasis being an almost effortless process, aging requires more attention for maintaining this balance.

Older adults have a smaller fluid reserve due to decreased total body water; therefore, dehydration becomes more rapid and frequent. Unlike younger adults and children, the thirst response is decreased and usually requires a dramatic increase in osmolality before it is triggered (Hooper, Bunn, Jimoh, & Fairweather-Tate, 2013). Vasopressin also decreases, disabling the capacity of the kidneys to concentrate urine. Muscle can store a large amount of water, contributing to approximately 70% of storage, whereas fat stores only approximately 10% to 40% of water. Older adults have decreased muscle mass and increased adipose tissue so they lose the added benefit of a great water reserve (Olde Rikkert et al., 2009).

Often classic signs of dehydration look similar to natural, benign changes in older adults. Periorbital areas appear sunken in many older adults due to loss of subcutaneous fat and collagen rather than dehydration (Cheuvront et al., 2013). Skin naturally loses elasticity, causing poor skin turgor (Vivanti, Harvey, Ash, & Battistutta, 2008). Due to chronic obstructive pulmonary disease or other pulmonary diseases, as well as antihistamine use, mouth breathing is common and causes the appearance of dry mucous membranes, making physical assessment a challenge (Cheuvront et al., 2013).

Incontinence, although not a symptom of aging, is common in older adults and can play a large factor in the decision to purposely decrease fluid intake (Richards & Borglin, 2011). In older populations, dementia creates a scheme of reasons for lack of hydration. Many older adults with cognitive impairment may not be able to communicate their needs, including thirst. Facilities are often understaffed and cannot provide sufficient attendance to residents to make sure that they are given fluids throughout the day. It is a chore for individuals who are physically impaired and affected by arthritis to get up and retrieve something to drink (Mentes, 2007).
Taste bud capability decreases with age, leaving primarily bitter and salty taste ability preserved (Solemdal, Sandvik, Willumsen, Mowe, & Hummel, 2012). Flavored water, tea, coffee, and other hot drinks, milk, fruit juices, soft drinks, and alcohol account for 70% to 80% of fluid intake of individuals 70 and older. Consuming high sugar, high sodium, and alcoholic and/or caffeinated products can further cause diuresis and fluid shifts (Bellisle, Thronton, Hébel, Denizeau, & Tahiri, 2010).

**CLINICAL PRESENTATION**

**History and Review of Systems**

A review of systems and daily oral fluid intake are helpful in diagnosing dehydration; however, this is often a challenge with older patients. Many older patients may not be able to recall a 24-hour fluid or diet intake or even the amount of times that they typically urinate in a day. Many times, facilities do not have the capability of accurately measuring and tracking patients’ intake and output (Vergne, 2012). Information on the types of fluids (e.g., high sodium, high sugar, caffeinated) can be helpful in determining possible reasons for change in osmolality and diuresis. Difficulty drinking due to dysphagia can also deter patients from drinking. Incontinence is often an embarrassing subject, and many patients do not freely bring up the topic unless a health care professional addresses the issue first. Medication review may be the most important part of the history for older patients. Polypharmacy often can have a large role in dehydration. Approximately 25% of patients 65 and older take a diuretic, which can often play a large role in excessive water loss (Kenkmann, Price, Bolton, & Hooper, 2010). A U.S. analysis of medication expenditures showed that 23.3% of community-dwelling individuals with dementia older than 65 were taking medication with high levels of anticholinergic activity (Sura, Carnahan, Chen, & Aparasu, 2013). Medications that are not necessary, play a role in dehydration, or alter taste should be discontinued (Richards & Borglin, 2011).

Classic symptoms of dehydration, including headaches, dizziness upon standing, dry mouth, diarrhea, and weight loss, should be inquired. Change in body weight may be helpful in diagnosing rapid dehydration. Water volume alters quickly in comparison to fat and muscle mass, so that a substantial change in body weight over a few days will relate most directly to fluid status (Hooper et al., 2013).

Self-reports of dry mouth may be a sign that an older adult has a cold and is mouth breathing or it may indicate use of medication that causes dry mouth. Some blood pressure medications, antihistamine drugs, antidepressant agents, diuretic agents, and nonsteroidal anti-inflammatory drugs can cause dry mouth. Chronic illnesses, such as rheumatoid arthritis or lupus, often also cause dry mouth (Vivanti et al., 2008).

**Physical Examination**

Typical signs and symptoms of dehydration can be found on physical examination, although many are also related to other conditions. The constitutional signs of dehydration often present as fatigued appearance, pallor, sunken periorbital areas, and chapped lips (Leibovitz et al., 2007). Temperature may be elevated due to the body’s decreased capability to maintain homeostasis. Hypotension and tachycardia are signs of hypovolemia, and orthostatic blood pressures should be collected to further assess for signs of hyponatremia or hypovolemia (Sands, 2009). Weight loss ≥4% of body weight 7 days prior is indicative of water loss. Therefore, an increase of ≥4% of body weight on rehydration would be required for a clearer indication of dehydration. This method of weight monitoring requires reassessment and therefore can only be determined after multiple visits (Hooper et al., 2013). The assessments of weight must be accurate and take issues such as constipation and edema into account. Screening for dehydration will only pick up rapid dehydration rather than a slow decline leading toward dehydration.

