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Dehydration of the Elderly in Nursing Homes

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Introduction

Water is a nutrient and its maintenance is critical for sustaining life. Sources of water include fluids, food and the oxidation of ingested foods. Adjustments with water consumption and urine concentration regulate water balance. Because water and sodium balances are interrelated, a decrease in water can increase the sodium concentration in the extracellular fluid. Normal serum osmolality (285 + mosmol/kg water) increases with hypovolemia. Thus, hypovolemia can lead to hypernatremia.

In response to hypovolemia, the body releases aldosterone, which acts on the collecting tubule in the kidney to reabsorb sodium and water, to increase circulating plasma volumes. An increase in serum osmolality activates the hypothalamic osmoreceptors to release antidiuretic hormone (ADH). This release of ADH triggers the insertion of water channels (type-2 aquaporins) into the collecting tubules of the kidney so that water is reabsorbed. As a result, urine is concentrated and the serum osmolality is decreased. A 2% increase in serum osmolality or body water loss that equals 2% of an individual's body weight in blood volume provokes the hypothalamic osmoreceptors to induce thirst (1). This thirst mechanism prompts drinking behavior to maintain normal water balance.

Both hypovolemia and hypernatremia are caused by dehydration. Dehydration is defined as the depletion of total body water (TBW) content due to pathologic fluid loss or decreased fluid intake and is associated with high mortality rates among the elderly population in nursing homes (1). It is a costly and serious medical condition that can be easily prevented. If left untreated, mortality may exceed 50% (2).

WHY ARE THE ELDERLY MORE AT RISK FOR DEHYDRATION?

With aging, the body's ability to maintain homeostasis declines significantly (1). There are many predisposing factors that make the elderly vulnerable to dehydration. Among them are a blunted thirst mechanism; a decreased TBW as a proportion to body weight due to the loss of lean muscle mass (such a loss of lean muscle mass, which holds 40% of TBW, significantly reduces the overall water content in the body); a functional decline of the renal system (there is a loss of nephrons resulting in reduced filtration, diminished effect of ADH and decreased responsiveness of the renin-angiotensin-aldosterone system); and chronic diseases (i.e., chronic obstructive pulmonary disease) (1,3). In regard to a blunted thirst mechanism, the elderly are most vulnerable to dehydration after a variety of insults such as hot, humid weather, diarrhea, vomiting, fever, vomiting or diarrhea and taking prescribed medications (3). Other notable factors include physical and neurological impairments that result from a stroke, which is the leading cause of disability for the aging population and forces them into nursing homes. Such a neurological impairment alters the function of the hypothalamus and pituitary gland, which adversely affect thirst sensation and fluid regulation. Patients with other neurological impairments such as dementia and depression, are more at risk to dehydration because these patients are unable to seek water (3).

There are also functional barriers that make the elderly more at risk in the nursing home. For example, patient immobility resulting from physical impairments/disabilities (i.e., arthritis) can adversely affect the patients' ability to hydrate themselves (1). Other functional barriers include

dysphagia; diminished visual acuity; reduced olfactory sense and sensitivity to the four primary tastes (which can dampen an elderly person's appetite for food and fluid intake); and aphasia (1). Certain medications (e.g., diuretics, sedatives, antipsychotics, tranquilizers, etc.) also make one susceptible to dehydration.

Incontinence is another contributing factor toward dehydration in the elderly. Many elderly deliberately reduce their fluid intake to decrease incontinence and eliminate embarrassment. Women are more likely to avoid fluids than men (1). Inadequate fluid intake, which oftentimes results in dehydration, makes the elderly more susceptible to urinary tract infection, pneumonia, pressure ulcers, hypotension, confusion and disorientation (4).

MINIMUM FLUID REQUIREMENTS FOR THE ELDERLY

Water replacement must be equivalent to water that is lost through the skin, lungs, urine, sweat and feces. There are several formulas for estimating the adequate hydration of the elderly. Among those commonly used by research investigators is one established by Chernoff, which is 1,500 mL/day for all elderly regardless of their size or caloric intake (5). Another standard that does not consider body size, or age, is one that requires 2,500 mL/day water intake from foods and fluids (6). Other investigators, such as Gasper, use another standard for determining adequate water intake: 100 mL/kg for the first 10 kg, 50 mL/kg for the next 10 kg and 15 mL for the remaining kg (6). Because of its adjustment for body weight, Gasper regards this as the best standard because it provides at least 1,500 mL/day for those with low body weights and does not overpredict for obese individuals.

