

## References: Hydration

### REF ID: 2639

#### Level 1: Systematic Review

#### Topic 6: Comprehensive

Maintaining oral hydration in older people.(2001). *BEST PRACTICE*, 5(1), 1S6.

Journal Article, Glossary, Systematic Review, Tables/Charts

### REF ID: 2587

#### Level V: Literature Review

#### Topic 1: Risks

Allison, S. P., & Lobo, D. N. (2004). Fluid and electrolytes in the elderly. *Current Opinion in Clinical Nutrition and Metabolic Care*, 7(1), 27-33.

Journal Article; Review; IM

PURPOSE OF REVIEW: The intake of water and electrolytes is inseparable from the ingestion of nutrients by normal or artificial means. Recent reports have agreed in criticizing the poor standards of practice and of training in the management of fluid and electrolyte balance, resulting in a large amount of avoidable morbidity, particularly in the elderly who are more vulnerable to fluctuations in body composition.

RECENT FINDINGS: Ageing is associated with impaired physiological reserve and a reduced ability to compensate for fluctuations in environmental conditions. These changes include reduced cardiac and renal reserve, making the elderly more vulnerable to changes in water and electrolyte gain or loss with a resulting increase in morbidity and mortality. The ability to cope with errors in prescriptions is correspondingly diminished. Dehydration is a common problem in nursing homes and in the community, due often to failures in detection and appropriate management. In many cases, the cause is iatrogenic due to diuretics or drugs which impair the intake of food and fluid. Salt and water overload, particularly in hospital patients, is also common and results in impaired recovery from surgery and increased perioperative mortality and morbidity. Hyponatraemia is also an important clinical problem in hospital and the community. SUMMARY: Better training in the detection, prevention and management of fluid and electrolyte imbalance is needed to reduce common and serious morbidity associated with this problem to which the elderly are especially prone, owing to their diminished physiological reserves and increased comorbidity.

### REF ID: 2575

#### Level V: Literature review

#### Topic 3: Assessment

Amella, E. J. (2006). Presentation of illness in older adults. if you think you know what you're looking for, think again. *AORN Journal*, 83(2), 372-4, 377-82, 385-9.

Journal Article; Review; IM; N

ALTHOUGH PEOPLE AGE at different rates, changes to the composition of the human body are a hallmark of aging. As a result of such changes, disease can present differently in a person over 65 years old than it would in a younger adult or child. THIS ARTICLE IDENTIFIES the critical indicators of underlying conditions, including changes in mental status, loss of function, decrease in appetite, dehydration, falls, pain, dizziness, and incontinence. It also describes the presentation of diseases common to older adults, including depression, infection, cardiac disease, gastrointestinal disorders, thyroid disease, and type 2 diabetes.

### REF ID: 2584

#### Level V: Literature review

#### Topic 6: Comprehensive

Amella, E. J. (2004). Feeding and hydration issues for older adults with dementia. *The Nursing Clinics of North America*, 39(3), 607-623.

Journal Article; Review; AIM; IM; N

All cultures dictate the need to feed the hungry and create rituals for almost every life passage around the

consumption of food and beverage. Yet, in old age and among those who cannot advocate for themselves, mealtime is medicalized and demoted to an insignificant event without dignity or regard for individualized needs. Attention must be paid to not only what people eat, but how they eat, and how they are supported in that process. Kayser-Jones summarized the extensive findings of several ethnographic studies in nursing homes by noting the multi-factorial issues involved in delivering excellent care to all residents, especially those lacking an advocate. Her findings exposed how lack of staff education, inadequate staffing and supervision, disregard for personal and cultural preferences, lack of assessment for comorbid health problems, intake of food and fluids, dysphagia, and oral health problems all contributed to malnutrition and dehydration among the residents studied. This seminal set of studies, along with Dr. Kayser-Jones' testimony in US Congressional hearings directly affected the design of federal regulatory protocols to address malnutrition and dehydration. In an attempt to increase the number of staff available to assist at meals, the Centers for Medicare and Medicaid issued a change in regulations on Sept. 26, 2003, allowing reimbursement for staff trained for a total of 8 hours to act as feeding assistants. This change is intended to, "provide more residents with help in eating and drinking and reduce the incidence of unplanned weight loss and dehydration". Although seen as answering some of the staffing ratio issues at meal times, this rule change has been criticized for not addressing the complexities of resident needs at meal times. Although offering food and fluid is time-consuming and requires special knowledge of physiological changes and empathy for persons whose behavior might be objectionable at times, it may be one of the few times during the day that the individual with dementia receives normalized social interaction. Thus, as in the care of all vulnerable persons with dementia, whether at home or in an institution, perhaps the greatest challenge and need is for nurses and other caregivers to provide a social environment that promotes individual dignity and comfort.

**REF ID: 2583**

**Level V: Case report**

**Topic 3: Assessment**

**Amella, E. J. (2004). Presentation of illness in older adults. *The American Journal of Nursing*, 104(10), 40-51; quiz 52.**

**Case Reports; Journal Article; Review; AIM; IM; N**

Although people age at different rates, changes to the composition of the human body are a hallmark of aging. As a result of such changes, disease can present differently in a person over 65 years old than it would in a younger adult or child. This article identifies the critical indicators of underlying conditions, including changes in mental status, loss of function, decrease in appetite, dehydration, falls, pain, dizziness, and incontinence. It also describes the presentation of diseases common to older adults, including depression, infection, cardiac disease, gastrointestinal disorders, thyroid disease, and type 2 diabetes.

**REF ID: 2569**

**Level V: Case report**

**Topic 6: Comprehensive**

**Archibald, C. (2006). Promoting hydration in patients with dementia in healthcare settings. *Nursing Standard (Royal College of Nursing (Great Britain) : 1987)*, 20(44), 49-52.**

**Case Reports; Journal Article; Review; N**

This is the second article in a series of five on dementia. It aims to enhance nurses' understanding of dehydration in patients with dementia. Research shows that dehydration is present in up to one quarter of older patients and patients with dementia are likely to have an even higher risk. Dehydration may be harder to recognise in these patients and strategies to identify and prevent dehydration are outlined.

**REF ID: 2644**

**Level IV: Non-experimental study**

**Topic 1: Risks**

**Baker, L. B., Munce, T. A., & Kenney, W. L. (2005). Sex differences in voluntary fluid intake by older adults during exercise. *Medicine and Science in Sports and Exercise*, 37(5), 789-796.**

**Clinical Trial. Journal Article. Randomized Controlled Trial**

**PURPOSE:** This study compared the voluntary fluid intake behavior of older men and women (54-70 yr)

when provided cold, palatable beverages and ample opportunity to drink between repeated bouts of exercise in the heat. **METHODS:** Thirteen men and 14 women performed four bouts of 15-min cycling at 65% VO<sub>2</sub>peak followed by 15 min of rest at 30 degrees C and 50% relative humidity. In separate trials, subjects drank either a carbohydrate-electrolyte solution (CES) or water ad libitum during the rest periods and were unaware that their fluid intake was being measured. **RESULTS:** Fluid intake behavior was repeatable (intra-class correlation coefficient = 0.75), and subjects drank enough of either beverage to match sweating rates and maintain their body mass (BM). Fluid intake per kilogram of BM was greater with CES (18.7 +/- 2.2 vs 15.1 +/- 2.1 mL x kg(-1); P < 0.05), and plasma volume (PV) was better maintained during the CES trials (-1.3 +/- 1.1 vs -4.2 +/- 1.1% during the second half of the session). Women drank significantly more water than the men on a per kilogram basis (17.2 +/- 2.9 vs 12.8 +/- 1.7 mL x kg(-1) BM), and one woman (BM = 45.7 kg) became hyponatremic (S(NA) = 126 mmol x L(-1)) with symptoms during the water trial. **CONCLUSION:** Older adults drank enough to maintain fluid balance when palatable fluid was readily available; however, CES promoted greater voluntary fluid intake and restored PV losses faster than water. In addition, older women drank more water than men during interval exercise in the heat, which may put smaller women at an increased risk for developing hyponatremia.

**REF ID: 2582**

**Level VI: Opinion**

**Topic 4.3: Management-medication**

**Barton, A., Fuller, R., & Dudley, N. (2004). Using subcutaneous fluids to rehydrate older people: Current practices and future challenges. *QJM : Monthly Journal of the Association of Physicians*, 97(11), 765-768.**

**Journal Article; Review; IM**

No abstract

**REF ID: 2602**

**Level V: Literature Review**

**Topic 3: Assessment**

**Bassichis, B. A., & Marple, B. F. (2002). Dry mouth and nose in the older patient. what every PCP should know. *Geriatrics*, 57(10), 22-4, 29, 32 passim.**

**Journal Article; Review; AIM; IM**

Dry mouth and dry nose are common complaints among the older population. Dry mouth can be attributed to medical conditions and other underlying causes, whereas dry nose is usually associated with age-related changes in nasal physiology and structure. In both cases, medications can contribute to dryness, so a proper evaluation includes a careful drug review. Management of dry mouth includes hydration and use of mouthwash, sugarless gum, candy, and saliva substitutes. Dry nose can be managed with nasal sprays that moisten the nasal cavity.

**REF ID: 2631**

**Level IV: Non-experimental study**

**Topic 1: Risks**

**Bennett, J. A., Thomas, V., & Riegel, B. (2004). Unrecognized chronic dehydration in older adults: Examining prevalence rate and risk factors. *Journal of Gerontological Nursing*, 30(11), 22-8, 52-3.**

**Journal Article, CEU, Exam Questions, Research, Tables/Charts**

Dehydration has serious consequences for older adults, including increased risk of illness or death. This retrospective review of medical records describes the prevalence, assessment, and risk factors for chronic dehydration in 185 older adults who visited an emergency department in June 2000. Results showed chronic dehydration was present in 89 (48%) patients. Physicians documented assessment for signs of dehydration in 23 (26%) of the dehydrated older adults, but no independent assessments for dehydration were recorded by nurses. These findings indicate many older adults may suffer from unrecognized dehydration, and nurses should be alert to the possibility that dehydration may be present in community-dwelling older adults as well as those who live in residential facilities.

**REF ID: 2607**

**Level V: Literature review**

#### **Topic 4: Management**

**Bhalla, A., Wolfe, C. D., & Rudd, A. G. (2001). Management of acute physiological parameters after stroke. *QJM : Monthly Journal of the Association of Physicians*, 94(3), 167-172.**

**Journal Article; Review; IM**

Considerable effort has been directed towards acute stroke research with numerous drug therapies being tried and tested. As yet there is still no routine treatment that is unequivocally effective in acute stroke. The development of stroke units has been a major breakthrough in reducing disability through co-ordinated rehabilitation, and new interest is being focussed towards limiting acute neurological deterioration through acute stroke units. Monitoring and attempting to stabilize acute physiological parameters within normal limits such as blood pressure, temperature, hydration status, glucose levels and oxygen saturations, has become standard practice for some acute stroke units. Strategies to correct hypertension, hypotension, dehydration, hyperglycaemia, pyrexia and hypoxia may potentially reduce neuronal damage in the acute phase of stroke and subsequently improve functional outcome and survival. Whether we require large prospective randomized controlled trials to test whether these specific interventions are to be used in mainstay practice is unclear.