Poor skin turgor is a classic sign of dehydration, although this is an expected finding in older adults. One research study (Vivanti et al., 2008) suggests poor skin turgor of the sternum as highly correlated with mild to moderately dehydrated older adults. To test sternal skin turgor, a provider can pinch an area of skin above the sternum, hold for a few seconds, and release. Poor skin turgor will tent and take a few seconds to return flush with the skin surface (Vivanti et al., 2008).

As previously mentioned, dry mucous membranes, although often a sign of dehydration, can be tied to many other conditions or a side effect of medications (Hooper et al., 2013). With 89% specificity and 44% sensitivity, a recent study of 27 older adults clinically diagnosed with dehydration showed that dry axilla, dry mouth, sunken eyes, delayed capillary refill, and upper body weakness were comparable to diagnostic testing (Shimizu et al., 2012). Dentition should not be overlooked as poor oral health can cause adverse taste sensation and a decrease in oral intake. Often sore gums or the necessity of dentures prevents adequate oral intake (Solemdal et al., 2012).

**Laboratory and Diagnostic Tests**

A plasma urea–creatinine ratio is a great indicator of dehydration in a healthy kidney, but older adults often have a raised ratio related to renal failure, bleeding, heart failure, sarcopenia, glucocorticoids, or
high intakes of protein, making it unhelpful in the specific diagnosis of dehydration (AMDA, 2009). Due to the frequent and unnecessary screening and treatment of asymptomatic urinary tract infections in older adults, more providers are refraining from using urinalysis; however, in the case of dehydration, urinalysis may play an important role. When dehydration is suspected, urine can be collected and assessed for a high specific gravity and an amber to tea color. A urinalysis can further look for the presence of leukocytes, nitrites, and blood to help identify if a urinary tract infection may be causing an intentional decrease in water intake (Hooper et al., 2013).

Osmolality. Serum or plasma osmolality is the gold standard to diagnose dehydration. Osmolality change is sensitive enough to show dehydration with only a 1% water loss (AMDA, 2009). Sodium is not as sensitive of an indicator as osmolality and shifts typically do not occur until moderate stages of dehydration. Serum osmolality >295 mOsm/kg can be indicative of hyperosmolality and dehydration. The results are rapid and necessary to diagnose and support clinical findings, if any. To determine serum osmolality, lab values for blood urea nitrogen, serum bicarbonate, creatinine, glucose, sodium, calcium, and potassium should be obtained.

In the United States, more than 25% of adults 65 and older have impaired glucose regulation (Kirkman et al., 2012). High serum glucose will increase tonicity and an increase in tonicity is also seen with dehydration, potentially complicating diagnosis and testing.

Overall, there are clear benefits of using serum osmolality as a definitive diagnosis for water-loss dehydration, as serum and intracellular osmolality are central to body fluid control, acting as a trigger to thirst and renal conservation of fluid (Fluharty, 2002).

### Treatment and Interventions

#### Nonpharmacological

Social, psychological, medical, and environmental factors all contribute to the amount of fluid consumption (Köster, 2009). Due to the body's natural changes that occur with aging, including possible cognitive deficits as well as changes in physical surroundings, a conscious effort must be made to increase oral hydration in the older adult population.

Physical limitations, such as being wheelchair-bound, make it difficult for the patient to access fluids, lift containers, or reach a sink. Carrying heavy groceries, a task that fluids contribute to, becomes a burden. Water coolers and dispensers are a great option for older patients who reside alone or in a nursing home; they provide lower-level access and minimal to no physical exertion (Campbell, 2011).

The use of bright red jugs in facilities has been shown to be helpful as fluid reminders to staff and residents. Patients with bright red jugs alert staff that they are at risk of dehydration and the jugs should be filled at every opportunity. The bright red is also easy for patients to see, as vision can decline with age or dehydration and pale cups are not easily visible (Hollis, 2011). A small U.S. study of patients with Alzheimer's disease showed an 83.7% increase of daily fluid intake with the use of a brightly colored cup (Dunne, Neargarder, Cipolloni, & Cronin-Golomb, 2004).

In facilities, many residents do not ask for fluids other than at meals because they do not want to be a burden to the staff if they need help toileting. This is often seen in patients who experience urinary incontinence. The priority in these scenarios is to incorporate frequent toileting and bladder training for patients to feel comfortable asking for drinks throughout the day and to manage incontinence (Godfrey, Cloete, Dymond, & Long, 2012). Many patients with dementia also cannot communicate their needs effectively, including thirst and toileting.

The aesthetics of the environment and associating drinking with social activities may improve intake. In facilities, smaller, home-like dining rooms may be more comfortable for residents. Providing drinks during social activities may result in a pleasurable correlation with drinking. The use of a favorite cup or mug for patients may also allow drinking to be more desirable. Having a variety of drinks available in facilities and in patients’ homes may increase interest in drinking (Kant, Graubard, & Atchison, 2009).