In 1999, Holben et. al. examined four standards of recommended fluid intake on 121 elderly long-term care residents over three 24-hour periods. The standards compared were: 1) 30 mL/kg, 2) 30 mL/kg with a minimum water intake of 1,500 mL (Chernoff's standard), 3) 1 mL/kcal energy consumed and 4) 100 mL/kg for the first 10 kg, 50 mL/kg for the next 10 kg and 15 mL for the remaining kg (7). The results of the study confirmed that Chernoff's standard (standard 2) provides adequate fluid intake for preventing dehydration (7). Contrary to other research findings, the investigators assert that Gasper's standard (standard 4) overestimated the needs of obese subjects.

SIGNS/SYMPTOMS OF DEHYDRATION AND THE TREATMENT THEREOF

There are obvious signs for the well-trained clinician or allied health care professional to identify dehydration. Another way to detect dehydration is to measure one's serum osmolality. An increased serum osmolality coupled with a rapid weight loss of greater than 3% of body weight, leads to the diagnosis and treatment of dehydration (2). Due to cost constraints and lack of laboratory equipment, nursing home staff do not take this measurement. Thus, detection of dehydration in the nursing home relies heavily upon well-educated and well-trained staff.

The signs for dehydration are skin tenting in the forehead; concentrated urine; oliguria; sunken eyes; lack of axillary moisture; decline of orthostatic blood pressure; tachycardia; and mucosal dryness of the mouth and nose (1). In regard to the latter, Weinberg points out that this may be misleading since the same sign presents when the elderly breathe through their mouths or take anticholinergic medications (2). For many elderly, dehydration causes symptoms of constipation

and mental confusion. If undetected, these signs and symptoms can result to an elderly person's death.

With detection, dehydration is treated effectively with rehydration therapy which involves intravenous fluid replacement of isotonic solution (1). Chernoff argues that even with detection and treatment, patient compliance is difficult because the elderly have reduced thirst sensitivity and are resistant to consuming large volumes of fluid (5). This argument is supported by the results of Gasper's 1999 study whereby 63% of the nursing home subjects indicated they had no desire for fluids and 39% indicated that they limited their fluid intake due to their fear of incontinence (6).

GUIDELINES FOR NURSING HOMES

According to the Nursing Home Reform Act of 1987, the lack of assistance with eating and drinking, which leads to malnutrition and dehydration, is listed under neglect (8). There are several statutes that establish guidelines for the detection and prevention of dehydration in the nursing home population. For example, the Omnibus Budget Reconciliation Act (OBRA) established dehydration/fluid maintenance triggers (e.g., deterioration in cognitive status, skills, or abilities in last 90 days, intake levels less than 75% of food at most meals, etc.) to alert staff of dehydration in long-term care residents (2). The federal Department of Health and Human Services (latest guidelines established in 1999) requires nursing home investigators to review records, interview health professionals and family members and observe two meals (8). Under the federal Older Americans Act, every state is required to have an Ombudsman Program that investigates and resolves complaints and problems involving long-term care facilities (Ombudsmen are listed under the branch of the state Department of Aging) (8). Despite these statutes, guidelines, and regulations, dehydration is still attributed to the many deaths of nursing home residents. Several studies have identified many underlying factors related to dehydration that remain unresolved.

THE UNDERLYING FACTORS FOR THE INCIDENCE OF DEHYDRATION IN NURSING HOMES

The 1999 UCSF prospective anthropological study by Kayser-Jones et al. assessed the amount of liquid (e.g., water, milk, coffee, tea and juices) consumed over a 3-day period in 40 nursing home residents and found that the mean fluid intake was inadequate. Of the 40 residents, 39 consumed less than 1,500 mL/day (mean = 847 mL/day, range 278-1560, SD 284) (4). Thus, only one resident drank more than 15000 mL/day. The investigators attributed these findings to clinical factors (e.g., dysphagia; functional and cognitive impairment, etc.) and institutional factors (e.g., inadequate staff, attitudes and beliefs of staff, etc) (4). With only one certified nursing home assistant for every 10 patients, staff tried to save time to be more efficient during their shift even if it at the expense of quality care toward the elderly. One staff member admitted to restricting fluids in order to reduce the urinary output of incontinent patients (and thus avoid changing wet beds). The UCSF study found that of those residents who received assistance, most were fed in 5 to 10 minutes while lying in bed on their sides (4). One patient, who had cognitive and functional impairment as a result of a stroke, ate her meals in a reclining position without assistance. This patient learned to adapt and instead of drinking her fluids she dipped her fingers into her juice and licked them to avoid spills (4). This demonstrates how positioning of the

patient is crucial. To save time, the nursing staff do not appropriately position the patient from reclining to sitting upright. Extra minutes can greatly enhance the fluid intake of nursing home (NH) residents and thus, enhance their health.