**REF ID: 2633**

#### **Level IV: Non-experimental study**

#### **Topic 3: Assessment**

**Boockvar, K. S., & Lachs, M. S. (2003). Predictive value of nonspecific symptoms for acute illness in nursing home residents. *Journal of the American Geriatrics Society*, 51(8), 1111-1115.**

**Journal Article, Research, Tables/Charts**

**OBJECTIVES:** To examine the predictive value of nonspecific symptoms for acute illness in nursing home residents. **DESIGN:** Prospective, observational study. **SETTING:** Academic nursing home located in an urban setting. **PARTICIPANTS:** Two hundred two newly admitted residents. **MEASUREMENTS:** Eleven nonspecific symptoms were ascertained by review of observations documented by nursing home staff in the medical record. Research staff independently identified acute illness according to previously established criteria from nurse report and medical record review. Follow-up was divided into 10-day intervals, and concordance between nonspecific symptoms and acute illness within these intervals was determined. Predictive values were calculated according to standard formulae. **RESULTS:** Nonspecific symptoms and acute illnesses occurred in 21.7% and 12.5% of 10-day intervals, respectively. Positive predictive values (PPVs) were highest for lethargy, weakness, and decreased appetite, each of which correctly predicted the presence of an acute illness one out of two times the symptoms were reported. Agitation and disorientation predicted an acute illness one out of three times, and falls predicted an acute illness one out of four times. Overall, the PPV of the occurrence of any nonspecific symptom was 0.24, and the negative predictive value of the absence of nonspecific symptoms was 0.91. **CONCLUSION:** Hypoactive nonspecific symptoms are more likely than other nonspecific symptoms to be signs of incipient acute illness. Studies are needed to determine whether an intervention in residents with these nonspecific symptoms can enable earlier detection and treatment of acute illness.

**REF ID: 2613**

#### **Level VI: Opinion**

#### **Topic 2: Prevention**

**Burger, S. G., Kayser-Jones, J., & Bell, J. P. (2001). Food for thought. Preventing/treating malnutrition and dehydration. *Contemporary Longterm Care*, 24(4), 24-28.**

**Journal Article; H**

**REF ID: 2588**

#### **Level V: Literature Review**

#### **Topic 4: Management**

**Byrd, L. (2004). Artificial hydration and nutrition in elders with advanced dementia: An ethical dilemma. *Mississippi RN*, 66(1), 7.**

**Journal Article; Review; N**

**REF ID: 2550**

**Level VI: Opinion**

**Topic 1: Risks**

Casa, D. J., Clarkson, P. M., & Roberts, W. O. (2005). American college of sports medicine roundtable on hydration and physical activity: Consensus statements. *Curr.Sports Med.Rep.*, 4(3), 115-127.

Consensus Development Conference; Journal Article; IM

**REF ID: 2551**

**Level IV: Non-experimental study**

**Topic 4: Management**

Crary, M. A., Carnaby Mann, G. D., Groher, M. E., & Helseth, E. (2004). Functional benefits of dysphagia therapy using adjunctive sEMG biofeedback. *Dysphagia*, 19(3), 160-164.

Journal Article; IM

This article describes a retrospective analysis of functional outcome, time in therapy, and cost per unit of functional change in patients who received therapy for pharyngeal dysphagia. Twenty-five patients presenting dysphagia following stroke and 20 patients with dysphagia following treatment for head/neck cancer completed a systematic therapy program supplemented with surface electromyographic (sEMG) biofeedback. Eighty-seven percent (39/45) of all patients increased their functional oral intake of food/liquid including 92% of stroke patients and 80% of head/neck cancer patients. Patients with dysphagia following stroke demonstrated greater improvement than those in the head/neck cancer group. Patients in the stroke group completed more therapy sessions thus increasing the total cost of therapy, but they made more functional progress resulting in lower costs per unit of functional change than patients in the head/neck cancer group. Limitations of this study are described in reference to implications for future clinical research on the efficacy of this therapy approach.

**REF ID: 2597**

**Level II: Individual experimental study**

**Topic 2: Prevention**

Culp, K., Mentis, J., & Wakefield, B. (2003). Hydration and acute confusion in long-term care residents. *Western Journal of Nursing Research*, 25(3), 251-66; discussion 267-73.

Clinical Trial; Controlled Clinical Trial; Journal Article; IM; N

Although it is generally appropriate for a healthy adult to consume 2000 to 2500 ml per day, the literature does not address evaluating any standard. The objective here was to develop a weight-based hydration management intervention and evaluate the impact of this on the incidence of acute confusion (AC) using an N = 98. The intervention consisted of a fluid intake goal based on 100 ml per kg for the first 10 kg, 50 ml/kg for the next 10 kg, and 15 ml for the remaining body weight. The treatment group received instruction and assistance on the fluid goal and the control group received routine care. Measurements included serum electrolytes, bioimpedance analysis, urinalysis, Mini-Mental State Exam, and the NEECHAM. There was no difference in the incidence of AC between treatment and controls, but those individuals with > or = 90% compliance demonstrated higher ECF volumes and also lower urine leukocyte counts.

**REF ID: 2570**

**Level V: Literature Review**

**Topic 4: Management**

Davidhizar, R., Dunn, C. L., & Hart, A. N. (2004). A review of the literature on how important water is to the world's elderly population. *International Nursing Review*, 51(3), 159-66; discussion 134.

Journal Article; Review; IM; N

AIM: This article reviews the literature on how important water is to the world's elderly population.

BACKGROUND: Water is a finite resource, so we must preserve the water that we have. Physiological aspects and what water requirements our bodies maintain sum up this essential nutrient for life.

Dehydration is a concern in the elderly. CONCLUSIONS: Five strategies related to water intake can promote health: (1) assess for symptoms which may indicate dehydration, (2) encourage ingestion of fluids

and foods to maintain an optimal fluid level, (3) be alert to physical and clinical conditions affecting hydration in the elderly, (4) consider environmental factors which may affect body fluids, electrolytes and acid-base balance, and (5) encourage methods to increase fluid consumption.

**REF ID: 2549**

**Level II: Individual experimental study**

**Topic 4: Management**

**Dennis, M., Lewis, S., Cranswick, G., Forbes, J., & FOOD Trial Collaboration. (2006). FOOD: A multicentre randomised trial evaluating feeding policies in patients admitted to hospital with a recent stroke. *Health Technology Assessment (Winchester, England)*, 10(2), iii-iv, ix-x, 1-120.**

**Journal Article; Multicenter Study; Randomized Controlled Trial; IM**

**OBJECTIVES:** To determine whether routine oral nutritional supplementation of a normal hospital diet improves outcome after stroke (Trial 1); whether early tube feeding improves the outcomes of dysphagic stroke patients (Trial 2); and if tube feeding via a percutaneous endoscopic gastrostomy (PEG) results in better outcomes than that via a nasogastric tube (NG) (Trial 3). **DESIGN:** The Feed Or Ordinary Diet (FOOD) trial was a family of three pragmatic, randomised controlled trials (RCTs). They shared facilities for randomisation, data collection, follow-up and coordination. Patients could be co-enrolled in more than one of these trials. **SETTING:** Patients were enrolled in 131 hospitals in 18 countries. **PARTICIPANTS:** A total of 5033 patients who had been admitted to hospital with a recent stroke were enrolled in the trials between November 1996 and July 2003. **INTERVENTIONS:** In Trial 1, patients who could swallow within the first 30 days of admission were allocated to normal hospital diet versus normal hospital diet plus oral nutritional supplements (equivalent to 360 ml of 1.5 kcal/ml, 20 g of protein per day) until hospital discharge. In Trial 2, dysphagic patients enrolled within 7 days of admission were allocated to early enteral tube feeding versus avoid any enteral tube feeding for at least 1 week. In Trial 3, dysphagic patients were allocated within 30 days of admission to receive enteral tube feeding via PEG versus NG. **MAIN OUTCOME MEASURES:** Survival and the modified Rankin scale (MRS), a measure of functional outcome (grade 0 indicating no symptoms and grade 5 indicating severe disability, requiring help day and night). The primary outcomes were measured 6 months after enrollment, blind to treatment allocation, by the patient or their proxy completing a postal or telephone questionnaire. **RESULTS:** In Trial 1, 4023 patients were enrolled by 125 hospitals in 15 countries. Only 314 (7.8%) patients were judged undernourished at baseline. Vital status and MRS at the end of the trial were known for 4012 (99.7%) and 4004 (99.5%), respectively. Of the 2007 allocated normal hospital diet, 253 (12.6%) died, 918 (45.7%) were alive with poor outcome (MRS 3-5) and 823 (41.1%) had a good outcome (MRS 0-2). Of the 2016 allocated oral supplements, 241 (12.0%) died, 953 (47.3%) were alive with poor outcome and 813 (40.4%) had a good outcome. The supplemented diet was associated with an absolute reduction in risk of death of 0.7% (95% CI -1.4 to 2.7;  $p = 0.5$ ) and a 0.7% (95% CI -2.3 to 3.8,  $p = 0.6$ ) increased risk of death or poor outcome. In Trial 2, a total of 859 patients were enrolled by 83 hospitals in 15 countries. MRS at the end of the trial was known for 858 (99.9%). At follow-up, of 429 allocated early tube feeding, 182 (42.4%) died, 157 (36.6%) were alive with poor outcome (MRS 4-5) and 90 (21.0%) had a good outcome (MRS 0-3). Of 430 allocated avoid tube feeding 207 (48.1%) died, 137 (31.9%) were alive with poor outcome and 85 (19.8%) had a good outcome. Early tube feeding was associated with an absolute reduction in risk of death of 5.8% (95% CI -0.8 to 12.5;  $p = 0.09$ ) and a reduction in death or poor outcome of 1.2% (95% CI -4.2 to 6.6;  $p = 0.7$ ). In Trial 3, 321 patients were enrolled by 47 hospitals in 11 countries. Of 162 allocated PEG, 79 (48.8%) died, 65 (40.1%) were alive with poor outcome and 18 (11.1%) had good outcome. Of 159 allocated NG, 76 (47.8%) died, 53 (33.3%) were alive with poor outcome and 30 (18.9%) had good outcome. PEG was associated with an increase in absolute risk of death of 1.0% (95% CI -10.0 to 11.9;  $p = 0.9$ ) and an increased risk of death or poor outcome of 7.8% (95% CI 0.0 to 15.5;  $p = 0.05$ ). **CONCLUSIONS:** The results of Trial 1 would be compatible with oral supplementation being associated with a 1-2% absolute benefit or harm, but do not support routine supplementation of hospital diet for unselected stroke patients who are predominantly well nourished on admission. In Trial 2, the data suggest that a policy of early tube feeding may substantially reduce the risk of dying after stroke and it is very unlikely that the alternative policy of avoiding early tube feeding would significantly improve survival.