Daily intake and output logs are a calculated method of monitoring for dehydration, although this is usually not practical in a facility and is often difficult for older patients to keep track of at home. Therefore, it is useful to educate all patients and staff on monitoring for early signs of dehydration, including headache, fatigue, weakness, dizziness, and lethargy. Recognition of dark urine and decreased or poor output, dry mouth, and rapid heart rate should alarm patients and staff that dehydration has progressed.

#### Pharmacological

If there is an underlying cause for the dehydration, such as an acute illness or baseline dementia, the plan of care in conjunction with rehydration should be priority to the causal factor. If dehydration can be determined by ≥4% weight loss within 7 days, AMDA (2009) strongly suggests an oral fluid prescription given over a 3-day period, in addition to 1,500 mL of fluid daily. The specific calculation to determine the amount of replacement fluid and the method of implementation are shown in the Table.

After the 3-day rehydration, the patient’s weight should be approximately identical to previous baseline
weight. This method is best for acute or abrupt dehydration, which can often be seen with vomiting, diarrhea, a change in mental status, sudden dysphagia, or an acute illness (AMDA, 2009).

Hyperdermoclysis is suggested for moderate dehydration in an outpatient setting, which allows for primary care to treat and monitor dehydration without a hospital admission. This method consists of subcutaneous fluid replacement, which shows to be as effective as parenteral replacement. Contraindications to this treatment include coagulation disorders and concurrent anticoagulation (AMDA, 2009).

For severe dehydration, AMDA (2009) highly recommends hospitalization for fluid and electrolyte replacement. In older adults, dehydration can cause death within days and is considered a medical emergency. Signs of hypovolemic shock include cool and clammy skin, reduced urine output, flat neck veins, altered mental status, and a low cardiac index, which indicates a low circulating volume (Hooper et al., 2013). Hospitalization for dehydration typically means that other body organs have been detrimentally affected and, as a result, 17% of older adults hospitalized for dehydration die within 30 days (Waikar, Mount, & Curhan, 2009).

### CLINICAL CONCERNS

Dehydration causes a multitude of issues clinically and has a huge impact on quality of life for older adults. It is associated with many chronic health problems in older adults, including falls, fractures, confusion, heat stress, constipation, urinary tract infections, kidney stones, renal failure, drug toxicity, stroke, and poor wound healing (Olde Rikkert et al., 2009).

Approximately 30% of adults older than 65 and 50% of adults older than 80 experience at least one fall every year (WHO, 2009). Regarding dehydration, falls may be caused by orthostatic hypotension and increased confusion and/or weakness. Incontinence in the older adult population can also lead to falls and may in turn discourage adequate fluid intake.

Diverticulosis, which is common in 65% of adults 75 and older, often causes chronic diarrhea (Toney, Wallace, Sekhon, & Agrawal, 2008). Other common causes of diarrhea in older adults include antibiotic drugs, *Clostridium difficile*, and diabetes. As a result of dehydration, many patients become constipated and require harsh stimulant laxatives.

The current gold standard of dehydration diagnosis relies on biochemical confirmation, which is often not feasible or accessible to many older adults, and therefore causes dehydration to be overlooked or ignored. Available studies (Leibovitz et al., 2007; Shimizu et al., 2012; Solemdal et al., 2012; Vivanti et al., 2008) focus on clinical findings of dehydration in older adults rather than the biochemical diagnosis, likely due to staying in the realm of realistic and manageable care for this population.

### CONCLUSION

Currently, research is still needed regarding dehydration in older adults. Although studies exist that identify clinical signs of dehydration in this population, the evidence is likely insufficient, and implementing affordable and available biochemical evaluation of older adults may be the most accurate and best solution while more research is being conducted.

Considering the physiological changes with age that are inevitable, a screening tool must be catered to this population for dehydration to be caught early and before it takes a toll on patients’ health. A tool for this population may include the review of current headaches, dizziness when standing, and dry mouth; the identification of anticholinergic medication use; and the inquiry of quantity and types of fluids consumed daily, as well as a medical history of diabetes and urinary incontinence. The tool should also contain an assessment portion including at least blood pressure and weight.

Primary care must include a focus on the prevention of dehydration, including recognition of early signs and symptoms catered to an older population, support and treatment of causal comorbidities, and monitoring of responses to treatment.

Educating all staff, patients, and family on early signs of dehydration may be helpful for patients who may be forgetful and mentally and/or physically impaired. Prevention of dehydration can cease an entire cascade of future health problems, which can be a burden.

### TABLE

**Calculation and Implementation of Fluid Replacement**

<table>
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<th>Calculation</th>
<th>Pre-Illness weight (kg) – current weight (kg) = deficit (L)</th>
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<tr>
<td>Implementationa</td>
<td>% of Deficit Replaced</td>
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<tr>
<td>Day</td>
<td>% of Deficit Replaced</td>
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a % of deficit replaced + concurrent daily maintenance (mL) = total daily intake (mL).
physically to the patient and economically to the health care system. Better understanding of fluid variability in older adults is necessary for preventive measures and to improve outcomes of mortality, morbidity, and quality of life.

REFERENCES