In addition to measuring the fluid intake of elderly (n=57) in three different care settings, Armstrong-Esther et al. also studied the knowledge of the nursing staff by having them complete questionnaires that addressed hydration of the elderly (9). The nursing subjects (n=47) were of three grades: 1) registered (13), 2) enrolled or practical (16) and 3) aides (18). The mean number of signs and symptoms correctly identified by the nurse subjects was 3.74 out of a list of eight with the registered nurses doing slightly better (4.6) than the other grades of staff (3 (4)). As part of their duties, nursing staff chart the fluid intake for the elderly. In most cases, estimates are made from standard receptacles such as a cup, (capacity 150 mL), drinking glass (200 mL) and cereal/soup bowl (150 mL) (9). Only 50% of the nurse subjects knew the volumes that each receptacle held (9). These findings strongly suggest that charted fluid intake is oftentimes inaccurate and stronger efforts to educate/train the nursing staff must be made.

In 2000, UCLA researchers Simmons and Reuben conducted a validation study to compare three methods of assessing the food and fluid intake of 56 incontinent NH residents in one facility for nine meals: 1) NH staff chart documentation, 2) an independent rater's (Master's degree level nutrition student) comparison of photographs taken of residents' trays before and after each meal and 3) direct observations by research staff (10). In this study, the photography and direct observation methods yielded the same information (58.2 + 14.6 and 58.9 + 16.1 respectively) (10). Both methods revealed low intake levels of 19 NH residents that were not documented by NH staff. This is explained by the finding that NH staff documentation overestimated the intake of NH residents by 22% (79.3 + 16 (1)). The investigators list the many advantages to the photography method (e.g., permanent record for health professionals to assess a resident's dietary intake, provides greater accuracy because it does not rely on memory recall, etc.). However, they also mention that direct observations can capture mealtime processes (i.e., residents taking food items from other residents) that greatly affect the accurate documentation, and thus, assessment of a resident's dietary intake (10).

SOLUTIONS TO SOLVING THE PROBLEM OF DEHYDRATION IN THE NURSING HOME POPULATION

Many institutional factors underlie the problem of dehydration in the nursing home population. Among them are the insufficient number of nursing staff to adequately care for the elderly residents. As a result of the nursing assistant to patient ratio of 1:10, those who care for the elderly are overworked and cannot spend the appropriate amount of time to assist with eating and drinking during mealtime. For those residents who become thirsty and request beverages, time constraints and a busy workload do not allow the NH staff to respond. If they do respond, they may place a can of Ensure (a commercial nutritional formula) in front of the patient and not have time to open it. A patient with a functional impairment who is unable to open the container remains thirsty.

Simple measures, like opening a can for the patient, can affect the health of a nursing home resident. Another remedy to improve the hydration of the NH resident is to place water-filled receptacles within the resident's reach. Researchers have commented in their studies how there

was no evidence of water receptacles in the rooms (e.g., table, nightstand, etc.). Even if a resident has all physical and mental faculties, he or she is still at the mercy of the nursing staff having the time (or making the time) to provide a glass of water.

Researchers of the UCLA study suggest expanding the menus to include a variety of foods and hiring more well-trained staff (e.g., dietitians/nutritionists, certified nursing assistants, etc. (10)). Investigators of the Armstrong-Esther et al. study strongly recommend education/training of allied health professionals/caregivers about the predisposing factors that make the elderly susceptible to dehydration; the detection of signs and symptoms; and implementation of preventative strategies (9).

Gaspar's observations of 99 NH residents for two 24-hour periods to record food and fluid intake revealed a high correlation with adequate water intake and the number of ingestion sessions. The study identified the scheduling of more ingestion sessions (i.e., offering more between-meal snacks) as a necessary intervention for those identified as at risk for dehydration (6). This can easily be attained with adequate staffing at the long-term care facilities.

CONCLUSION

In essence, the elderly nursing home population is at great risk for dehydration and subsequent death. This is attributed to the many predisposing factors (e.g., blunted thirst mechanism, loss of nephrons, chronic illnesses, etc.) that result from the aging process. These predisposing factors make them susceptible to dehydration. Research reveals that a great percentage of the nursing home residents are not receiving the minimum fluid intake requirement of 1,500 mL/day. Many studies attribute clinical and institutional factors to dehydration, many of which can be addressed by simple measures such as properly positioning the nursing home resident for feeding and drinking. The common theme in these published findings is the need to hire more educated, well-trained and compassionate nursing home staff.

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ADDITIONAL READING

State Long Term Care Ombudsmen, National Citizen's Coalition for Nursing Home Reform web site <http://www.nccnhr.org> 2000.

Comment: An advocacy group that provides information on nursing home quality issues, such as nutrition and hydration, and works with each state's Long-Term Care Ombudsman Program.