Improved survival may be at the expense of increasing the proportion surviving with poor outcome. These data might usefully inform the difficult discussions about whether or not to feed a patient with a severe stroke. In Trial 3, the data suggest that in the first 2-3 weeks after acute stroke, better functional outcomes result from feeding via NG tube than PEG tube, although there was no major difference in survival. These data do not support a policy of early initiation of PEG feeding in dysphagic stroke patients. Future research might be focused on making NG tube feeding safer and more effective, also studies need to confirm the increased risk of gastrointestinal haemorrhage associated with tube feeding and, if confirmed, establish whether any interventions might reduce this risk. Future work might also aim to establish why worse functional outcomes occurred in PEG-fed patients because patients with prolonged dysphagia or intolerance of an NG tube are inevitably fed via a PEG tube.

**REF ID: 2585**

**OM: Quality Measures**

**Topic 5: Evaluation/follow-up**

**Dibert, C. (2004). Delirium and the older adult after surgery. *Perspectives (Gerontological Nursing Association (Canada))*, 28(1), 10-16.**

**Journal Article; Review; N**

Nurses are in an excellent position to positively impact the quality of care for this group of patients. By developing a knowledge base of risk factors with a special emphasis on modifiable risks factors, nurses become pivotal in the development of an client focused plan of care. The value of the plan of care is to target intervention protocols to ameliorate the effect of the hospital environment on the at-risk patient with the goal of decreasing the incidence of delirium. Careful screening and a systematic approach to assessment (using a validated assessment tool) can result in early detection and rapid intervention to treat the modifiable causative factors while continuing to provide supportive pharmacological and nonpharmacological care. A sample care path for hospitalized older patients at-risk for developing delirium is described in Figure 1. Delirium is a common occurrence in the older surgical patient and is a contributing cause of functional disability, morbidity, and mortality. Unfortunately, it remains underdiagnosed and undertreated. Nurses can improve patients' quality of care and outcomes by implementing interventions targeted at modifiable risk factors and early recognition of delirium. The care of older surgical patients requires a rigorous approach to prevention, detection and management. Close attention to ensure adequate oxygenation, perfusion, hydration, nutrition and stimulation is critical. Commitment to improve outcomes in a decidedly vulnerable patient population holds the potential to reduce morbidity and mortality as well as reducing costs and length of stay for the older surgical population who experience an episode of acute post-operative delirium.

**REF ID: 2559**

**Level I: Systematic Review**

**Topic 3: Assessment**

**Doggett, D. L., Tappe, K. A., Mitchell, M. D., Chapell, R., Coates, V., & Turkelson, C. M. (2001). Prevention of pneumonia in elderly stroke patients by systematic diagnosis and treatment of dysphagia: An evidence-based comprehensive analysis of the literature. *Dysphagia*, 16(4), 279-295.**

**Journal Article; Review; D; IM**

We conducted a systematic literature review and analysis of programs for evaluating swallowing in order to prevent aspiration pneumonia. This article derives from an evidence report on diagnosis and treatment of swallowing disorders (dysphagia) in acute-care stroke patients prepared by us as an Evidence-based Practice Center (EPC) under contract to the U.S. Agency for Healthcare Research and Quality (AHRQ). Available evidence on the diagnosis and treatment of dysphagia for preventing pneumonia is limited. We found reported pneumonia rates in one historical controlled study of a program using bedside exams (BSE) for acute stroke patients; one uncontrolled case series study of acute stroke patient-reporting of swallowing difficulty; one controlled case series study of videofluoroscopic study of swallowing (VFSS) for acute stroke patients; and one historical controlled study of fiberoptic endoscopic examination of swallowing (FEES) for patients referred for swallowing evaluation in rehabilitation centers. Comparing these results with historical controls indicates that implementation of dysphagia programs is accompanied by substantial

reductions in pneumonia rates. While all these methods appeared effective, the small sizes of available studies did not allow determination of the relative efficacy of BSE, VFSS, or FEES.

**REF ID: 2590**

**Level V: Literature Review**

**Topic 3: Assessment**

**Feinsod, F. M., Levenson, S. A., Rapp, K., Rapp, M. P., Beechinor, E., & Liebmann, L. (2004). Dehydration in frail, older residents in long-term care facilities. *J.Am.Med.Dir.Assoc.*, 5(2 Suppl), S35-41.**

**Journal Article; Review; IM**

**REF ID: 2578**

**Level V: Literature Review**

**Topic 6: Comprehensive**

**Ferry, M. (2005). Strategies for ensuring good hydration in the elderly. *Nutrition Reviews*, 63(6 Pt 2), S22-9.**

**Journal Article; Review; IM**

Dehydration is a frequent etiology of morbidity and mortality in elderly people. It causes the hospitalization of many patients and its outcome may be fatal. Indeed, dehydration is often linked to infection, and if it is overlooked, mortality may be over 50%. Older individuals have been shown to have a higher risk of developing dehydration than younger adults. Modifications in water metabolism with aging and fluid imbalance in the frail elderly are the main factors to consider in the prevention of dehydration. Particularly, a decrease in the fat free mass, which is hydrated and contains 73% water, is observed in the elderly due to losses in muscular mass, total body water, and bone mass. Since water intake is mainly stimulated by thirst, and since the thirst sensation decreases with aging, risk factors for dehydration are those that lead to a loss of autonomy or a loss of cognitive function that limit the access to beverages. The prevention of dehydration must be multidisciplinary. Caregivers and health care professionals should be constantly aware of the risk factors and signs of dehydration in elderly patients. Strategies to maintain normal hydration should comprise practical approaches to induce the elderly to drink enough. This can be accomplished by frequent encouragement to drink, by offering a wide variety of beverages, by advising to drink often rather than large amounts, and by adaptation of the environment and medications as necessary.

**REF ID: 2638**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Finestone, H. M., Foley, N. C., Woodbury, M. G., & GreeneFinestone, L. (2001). Quantifying fluid intake in dysphagic stroke patients: A preliminary comparison of oral and nonoral strategies. *Archives of Physical Medicine and Rehabilitation*, 82(12), 1744-1746.**

**Journal Article, Research, Tables/Charts**

**OBJECTIVE:** To determine whether dysphagic stroke patients receiving oral (thickened-fluid dysphagia) diets or nonoral (enteral feedings supplemented with intravenous fluids) diets met their estimated fluid requirements. **DESIGN:** Cohort study. **SETTING:** University-affiliated hospital. **PARTICIPANTS:** Thirteen dysphagic patients with new strokes were studied for 21 days postadmission to hospital. **INTERVENTIONS:** Seven patients (group 1) were started on nonoral feeding and later progressed to oral diets and 6 patients (group 2) received oral dysphagia diets only. **MAIN OUTCOME MEASURE:** Fluid intake. **RESULTS:** Fluid intake of patients in group 1 significantly declined over the 21 days (mean +/- standard deviation, 3158 +/- 523mL/d vs 984 +/- 486mL/d;  $p < .0001$ ), representing 134% +/- 26% and 43% +/- 20% of their fluid requirements, respectively. Mean fluid intake of patients in group 2 was 755 +/- 162mL/d, representing 33% +/- 5% of requirements. This volume was significantly lower than the fluid intake of patients who received nonoral feeding ( $p < .0001$ ). **CONCLUSIONS:** Dysphagic stroke patients who received thickened-fluid dysphagia diets failed to meet their fluid requirements whereas patients on enteral feeding and intravenous fluid regimens received ample fluid. Copyright 2001 by the American Congress of Rehabilitation Medicine and the American Academy of Physical Medicine and Rehabilitation

**REF ID: 2630**

**Level IV: Non-experimental study**

**Topic 4: Management**

**Flesher, M. E., Archer, K. A., Leslie, B. D., McCollom, R. A., & Martinka, G. P. (2005). Assessing the metabolic and clinical consequences of early enteral feeding in the malnourished patient. *JPEN: Journal of Parenteral and Enteral Nutrition*, 29(2), 108-117.**

**Journal Article, Practice Guidelines, Questionnaire/Scale, Research, Tables/Charts**

**BACKGROUND:** It is often thought that enteral feeding should be initiated slowly in those who are severely malnourished. This descriptive study examined the effect of an enteral feeding protocol on the typical metabolic consequences seen in refeeding syndrome. **METHODS:** A retrospective chart review was conducted on 51 patients who had been placed on hospital-wide enteral feeding and electrolyte replacement protocols over a 9-month period to determine whether there were any negative clinical consequences to early feeding. **RESULTS:** Goal feeding rate was achieved within 17.6 +/- 8.7 hours. Forty patients (80%) developed depletions in phosphate, magnesium, or potassium after initiation of enteral feeding, including 93% of those deemed "at risk" and 74% of those "not at risk." All patients received electrolyte replacement according to protocols, and no patients showed any negative clinical effect. **CONCLUSIONS:** This study showed that malnourished patients at risk for refeeding syndrome can be fed early without observed negative clinical consequences. An electrolyte replacement protocol may be an effective means of minimizing the electrolyte imbalances associated with early feeding. It also demonstrated the significance of applying such protocols to all patients requiring enteral support, as current methods of assessing "risk" for refeeding syndrome may be inadequate.

**REF ID: 2586**

**Level V: Literature review**

**Topic 1: Risks**

**Gaglia, J. L., Wyckoff, J., & Abrahamson, M. J. (2004). Acute hyperglycemic crisis in the elderly. *The Medical Clinics of North America*, 88(4), 1063-84, xii.**

**Journal Article; Review; AIM; IM**

The geriatric population is at particular risk for developing hyperglycemic crises with the development of diabetes. With increasing age, insulin secretory reserve, insulin sensitivity, and thirst mechanisms decrease. The elderly are particularly vulnerable to hyperglycemia and dehydration, the key components of hyperglycemic emergencies. If recognized early, hyperglycemia can frequently be treated in the outpatient setting even with moderate or large ketonuria, provided patients can take fluids, monitor blood glucose frequently, and follow standard "sick day rules." With increased diabetes surveillance and aggressive early treatment of hyperglycemia and its complications, morbidity and mortality from acute diabetic crises in the geriatric population can be greatly reduced.

**REF ID: 2555**

**Level 1: Systematic review**

**Topic 6: Comprehensive**

**Hodgkinson, B., Evans, D., & Wood, J. (2003). Maintaining oral hydration in older adults: A systematic review. *International Journal of Nursing Practice*, 9(3), S19-28.**

**Journal Article; Review; N**

Dehydration is the most common fluid and electrolyte imbalance in older adults. The objectives were to identify the factors that increase the risk of dehydration in older adults, how best to assess the risk and manage oral fluid intake. Data sources included Medline, CINAHL, Cochrane Library, Embase and Current Contents, which were searched until February 2002. Randomized controlled trials for management of adequate fluid intake were undertaken. Cohort and case control studies were used for the identification of risk factors for dehydration. Studies of assessment tools for the identification of dehydration were also considered. Results show that there is no clear determination of the risk factors for dehydration and decreased fluid intake. The recommended daily intake of fluids should be not less than 1600 mL/24 h in order to ensure adequate hydration. A fluid intake sheet and urine specific gravity might be the best methods of monitoring daily fluid intake. Regular presentation of fluids to bedridden older adults can

maintain adequate hydration status. In conclusion, more research is required to determine the optimum method of maintaining adequate oral hydration in older adults.

**REF ID: 2564**

**Level V: Literature review**

**Topic 4: Management**

**Holman, C., Roberts, S., & Nicol, M. (2005). Promoting adequate hydration in older people. *Nurs.Older People, 17(4), 31-32.***

**Journal Article; Review; N**

**REF ID: 2557**

**Level IV: Non-experimental study**

**Topic 1: Risks**

**Huang, Z. B., Neufeld, R. R., Likourezos, A., Breuer, B., Khaski, A., & Milano, E. et al. (2003). Sociodemographic and health characteristics of older chinese on admission to a nursing home: A cross-racial/ethnic study. *Journal of the American Geriatrics Society, 51(3), 404-409.***

**Journal Article; IM**

**OBJECTIVES:** To investigate sociodemographic characteristics (SDCs) and health status of older Chinese newly admitted to a nursing home (NH) and to compare them with the characteristics of residents from other racial/ethnic groups. **DESIGN:** Secondary analysis of the admission Minimum Data Set Plus (MDS+). **SETTING:** A New York City municipal NH near Chinatown. **PARTICIPANTS:** Two hundred fifty-eight (125 Chinese, 57 white, 53 Hispanic, and 23 black) of 292 residents consecutively admitted from November 1992 to May 1997 were selected after excluding those younger than 60 or transferred from another NH. **MEASUREMENTS:** SDCs, health status parameters (cognitive performance, physical functioning, mood/behavior patterns, and psychosocial well-being), and morbidity information (most-frequent diagnoses/conditions and medication use) documented in or generated from the MDS+. **RESULTS:** The majority of these Chinese were first-generation immigrants and spoke primarily Cantonese or Mandarin Chinese. Compared with whites, they were more likely to be married, less likely to have lived alone, more likely to be using Medicaid, less likely to make medical decision alone, and more likely to depend on family members for decision-making. Nearly three-quarters of Chinese had cognitive impairment. There was an underdiagnosis of dementia in the Chinese subjects on admission. Severe dependence in activity of daily living was identified in more than one-third of Chinese. Fewer Chinese were using psychotropic medications on admission than the whites. Similar to other groups, many of the Chinese subjects were incontinent of bowel and bladder and had chewing or swallowing problems, hypertension, anemia, and stroke. **CONCLUSION:** This is the first systematic report of the SDCs and health status of a group of newly admitted older Chinese to an urban NH in the United States using the Minimum Data Set database. These findings suggest that Chinese residents are as frail as other racial/ethnic residents on admission. NHs caring for older Chinese need to be sensitive to the presence of dementia, and require a staff that can speak Cantonese and Mandarin Chinese and is comfortable negotiating with families who are more likely to be the designated decision makers.

**REF ID: 2635**

**QM: Quality measures**

**Topic 5: Evaluation/follow-up**

**Jensdottir, A. B., Rantz, M., Hjaltadottir, I., Gudmundsdottir, H., Rook, M., & Grando, V. (2003). International comparison of quality indicators in united states, icelandic and canadian nursing facilities. *International Nursing Review, 50(2), 79-84.***

**Journal Article, Research, Tables/Charts**

**AIM:** To discuss the results of a comparison using minimum data set (MDS)-based quality indicators (QIs) for residents in nursing facilities in three countries (Iceland; Ontario, Canada; and Missouri, United States) together with implications regarding nursing practices and resident outcomes in these countries.

**METHOD:** Data were extracted from databases in each country for four consecutive quarterly periods during 1997 and 1998. All facilities investigated had the required consecutive quarterly data. Analytical techniques were matched to measure resident outcomes using the same MDS-based QIs in the three

countries. RESULTS: Similarities among the three countries included the use of nine or more multiple medications, weight loss, urinary tract infection, dehydration, and behavioural symptoms that affect others. Differences among the three countries included bowel and bladder incontinence, indwelling catheter use, fecal impaction, tube feeding use, development of pressure ulcers, bedridden residents, physical restraint use, depression without receiving antidepressant therapy, residents with depression, use of anti-anxiety or hypnotic drugs, use of anti-psychotic drugs in the absence of psychotic and related conditions, residents spending little or no time in activities, and falls. CONCLUSIONS: Comparisons highlighted differences in clinical practices among countries, which may account for differences in resident outcomes. Learning from each other's best practices can improve the quality of care for older people in nursing homes in many countries.

**REF ID: 2608**

**Level V: Case report**

**Topic 1: Risks**

**Kayser-Jones, J. (2006). Preventable causes of dehydration: Nursing home residents are especially vulnerable. *The American Journal of Nursing*, 106(6), 45.**

**Case Reports; Journal Article; AIM; IM; N**

**REF ID: 2604**

**Level V: Literature review**

**Topic 1: Risks**

**Kenney, W. L., & Chiu, P. (2001). Influence of age on thirst and fluid intake. *Medicine and Science in Sports and Exercise*, 33(9), 1524-1532.**

**Journal Article; Review; IM; S**

Independently living older adults (over the age of 65 yr) consume adequate volumes of fluids on a daily basis. However, when challenged by fluid deprivation, a hyperosmotic stimulus, or exercise in a warm environment (all of which combine hypovolemia and hyperosmolality), older adults exhibit decreased thirst sensation and reduced fluid intake. Full fluid restoration eventually occurs, but full restoration of fluid balance is slowed. The aging process alters important physiological control systems associated with thirst and satiety. Recent evidence suggests that older men and women (i) have a higher baseline osmolality and thus a higher osmotic operating point for thirst sensation (with little or no change in sensitivity), and (ii) exhibit diminished thirst and satiety in response to the unloading (hypovolemia) and loading (hypervolemia) of baroreceptors. A diminished sensation of thirst in the elderly relative to young adults is generally absent when a volume stimulus is absent, despite higher baseline plasma osmolalities. Compared with the elderly, there are scant data associated with homeostatic control of thirst in children.

Nonhomeostatic control of thirst and drinking behavior may likewise be different for children (as it is for the elderly), as compared with young adults; however, little empirical data exist on this topic. Children rarely exhibit voluntary dehydration for activities lasting 45 min or less; however, drink flavoring and sodium chloride are important promoters of drinking in active children.

**REF ID: 2646**

**Level II: Individual experimental study**

**Topic 4.3: Management-medication**

**Kitagawa, S., Matsumoto, T., Ikenoue, M., Omori, Y., Kamimura, O., & Kitagawa, N. et al. (2003). Effectiveness of OS-1 for water and electrolyte supplementation in elderly dehydrated patients -**

**multicenter clinical study using commercially available mineral water as a control solution. *Japanese Pharmacology & Therapeutics*, 31(10), 855-868.**

**Journal Article**

A three-center controlled clinical study was conducted to evaluate the effectiveness of OS-1 for water and electrolyte supplementation in elderly dehydrated patients. Mineral water (CRYSTAL GEYZER(R)), which is often used for oral rehydration, was used as the control solution. A total of 41 hospitalized elderly patients with mild to moderate dehydration were randomly allocated to an OS-1 group (21 patients) and a control group (20 patients). One patient in the control group was dropped from the study because informed consent was withdrawn. Therefore, 21 patients (5 men and 16 women) in the OS-1 group and 19 patients (1

man and 18 women) in the control group were included in the efficacy analysis. The subjects were instructed to consume approximately 600 mL of the study solution (OS-1 or mineral water) per day for 7 days, in addition to their usual meals. Consumption of the study solution at various times during the day was permitted. During the study period, the consumption of other drinks except for green tea or plain hot water was prohibited. The volumes of study solution consumed in the OS-1 group and in the control group were 513 +/- 183mL and 387 +/- 184 mL, respectively, showing significantly higher consumption in the OS-1 group. However, no significant difference was observed in the total water intake, including green tea and plain hot water, between the two groups (OS-1 group, 928 +/- 493 mL; control group, 676 +/- 387 mL). With regard to the primary endpoints (changes in body weight and [DELTA] FENa), the values in the OS-1 group were significantly higher than those in the control group. These results indicate that OS-1 is effective for oral rehydration. The concentrations of urinary Na and Cl were significantly higher in the OS-1 group than in the control group, and changes in the level of serum uric acid were significantly lower in the OS-1 group than in the control group. These results indicate that OS-1 is effective for water and electrolyte (particularly Na) supplementation. No clinically significant problems were observed in the safety assessment, confirming the safety of OS-1. In summary, OS-1 is a clinically safe and useful oral solution for water and electrolyte supplementation that is available for the routine management of elderly patients with chronic dehydration.

**REF ID: 2629**

**Level III: Quasi-experimental studies**

**Topic 1: Risks**

**Lancaster, K. J., SmiciklasWright, H., Heller, D. A., Ahern, F. M., & Jensen, G. (2003). Dehydration in black and white older adults using diuretics. *Annals of Epidemiology*, 13(7), 525-529.**

**Journal Article, Research, Tables/Charts**

**PURPOSE:** To assess the association between dehydration and ethnicity in older adults; and to determine if diuretic use can help explain the disparity between blacks and whites in diagnosis of dehydration.

**METHODS:** We conducted a case-control study in black and white older adults in a pharmaceutical assistance program who were hospitalized during 1997. Cases were all those diagnosed with dehydration (N=9186). Randomly selected controls were 4:1 frequency matched to cases by sex and age group (N(Total)=45585). **RESULTS:** Patients taking loop, potassium-sparing, thiazide or combination diuretics were more likely to have a diagnosis of dehydration. Dehydration diagnosis was associated with being black (odds ratio (OR)=1.49, 95% confidence interval (CI), 1.36-1.63, p<.001), independent of diuretic use or dosage. That association remained when examining loop (OR=1.36, 95% CI, 1.10-1.63, p<.004) and thiazide diuretic users (OR=1.59, 95% CI, 1.09-2.34, p=.017), but not potassium-sparing or combination diuretic users. **CONCLUSION:** Diuretic use is significantly associated with dehydration diagnosis, but the greater likelihood of older blacks being diagnosed with dehydration is independent of diuretic use. The increased risk of morbidity and mortality associated with dehydration suggests that further examination of the root cause of this disparity in risk is warranted.

**REF ID: 2563**

**Level V: Literature Review**

**Topic 2: Prevention**

**Levi, R. (2005). Nursing care to prevent dehydration in older adults. *Australian Nursing Journal* (June 1993), 13(3), 21-23.**

**Journal Article; Review; N**

**REF ID: 2606**

**Level V: Literature review**

**Topic 1: Risks**

**Lieu, P. K., Chong, M. S., & Seshadri, R. (2001). The impact of swallowing disorders in the elderly. *Annals of the Academy of Medicine, Singapore*, 30(2), 148-154.**

**Journal Article; Review; IM**

**INTRODUCTION:** Swallowing disorders are common in the elderly but its prevalence is often underestimated. They can result in increased morbidity and mortality. **METHODS:** This article summarises

the findings of selected published papers in major international journals indexed on Medline on swallowing using the key words--swallowing, dysphagia, aged, geriatrics and deglutition. RESULTS: There are age-related changes in the oral, pharyngeal and oesophageal functions. In the elderly, central nervous system diseases such as stroke, parkinsonism, dementia, medications, local oral and oesophageal factors are common causes of swallowing dysfunction. Swallowing disorders in the elderly are associated with increased mortality and morbidity. Aspiration, dehydration, pneumonia, malnutrition, functional decline and institutionalisation are often encountered in the elderly with dysphagia. There is a choice of different interventions available to reduce morbidity and mortality arising from swallowing impairments, and improving their quality of life. CONCLUSION: The effective management of swallowing impairment in the elderly requires a multidisciplinary team approach.

**REF ID: 2595**

**Level III: Quasi-experimental study**

**Topic 4: Management**

**Lin, L. C., Wang, S. C., Chen, S. H., Wang, T. G., Chen, M. Y., & Wu, S. C. (2003). Efficacy of swallowing training for residents following stroke. *Journal of Advanced Nursing*, 44(5), 469-478.**

**Clinical Trial; Controlled Clinical Trial; Journal Article; IM; N**

BACKGROUND: The presence of dysphagia is associated with an increased risk of mortality, malnutrition, dehydration, compromised pulmonary function, and disability. Appropriate swallowing training can establish optimal nutritional status and eliminate or reduce the risk of developing medical complications associated with swallowing impairment. AIM(S) OF THE STUDY: The aim of this study was to examine the functional swallowing and nutritional outcomes of swallowing training in institutionalized stroke residents with dysphagia. DESIGN AND METHODS: A quasi-experimental parallel cluster design was used. Seven institutions with similar bed sizes were selected. All subjects in the experimental group received a structured swallowing training programme. The subjects in the experimental group (n = 40) received 30 minutes of swallowing training each day for 6 days per week for 8 weeks. The control group (n = 21) did not receive any training. RESULTS: After swallowing training, mean differences in volume per second, volume per swallow, mid-arm circumference and body weight between pre- and post-training of the experimental group were significantly higher than for the control group, while mean differences in neurological examination and choking frequency during meals for the experimental group were significantly lower than in the control group. CONCLUSION: This study used objective timed swallowing tests, a swallowing questionnaire, and a neurological examination to evaluate the effects of swallowing training. However, videofluoroscopy is generally considered the best method for evaluating the pharyngeal and esophageal stages of swallowing, and introducing this technique is recommended for future studies. Furthermore, it is recommended that nursing professionals should conduct swallowing training protocols in stroke patients to help prevent aspiration from dysphagia.

**REF ID: 2593**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Manz, F., & Wentz, A. (2003). 24-h hydration status: Parameters, epidemiology and recommendations. *European Journal of Clinical Nutrition*, 57 Suppl 2, S10-8.**

**Journal Article; Review; IM**

Hydration of individuals and groups is characterised by comparing actual urine osmolality (Uosm) with maximum Uosm. Data of actual, maximum and minimum Uosm in infants, children and adults and its major influencing factors are reviewed. There are remarkable ontogenetic, individual and cultural differences in Uosm. In the foetus and the breast-fed infant Uosm is much lower than plasma osmolality, whereas in children and adults it is usually much higher. Individuals and groups may show long-term differences in Uosm. In industrialised countries, the gender difference of Uosm is common. There are large intercultural differences of mean 24-h Uosm ranging from 860 mosm/kg in Germany, 649 mosm/kg in USA to 392 mosm/kg in Poland. A new physiologically based concept called 'free-water reserve' quantifies differences in 24-h euhydration. In 189 boys of the DONALD Study aged 4.0-6.9 y, median urine volume was 497 ml/24-h and median Uosm 809 mosm/kg. Considering mean-2 s.d. of actual maximum 24-h Uosm

of 830 mosm/kg as upper level of euhydration and physiological criterion of adequate hydration in these boys, median free-water reserve was 11 ml/24-h. Based on median total water intake of 1310 ml/24-h and the third percentile of free-water volume of -156 ml/24-h, adequate total water intake was 1466 ml/24-h or 1.01 ml/kcal. Data of Uosm in 24-h urine samples and corresponding free-water reserve values of homogeneous groups of healthy subjects from all over the world might be useful parameters in epidemiology to investigate the health effects of different levels of 24-h euhydration.

**REF ID: 2560**

**Level V: Literature Review**

**Topic 6: Comprehensive**

**Mentes, J. (2006). Oral hydration in older adults: Greater awareness is needed in preventing, recognizing, and treating dehydration. *The American Journal of Nursing, 106(6), 40-9; quiz 50.***

**Journal Article; Review; AIM; IM; N**

Maintaining adequate fluid balance is an essential component of health at every stage of life. Age-related changes make older adults more vulnerable to shifts in water balance that can result in overhydration or, more frequently, dehydration. This article reviews age-related changes, risk factors, assessment measures, and nursing interventions for dehydration.

**REF ID: 2565**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Mentes, J. C. (2006). A typology of oral hydration problems exhibited by frail nursing home residents. *Journal of Gerontological Nursing, 32(1), 13-9; quiz 20-1.***

**Journal Article; N**

Dehydration remains a substantial problem for nursing home residents, often with poor health outcomes. The purpose of this investigation was to establish 6-month prevalence of dehydration events in nursing home residents and to describe common hydration problems of nursing home residents. In this prospective observational study, 35 nursing home residents were followed for 6 months to assess problems with hydration and to evaluate the presence of dehydration. Urine specific gravity and color, bioimpedance measurements, meal intake recordings, and chart abstraction were used to assess hydration status. Field notes and informal staff interviews were used to describe specific hydration problems and clinically relevant interventions. Dehydration events occurred in 31% (11 of 35) of residents during the 6-month period. A typology of hydration problems was developed from the field observations. The typology consists of four groups (i.e., Can Drink, Can't Drink, Won't Drink, End of Life) and six corresponding subgroups. Demographic and hydration characteristics of the subgroups were compared and contrasted. Comparisons revealed the Won't Drink group is most vulnerable to dehydration events because this group has the highest percentage of dehydration events (58%, 4 of 7), the highest average specific gravity, and the lowest consumption of fluids during meals. Nursing interventions for the subgroups are discussed. Targeting nursing interventions to the specific hydration problem exhibited is proposed.

**REF ID: 2609**

**Level IV: Non-experimental study**

**Topic 4: Management**

**Mentes, J. C., Chang, B. L., & Morris, J. (2006). Keeping nursing home residents hydrated. *Western Journal of Nursing Research, 28(4), 392-406; discussion 407-18.***

**Journal Article; IM; N**

The purpose of this research is to ascertain nursing home (NH) staffs' perspectives of the problem of dehydration in NHs (skilled nursing facilities) and have them identify clinically practical interventions to ensure that NH residents consistently take adequate fluids. Four focus groups with 28 NH staff members in attendance are held in three NHs in metropolitan Los Angeles. The majority of participants are certified nursing assistants; however, licensed vocational nurses, registered nurses, and other NH staff also attend the groups. Content analytic techniques are used to analyze the data. Three themes emerge focusing on residents' reasons for not drinking, signs and symptoms of dehydration, and strategies for improving hydration in NH residents. NH staff members identify the complexity of providing adequate hydration that

was influenced by the resident's relationship with family and NH staff and communication between staff members.

**REF ID: 2634**

**Level III: Quasi-experimental study**

**Topic 2: Prevention**

**Mentes, J. C., & Culp, K. (2003). Reducing hydration-linked events in nursing home residents... including commentary by godkin D. *Clinical Nursing Research*, 12(3), 210-228.**

**Journal Article, Commentary, Research, Tables/Charts**

The authors used a quasi-experimental treatment and control group design with 49 participants from four nursing homes to test the effectiveness of an 8-week hydration intervention in reducing hydration-linked events (HLEs). A Kaplan Meier survival curve with log rank test was calculated to determine incidence and time to occurrence of a HLE. Incidence of and time to a HLE did not differ between the treatment and control groups over an 8-week period ( $p > .05$ ). However, treatment group participants were found to be more frail, more cognitively impaired and more at risk for acute confusion than the control group participants. Although there were no statistically significant differences between the groups, it is clinically significant that the frailer, more at-risk participants in the treatment group had a lower incidence of HLEs.

**REF ID: 2628**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Mentes, J. C., Wakefield, B., & Culp, K. (2006). Use of a urine color chart to monitor hydration status in nursing home residents. *Biological Research for Nursing*, 7(3), 197-203.**

**Journal Article, Research, Tables/Charts**

To determine whether urine color, as measured by a color chart, might be a valid indicator of hydration status in frail nursing home residents, this study tested the associations between urine color and urine specific gravity. This is a descriptive correlational study set in seven nursing homes in eastern Iowa. Ninety-eight nursing home residents  $> \text{ or } = 65$  years of age participated. Exclusion criteria for the study included: unstable congestive heart failure or diabetes, documented renal disease, hyponatremia (serum sodium  $\text{ or } = 50$  ml/min) had significant associations between average urine color and average Usg. Females with mild renal impairment (CrCl between 30 and 50 ml/min) also had significant associations between Ucol and Usg ( $r(s) = .64, p < .01$ ). Ucol averaged over several individual readings offers another tool in assessing hydration status in Caucasian nursing home residents with adequate renal function measures by estimated CrCl values.

**REF ID: 2594**

**Level IV: Non-experimental study**

**Topic 1: Risks**

**Morgan, A. L., Masterson, M. M., Fahlman, M. M., Topp, R. V., & Boardley, D. (2003). Hydration status of community-dwelling seniors. *Aging Clin.Exp.Res.*, 15(4), 301-304.**

**Journal Article; Multicenter Study; IM**

**BACKGROUND AND AIMS:** Dehydration is the most common fluid or electrolyte disorder among older persons. This study was designed to examine the hydration status of community-dwelling seniors. **METHODS:** Blood and urine samples were collected from 67 independently living volunteers (65-93 yrs) who had functional limitations but no condition that contraindicated 10 min of moderate exercise. Forty-six subjects who were not diabetic, had fasted for 12 hours, and had blood glucose levels  $< \text{ or } = 115$  mg/dL were thus included. Urine and serum samples were analyzed for osmolality (mosm/kg),  $\text{Na}^+$  (mmol/L) and  $\text{K}^+$  (mmol/L). Whole blood was analyzed for hemoglobin (Hb, g/dL) and hematocrit (Hct, %) and urine for specific gravity (USG). Means and standard deviations for the current data were compared with normal values. **RESULTS:** All values were within normal ranges except urine osmolality. **CONCLUSIONS:** While changes associated with aging may predispose an individual to dehydration, functionally limited, independently living older individuals demonstrate normal hydration status following a 12-hr fast. This suggests that dehydration is not solely a function of the aging process, but may be more related to concomitant medical conditions or dependent living.

**REF ID: 2627**

**Level V: Case report**

**Topic 4: Management**

**Moriarty, D., & Hudson, E. (2001). Hypodermoclysis for rehydration in the community. *British Journal of Community Nursing*, 6(9), 437-443.**

**Journal Article; N**

During 1999 and 2000 the practice development unit of Greater Glasgow Primary Care Trust received an increasing number of requests from community staff for guidance in caring for patients receiving subcutaneous fluids for rehydration. This article describes the process of developing guidelines in order to address the issue. Hypodermoclysis is a relatively safe, simple and cost-effective technique, suitable for use in the community with a range of client groups, e.g. older people or those recovering from recent cardiovascular accidents. Its use in palliative care, however, raises problems in terms of clinical evidence and ethical issues which need to be addressed. Various factors, i.e. products not being licensed for this specific use, staff requests for clinical guidance and the anticipated increasing use of hypodermoclysis for rehydration, all indicated the need for a collaborative approach, address the complexity of issues in the decision-making process and provide clinical guidance with the aim of improving nursing practice and patient outcomes.

**REF ID: 2576**

**Level III: Quasi-experimental study**

**Topic 3: Assessment**

**Morita, T., Hyodo, I., Yoshimi, T., Ikenaga, M., Tamura, Y., & Yoshizawa, A. et al. (2006). Artificial hydration therapy, laboratory findings, and fluid balance in terminally ill patients with abdominal malignancies. *Journal of Pain and Symptom Management*, 31(2), 130-139.**

**Controlled Clinical Trial; Journal Article; Multicenter Study; IM**

To explore the association between hydration volume and laboratory findings, and between calculated fluid balance and changes in clinical signs of dehydration and fluid retention in terminally ill cancer patients, a secondary analysis of a large multicenter, prospective, observational study was performed. The study enrolled 125 abdominal cancer patients who received laboratory examinations in the last week before death. Patients were classified into two groups: the hydration group (n = 44), who received 1L or more of artificial hydration per day both 1 and 3 weeks before death, and the nonhydration group (n = 81). The mean albumin level 1 week before death was significantly lower in the hydration group than in the nonhydration group, and the interaction between hydration group and decrease in the albumin level was statistically significant after adjusting multiple covariates (from 2.8 +/- 0.68 mg/dL 3 weeks before death to 2.4 +/- 0.56 mg/dL 24 hours before death in the hydration group vs. a decrease of 2.8 +/- 0.53 to 2.6 +/- 0.45 mg/dL in the nonhydration group, P = 0.015). There was no significant difference between the groups in the mean blood urea nitrogen/creatinine, sodium, or potassium levels 1 week before death. Among 53 patients who had oral fluid intake of less than 500 mL/day throughout the last 3 weeks and completed a fluid balance study, the median of calculated fluid balance was -400 mL/day 3 weeks before death, -521 mL/day 1 week before death, and -421 mL/day 24 hours before death. Calculated fluid balances did not significantly differ between the patients with deterioration of dehydration signs, edema, ascites, and pleural effusion during the final 3 weeks and those without. These data suggest that active artificial hydration might result in hypoalbuminemia, with no clear beneficial effects on normalizing blood urea nitrogen/creatinine, sodium, or potassium levels. Fluid balance did not significantly correlate with changes in dehydration-and fluid retention-signs. Calculated fluid balance is not an appropriate alternative to direct monitoring of patient symptoms. More studies are needed to determine the clinical efficacy of artificial hydration for terminally ill cancer patients.

**REF ID: 2581**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Morita, T., Hyodo, I., Yoshimi, T., Ikenaga, M., Tamura, Y., & Yoshizawa, A. et al. (2005). Association between hydration volume and symptoms in terminally ill cancer patients with**

**abdominal malignancies. *Annals of Oncology : Official Journal of the European Society for Medical Oncology / ESMO*, 16(4), 640-647.**

**Journal Article; Multicenter Study; IM**

**BACKGROUND:** To explore the association between hydration volume and symptoms during the last 3 weeks of life in terminally ill cancer patients. **PATIENTS AND METHODS:** This was a multicenter, prospective, observational study of 226 consecutive terminally ill patients with abdominal malignancies. Primary responsible physicians and nurses evaluated the severity of membranous dehydration (dehydration score calculated from three physical findings), peripheral edema (edema score calculated from seven physical findings), ascites and pleural effusion (rated as physically undetectable to symptomatic), bronchial secretion, hyperactive delirium (Memorial Delirium Assessment Scale), communication capacity (Communication Capacity Scale), agitation (Agitation Distress Scale), myoclonus and bedsores. **RESULTS:** Patients were classified into two groups: the hydration group (n=59) who received 1 l or more of artificial hydration per day, 1 and 3 weeks before death, and the non-hydration group (n=167). The percentage of patients with deterioration in dehydration score in the final 3 weeks was significantly higher in the non-hydration group than the hydration group (35% versus 14%; P=0.002), while the percentages of patients whose symptom scores for edema, ascites and pleural effusion increased were significantly higher in the hydration group than the non-hydration group (44% versus 29%, P=0.039; 29% versus 8.4%, P <0.001; 15% versus 5.4%, P=0.016; respectively). After controlling for multiple covariates and treatment settings, the association between hydration group and dehydration/ascites score was statistically significant. Subgroup analysis of patients with peritoneal metastases identified statistically significant interaction between hydration group and dehydration/pleural effusion score. There were no significant differences in the degree of bronchial secretion, hyperactive delirium, communication capacity, agitation, myoclonus or bedsores. **CONCLUSIONS:** Artificial hydration therapy could alleviate membranous dehydration signs, but could worsen peripheral edema, ascites and pleural effusions. It is suggested that the potential benefits of artificial hydration therapy should be balanced with the risk of worsening fluid retention symptoms. Further clinical studies are strongly needed to identify the effects of artificial hydration therapy on overall patient well-being, and an individualized treatment and close monitoring of dehydration and fluid retention symptoms is strongly recommended.

**REF ID: 2554**

**QM: Quality measures**

**Topic 5: Evaluation/follow-up**

**Moty, C., Barberger-Gateau, P., De Sarasqueta, A. M., Teare, G. F., & Henrard, J. C. (2003). Risk adjustment of quality indicators in french long term care facilities for elderly people. A preliminary study. *Revue d'Epidemiologie Et De Sante Publique*, 51(3), 327-338.**

**Journal Article; IM**

**BACKGROUND:** In France, the funding reform for long term care facilities mandates quality improvement efforts and the measurement of quality of care indicators. In the United States, the Center for Health Systems Research and Analysis (CHSRA) has proposed 24 indicators, which measure practices and outcomes ("events") in long term care facilities. The objective of this preliminary study was to propose risk adjustments on the CHSRA indicators for future use in France. **METHODS:** The unit of analysis was residents assessments (558) in eight French facilities which voluntarily participated to the experimentation of the Resident Assessment Instrument (RAI) from January 1996 to June 1999. This preliminary study focused on nine of the CHSRA's indicators: "prevalence of falls", "use of nine or more different medications", "prevalence of bladder or bowel incontinence", "prevalence of occasional or frequent bladder or bowel incontinence without a toileting plan", "prevalence of urinary tract infections", "prevalence of dehydration", "prevalence of bedfast residents", "prevalence of little or no activity" and "prevalence of stage 1-4 pressure ulcers". A working group selected residents' characteristics for risk adjustment based on the literature, risk adjustments selected by CHSRA, and their own propositions. For each event, candidate independent characteristics were screened using univariate analyses and, when significant, were entered into a stepwise selection analysis to obtain the final model. The proposed indicator was the ratio between observed and expected numbers of events. **RESULTS:** Six indicators were left unadjusted. For the event

"prevalence of occasional or frequent bladder or bowel incontinence without a toileting plan", we proposed a stratification on "dementia - neurological diseases" ( $p < 0.001$ ). We proposed two models of prediction: for the event "prevalence of bladder or bowel incontinence" we adjusted on "severe cognitive impairment" (OR=4.00), "dementia- neurological diseases" (OR=1.75) and "total dependence in mobility" (OR=9.30); for the event "prevalence of stage 1-4 pressure ulcers" we adjusted on "dependence for bed mobility" (OR=4.97), "leaves 25% or more food uneaten at most meals" (OR=1.82) and "diabetes mellitus" (OR=3.45). CONCLUSION: This preliminary study underlines the importance of considering risk-adjustment for quality indicators in elderly care facilities.

**REF ID: 2556**

**Level IV: Non-experimental study**

**Topic 1: Risks**

**Mukand, J. A., Cai, C., Zielinski, A., Danish, M., & Berman, J. (2003). The effects of dehydration on rehabilitation outcomes of elderly orthopedic patients. *Archives of Physical Medicine and Rehabilitation*, 84(1), 58-61.**

**Journal Article; AIM; IM**

OBJECTIVE: To study the effects of dehydration, by using the indices of prerenal azotemia and orthostasis, on the rehabilitation outcomes of elderly orthopedic patients. DESIGN: Prospective, pilot study. SETTING: Regional inpatient rehabilitation center. PARTICIPANTS: A consecutive sample of 39 patients (29 women, 10 men), ranging in age from 58 to 94 years (mean, 78y), of whom 13 had total hip replacements, 12 had total knee replacements, and 14 had hip fractures. INTERVENTIONS: Not applicable. MAIN OUTCOME MEASURES: Length of stay (LOS), change in the FIM trade mark instrument score, and discharge to home. RESULTS: The mean LOS was significantly longer in the group with prerenal azotemia ( $n=21$ ,  $12.9 \pm 3.0d$ ,  $t=2.49$ ,  $P < .01$ ) than in the nonazotemic group ( $n=18$ ,  $9.4 \pm 4.6d$ ). LOS was also significantly longer in the orthostatic group ( $n=18$ ,  $13.7 \pm 3.4d$ ,  $t=2.94$ ,  $P < .01$ ) than in the nonorthostatic group ( $n=21$ ,  $9.8 \pm 3.9d$ ). Two-way analysis of variance showed a statistically significant effect on LOS for both azotemia ( $F=8.4$ ,  $P=.006$ ) and orthostasis ( $F=10.5$ ,  $P=.003$ ). A statistical interaction existed ( $F=4.7$ ,  $P=.038$ ), but it was more pronounced in the absence of both conditions, as opposed to the presence of both. LOS for the group with both azotemia and orthostasis was  $13.6 \pm 2.7$  days ( $n=10$ ,  $F=4.7$ ,  $P=.038$ ), in contrast to  $7.2 \pm 2.8$  days in the group without either condition ( $n=10$ ). Of the patients who had neither azotemia nor orthostasis, 100% ( $n=10$ ) went home; 80% ( $n=8$ ) of patients who had both conditions went home. Logistic regression analysis, however, did not show a statistically significant correlation between discharge to home and the presence of azotemia, orthostasis, or both. CONCLUSION: Prerenal azotemia and orthostasis are present in a significant number of elderly orthopedic patients and have a major effect on rehabilitation outcomes.

**REF ID: 2598**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Pasman, H. R., The, B. A., Onwuteaka-Philipsen, B. D., van der Wal, G., & Ribbe, M. W. (2003). Feeding nursing home patients with severe dementia: A qualitative study. *Journal of Advanced Nursing*, 42(3), 304-311.**

**Journal Article; Multicenter Study; IM; N**

AIM: To describe the nature of problems nurses face when feeding nursing home patients with severe dementia, and how they deal with these problems. BACKGROUND: In our study on starting or withholding artificial nutrition and hydration for nursing home patients with dementia, we found that many problems in feeding arose (long) before any decision was made about artificial feeding, namely from the first moment a patient needed help with meals. Because 'ordinary feeding' was experienced as a daily recurring problem for nurses, we decided to investigate this within the study. METHODS: Participant observation by two researchers in two Dutch nursing homes. FINDINGS: Nurses interpreted the aversive behaviour of patients differently, and a link between interpretation and responses (stop or continue feeding) was observed. Differences in interpretation with regard to the same patient were observed in nurses in five of the seven units. Only in three units did nurses discuss their different interpretations in an attempt to find

out why a patient avoided food and fluids and how to deal with these problems. CONCLUSIONS: Nurses' interpretations of aversive behaviour of patients differ. No definite conclusions can be drawn about the causes of the aversive behaviour observed, because they cannot be verified. We recommend that interpretations of the behaviour of particular patients should be discussed by nurses with physicians, other disciplines and the patient's family to obtain more insight into all its possible causes and to determine together the most likely interpretation and appropriate way in which to deal with the aversive behaviour. This would give nurses more confidence and improve the quality and continuity of care provided. To structure the search for possible causes of aversive behaviour, we developed a framework of causes of aversive behaviour and domains of functioning.

**REF ID: 2610**

**Level V: Case report**

**Topic 2: Prevention**

Posthauer, M. E. (2006). Hydration: Does it play a role in wound healing? *Advances in Skin & Wound Care, 19*(2), 74-76.

Case Reports; Journal Article; N

**REF ID: 2580**

**Level V: Literature Review**

**Topic 1: Risks**

Posthauer, M. E. (2005). Hydration: An essential nutrient. *Advances in Skin & Wound Care, 18*(1), 32-33.

Journal Article; Review; N

**REF ID: 2605**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

Ritz, P., & Source Study. (2001). Bioelectrical impedance analysis estimation of water compartments in elderly diseased patients: The source study. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences, 56*(6), M344-8.

Journal Article; Multicenter Study; Validation Studies; AIM; IM

BACKGROUND: This study validates, in geriatric patients, bioelectrical impedance analysis (BIA) equations that had been derived to estimate total body water (TBW) and extracellular water (ECW) in healthy elderly subjects. METHODS: We performed a multicentric trial in six geriatric wards. We studied 169 patients with varying degrees of hydration: dehydrated, euvolemic, and overhydrated. BIA estimates of TBW and of ECW were compared with the measurement of TBW with (18)O dilution and of ECW with bromide (Br) dilution. RESULTS: BIA estimated TBW with a difference of 0.48 +/- 2.3 l (mean +/- SD) (50 kHz; p = .01) and 0.69 +/- 2.2 l (100 kHz; p < 0.001) compared with (18)O dilution. The difference was not affected by the hydration status. Estimates of ECW with BIA were systematically biased compared with Br dilution: 4.6 +/- 3.1 l (equation from Segal and colleagues; p < .001) and 3.4 +/- 2.9 l (equation from Visser and colleagues; p < .001). We propose a new, cross-validated equation. Conclusions. Body water spaces can be estimated accurately in geriatric patients with BIA.

**REF ID: 2589**

**Level V: Literature review**

**Topic 3: Assessment**

Robinson, B. E., & Weber, H. (2004). Dehydration despite drinking: Beyond the BUN/Creatinine ratio. *J.Am.Med.Dir.Assoc., 5*(2 Suppl), S67-71.

Journal Article; Review; IM

**REF ID: 2553**

**Level IV: Non-experimental study**

**Topic 4: Management**

Rodrigue, N., Cote, R., Kirsch, C., Germain, C., Couturier, C., & Fraser, R. (2002). Meeting the nutritional needs of patients with severe dysphagia following a stroke: An interdisciplinary approach. *Axone (Dartmouth, N.S.), 23*(3), 31-37.

## **Journal Article; N**

Dysphagia is a common problem with individuals who have experienced a stroke. The interdisciplinary stroke team noted delays in clinical decision-making, or in implementing plans for patients with severe dysphagia requiring an alternative method to oral feeding, such as enteral feeding via Dobhoff (nasogastric) or PEG (percutaneous endoscopic gastrostomy) tubes, occurred because protocols had not been established. This resulted in undernourishment, which in turn contributed to clinical problems, such as infections and confusion, which delayed rehabilitation and contributed to excess disability. The goal of the project was to improve quality of care and quality of life for stroke patients experiencing swallowing problems by creating a dysphagia management decision-making process. The project began with a retrospective chart review of 91 cases over a period of six months to describe the population characteristics, dysphagia frequency, stroke and dysphagia severity, and delays encountered with decision-making regarding dysphagia management. A literature search was conducted, and experts in the field were consulted to provide current knowledge prior to beginning the project. Using descriptive statistics, dysphagia was present in 44% of the stroke population and 69% had mild to moderate stroke severity deficit. Delays were found in the decision to insert a PEG (mean 10 days) and the time between decision and PEG insertion (mean 12 days). Critical periods were examined in order to speed up the process of decision-making and intervention. This resulted in the creation of a decision-making algorithm based on stroke and dysphagia severity that will be tested during winter 2002.

### **REF ID: 2552**

#### **Level VI: Opinion**

#### **Topic 3: Assessment**

**Rosenbek, J. C., McCullough, G. H., & Wertz, R. T. (2004). Is the information about a test important? applying the methods of evidence-based medicine to the clinical examination of swallowing. *Journal of Communication Disorders*, 37(5), 437-450.**

#### **Journal Article; IM**

A hotly debated topic in oropharyngeal dysphagia is the Clinical Swallowing Examination's (CSE) importance in clinical practice. That debate can profit from the application of evidence-based medicine's (EBM) principles and procedures. These can guide both appropriate data collection and interpretation as will be demonstrated in the present report. The study's purpose from which data for this report are drawn was to determine the relationship among signs elicited by a CSE and aspiration on a subsequent videofluoroscopic swallowing examination (VFSE). Sensitivity, specificity; positive and negative predictive values (NPV); likelihood ratios; and post-test probabilities for a variety of signs in isolation and in combinations are reported. These data, if judiciously selected and interpreted contribute to the clinician's knowledge about whether to follow a CSE with a VFSE and about what to expect if the VFSE is completed. LEARNING OUTCOMES: (1) Clinicians will learn how to use EBM principles in conjunction with clinical assessments of swallowing to enhance patient care. (2) Clinicians will learn how to identify combinations of patient signs during the CSE to predict VFSE performance.

### **REF ID: 2618**

#### **Level IV: Non-experimental study**

#### **Topic 3: Assessment**

**Rosher, R. B., & Robinson, S. B. (2004). Use of foot veins to monitor hydration in the elderly. *Journal of the American Geriatrics Society*, 52(2), 322-324.**

#### **Evaluation Studies; Letter; IM**

### **REF ID: 2615**

#### **Level IV: Non-experimental study**

#### **Topic 1: Risks**

**Ross, M. A., Compton, S., Richardson, D., Jones, R., Nittis, T., & Wilson, A. (2003). The use and effectiveness of an emergency department observation unit for elderly patients. *Annals of Emergency Medicine*, 41(5), 668-677.**

#### **Journal Article; AIM; IM**

**STUDY OBJECTIVE:** Emergency department observation units are cost-effective alternatives to hospital

admission for selected patients. However, the use and effectiveness of these units in the elderly population is unclear. We sought to describe the use of an ED observation unit by elderly patients ( $\geq 65$  years), to determine whether the ED observation unit is effective for them in terms of ED observation unit length of stay and hospital admission rates, and to compare efficacy and return visit rates between younger and older patients. **METHODS:** This is a retrospective observational cohort study of consecutive adult patients sent to an ED observation unit from 1996 to 2000 at a high-volume tertiary care suburban teaching hospital. ED observation unit length of stay of less than 18 hours and admittance rates of less than 30% were used as indicators of efficacy. Diagnosis, length of stay, hospital admission rates, and 30-day return visit rates were compared between younger and older patients. **RESULTS:** Twenty-two thousand five hundred and thirty adult patients were observed, with 37.2% older than 65 years of age. The most common diagnoses in elderly patients were chest pain (24.0%), dehydration (11.7%), syncope (6.5%), back pain (4.6%), and chronic obstructive pulmonary disease (3.8%). Length of stay in the ED observation unit was longer for the elderly than younger patients but still averaged less than 18 hours (15.8 hours [95% confidence interval (CI) 15.7 to 16.0] versus 14.4 hours [95% CI 14.3 to 14.5], respectively). Elderly patients were more likely to be admitted from the ED observation unit than younger patients (26.1% versus 18.5%); however, their overall admission rate remained less than 30%. Compared with younger patients, the odds ratios for inpatient admission of elderly patients was highest for back pain (2.10; 95% CI 1.62 to 2.73), pyelonephritis (1.78; 95% CI 1.16 to 2.71), and chest pain (1.65; 95% CI 1.44 to 1.89). Thirty-day related return visit rates between age groups were similar (9.4% versus 7.6%). **CONCLUSION:** Elderly ED observation unit patients had ED observation unit lengths of stay and hospital admission rates that were effective for an ED observation unit setting and ED return visits rates that were comparable with those of younger patients.

**REF ID: 2591**

**Level III: Quasi-experimental study**

**Topic 4: Management**

**Rypkema, G., Adang, E., Dicke, H., Naber, T., de Swart, B., & Disselhorst, L. et al. (2004). Cost-effectiveness of an interdisciplinary intervention in geriatric inpatients to prevent malnutrition. *The Journal of Nutrition, Health & Aging*, 8(2), 122-127.**

**Clinical Trial; Controlled Clinical Trial; Journal Article; IM**

**BACKGROUND:** In order to reduce protein-energy malnutrition in older people during hospitalisation an early interdisciplinary intervention is needed. We developed a protocol which includes screening for malnutrition, dysphagia and dehydration on admission, followed by immediate interventions.

**OBJECTIVE:** To assess effectiveness of the protocol on nutritional status, hospital-acquired infections and pressure sores, and to evaluate the protocol's economical feasibility. **DESIGN:** Prospective, controlled study. **SETTING:** The inpatient geriatric service of a university hospital (UMC Nijmegen) and a geriatric ward of a non-academic teaching hospital (Rijnstate Hospital, Arnhem). **SUBJECTS:** 298 older patients ( $>60$  years). **Methods:** One of the geriatric wards applied the protocol (N=140) while the other provided standard care (N=158). All non-terminally ill patients admitted for more than two days were included.

Body mass was measured on admittance and discharge and hospital-acquired infections and pressure sores were scored and costs related to nutrition, infections and length of hospital stay were assessed. **RESULTS:** There was a 0.8 kg loss (SEM 0.3 kg) in average weight in the standard care group and a 0.9 kg gain (SEM 0.2 kg) in the intervention group ( $p < 0.001$ ). The number of hospital acquired infections was significantly lower in the intervention group (33/140 versus 58/158,  $p = 0.01$ ) but no significant difference in number of patients with pressure sores (23/140 versus 33/158) was found. Costs were not significantly different: 7516 versus 7908 Euro/patient for intervention versus controls, respectively. **CONCLUSION:** An early interdisciplinary intervention approach can be effective in reducing protein-energy malnutrition and related hospital-acquired infections and appears to be economically feasible.

**REF ID: 2592**

**Level V: Literature review**

**Topic 3: Assessment**

**Sakata, E., & Sakata, H. (2001). Special features of old age vertigo. *The International Tinnitus***

*Journal*, 7(2), 115-117.

**Journal Article; Review; IM**

In daily clinical practice, it is seen that elderly patients complain most frequently of dizziness, tinnitus, and hearing loss. Listening to those complaints, do we not tend just to attribute them to age? Against this background, we review vertigo in elderly patients briefly and consider the key points of its treatment. In comparison to younger people, what is first noticeable about elderly people is that they have a lot of fat in the body and a markedly low level of intracellular water. In other words, elderly people are always at risk of dehydration and liable to enter a shock state. The dorsal root in the elderly is also degenerated, and this explains such diverse complaints as dizziness, tinnitus, ringing in the head, headache, neck and shoulder stiffness, and lumbago. However, these complaints cannot be dismissed simply as "an unidentified syndrome." Behind these complaints is invariably one or another organic disorder. This is the conclusion we have reached from our day-to-day clinical practice.

**REF ID: 2643**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Schut, A., Dascendo, V., Giraud, K., Chatap, G., Royand, F., & BlondeCynober, F. et al. (2005). Is bioelectrical impedance analysis a tool at bedside, during heat waves to assist geriatricians with discriminative diagnosis of hypertonic dehydration? *The Journal of Nutrition, Health & Aging*, 9(6), 441-445.**

**Journal Article. Randomized Controlled Trial**

**OBJECTIVES:** To assess BIA data given by Analycor 3 and some bio-impedance equations to assist geriatricians with discriminative diagnosis of hypertonic dehydration, during heat waves. **DESIGN:** Prospective study: a dehydrated patients group has been compared with a randomised control group. **SETTING:** The study was carried out in a French geriatric department, in the Emile Roux geriatric hospital. **PARTICIPANTS:** 36: six men and twelve women in each group. **MEASUREMENTS:** The most valuable clinical indicators of dehydration severity were recorded and scored. BIA measurements were performed with an Analycor 3 analyzer; TBW was calculated from impedances at 50 and 100 kHz, ECW from impedance at 5 kHz; Calculations were made also with formula described in the literature, validated in healthy or in institutionalised elderly subjects. **RESULTS:** TBW and ECW values were always lower in dehydrated group than in control group, but without significance, whatever the applied formula; however ICW values calculated with "manufacturers equations" significantly decreased in dehydrated group. Data given by the analyzer used in this study, as well as BIA age specific equations discriminated the severely hypertonic dehydrated patients sub-group, but not the mildly hypertonic dehydrated patients sub-group. **CONCLUSION:** The BIA data given by the analyzer used in this study assist geriatricians at bedside with discriminative diagnosis of hypertonic dehydration, especially in severe hypertonic dehydration, but data given by the analyzer used in this study, as well as age specific equations are sometimes in poor agreement with clinical and biological parameters usually selected to assess dehydration, in mildly dehydrated patients.

**REF ID: 2637**

**Level II: Individual experimental study**

**Topic 4: Management**

**Simmons, S. F., Alessi, C., & Schnelle, J. F. (2001). An intervention to increase fluid intake in nursing home residents: Prompting and preference compliance. *Journal of the American Geriatrics Society*, 49(7), 926-933.**

**Journal Article, Clinical Trial, Research, Tables/Charts**

**OBJECTIVE:** To evaluate a three-phase, behavioral intervention to improve fluid intake in nursing home (NH) residents. **DESIGN:** Controlled clinical intervention trial. **SETTING:** Two community NHs. **PARTICIPANTS:** Sixty-three incontinent NH residents. **INTERVENTION:** Participants were randomized into intervention and control groups. The intervention consisted of three phases for a total of 32 weeks: (1) 16 weeks of four verbal prompts to drink per day, in between meals; (2) 8 weeks of eight verbal prompts per day, in between meals; and (3) 8 weeks of eight verbal prompts per day, in between meals, plus

compliance with participant beverage preferences. MEASUREMENTS: Between-meal fluid intake was measured in ounces by research staff during all three phases of the intervention. Percentage of fluids consumed during meals was also estimated by research staff for a total of nine meals per participant (3 consecutive days) at baseline and at 8 and 32 weeks into the intervention. Serum osmolality, blood urea nitrogen, and creatinine values were obtained for all participants in one of the two sites at the same three time points. RESULTS: The majority (78%) of participants increased their fluid intake between meals in response to the increase in verbal prompts (phase 1 to 2). A subset of residents (21%), however, only increased their fluid intake in response to beverage preference compliance (phase 3). There was a significant reduction in the proportion of intervention participants who had laboratory values indicative of dehydration compared with the control participants. Cognitive and nutritional status were predictive of residents' responsiveness to the intervention. CONCLUSIONS: A behavioral intervention that consists of verbal prompts and beverage preference compliance was effective in increasing fluid intake among most of a sample of incontinent NH residents. Verbal prompting alone was effective in improving fluid intake in the more cognitively impaired residents, whereas preference compliance was needed to increase fluid intake among less cognitively impaired NH residents.

**REF ID: 2632**

**QM: Quality Measures**

**Topic 5: Evaluation/Follow-up**

**Simmons, S. F., Garcia, E. G., Cadogan, M. P., AlSamarrai, N. R., LevyStorms, L. F., & Osterweil, D. et al. (2003). The minimum data set weight-loss quality indicator: Does it reflect differences in care processes related to weight loss? *Journal of the American Geriatrics Society, 51(10), 1410-1418.***

**Journal Article, Research, Tables/Charts**

OBJECTIVES: To determine whether nursing homes (NHs) that score differently on prevalence of weight loss, according to a Minimum Data Set (MDS) quality indicator, also provide different processes of care related to weight loss. DESIGN: Cross-sectional. SETTING: Sixteen skilled nursing facilities: 11 NHs in the lower (25th percentile-low prevalence) quartile and five NHs in the upper (75th percentile-high prevalence) quartile on the MDS weight-loss quality indicator. PARTICIPANTS: Four hundred long-term residents. MEASUREMENTS: Sixteen care processes related to weight loss were defined and operationalized into clinical indicators. Trained research staff conducted measurement of NH staff implementation of each care process during assessments on three consecutive 12-hour days (7 a.m. to 7 p.m.), which included direct observations during meals, resident interviews, and medical record abstraction using standardized protocols. RESULTS: The prevalence of weight loss was significantly higher in the participants in the upper quartile NHs than in participants in the lower quartile NHs based on MDS and monthly weight data documented in the medical record. NHs with a higher prevalence of weight loss had a significantly larger proportion of residents with risk factors for weight loss, namely low oral food and fluid intake. There were few significant differences on care process measures between low- and high-weight-loss NHs. Staff in low-weight-loss NHs consistently provided verbal prompting and social interaction during meals to a greater proportion of residents, including those most at risk for weight loss. CONCLUSION: The MDS weight-loss quality indicator reflects differences in the prevalence of weight loss between NHs. NHs with a lower prevalence of weight loss have fewer residents at risk for weight loss and staff who provide verbal prompting and social interaction to more residents during meals, but the adequacy and quality of feeding assistance care needs improvement in all NHs.

**REF ID: 2642**

**Level III: Quasi-experimental study**

**Topic 4.3: Management-medication**

**Simmons, S. F., Walker, K. A., & Osterweil, D. (2004). The effect of megestrol acetate on oral food and fluid intake in nursing home residents: A pilot study. *Journal of the American Medical Directors Association, 5(1), 24-30.***

**Clinical Trial. Controlled Clinical Trial. Journal Article. Multicenter Study**

OBJECTIVES: The objective of this study was to evaluate the effect of megestrol acetate (Megace OS; Bristol-Myers Squibb, Princeton, NJ) on the oral food and fluid intake of nursing home (NH) residents

under two conditions: usual NH care and optimal mealtime feeding assistance. DESIGN AND SETTING: We conducted a prospective, preliminary trial in four NHs. PARTICIPANTS: Participants (n = 17) were recruited from a larger study designed to assess nutritional care quality. Eligibility for the Megace OS trial required participants to consistently eat less than 75% of most meals under both usual NH care and optimal feeding assistance conditions at baseline. INTERVENTION: Megace OS, an oral liquid suspension of megestrol acetate, was given daily in a 400-mg dose for 63 days. MEASUREMENTS: Each participant's oral food and fluid intake was monitored weekly for 1 day (three meals) during which research staff conducted direct observations of usual NH care (weeks 1, 3, and 5 and day 63) or provided optimal feeding assistance (weeks 2, 4, and 6). Average total percent intake was compared from baseline across the assessment weeks of the trial under the two mealtime care conditions. RESULTS: Megace OS had a significant effect on oral food and fluid intake only under the optimal mealtime feeding assistance condition, in which average total percent eaten increased from 50% (+/- 15%) at baseline to 63% (+/- 14%) post-63 days of the trial. There was no change in participants' oral food and fluid intake under the usual NH care condition (average total percent intake at baseline 43% +/- 12% vs. 43% +/- 20% post-63 days). CONCLUSION: The results of this preliminary study suggest that Megace OS is not an effective nutritional intervention to increase oral intake under usual NH care conditions, which is often characterized by inadequate feeding assistance. However, Megace OS in combination with optimal mealtime feeding assistance does significantly increase oral intake in a frail NH sample at high risk for weight loss.

**REF ID: 2636**

**Level II: Individual experimental study**

**Topic 4: Management**

**Slesak, G., Schnurle, J. W., Kinzel, E., Jakob, J., & Dietz, K. (2003). Comparison of subcutaneous and intravenous rehydration in geriatric patients: A randomized trial. *Journal of the American Geriatrics Society*, 51(2), 155-160.**

**Journal Article, Clinical Trial, Research, Tables/Charts**

OBJECTIVES: To compare the acceptance, feasibility, and adverse effects of subcutaneous (SC) and intravenous (IV) rehydration in dehydrated geriatric patients and clinical changes exhibited by the patients. DESIGN: A prospective, randomized, open clinical trial. SETTING: Hospital geriatric wards during a period of 20 months. PARTICIPANTS: Ninety-six patients with a mean age +/- standard deviation of 85.3 +/- 6.7 with signs of mild to moderate dehydration needing parenteral fluids. INTERVENTION: Geriatric patients were randomly allocated to receive SC or IV infusions of half-normal saline-glucose solutions as long as clinically necessary. MEASUREMENTS: A standardized patient record form was used to document the observed adverse effects. Using a Likert-like scale based on the German school marks system with scores ranging from 1 = very good to 6 = very bad, patients were asked to score their discomfort; nurses and doctors scored the feasibility of the intervention. Changes in laboratory and clinical findings (including patients' orientation and activities of daily living using the Barthel Index) and adverse effects were recorded. RESULTS: Forty-eight patients were randomized into each group. Median duration of fluid administration was 6 days (SC and IV, P =.33). Median volume was 750 mL/day (SC) and 1,000 mL/day (IV, P =.002). In 13 patients, the therapy had to be changed from SC to IV (SC/IV subgroup): 11 times because of the exigency of an IV drug application and twice because of poor resorption. In 17 patients, there was a change from IV to SC (IV/SC subgroup), mainly because of impossibility of further peripheral IV punctures (8 times) and permanent removal of the IV cannula (5 times). The patients of the IV/SC subgroup scored their discomfort significantly worse (median 5.5 vs all other groups median 2, P =.017). This corresponded with the scoring of feasibility by the nurses (IV/SC: median 4.25 vs all other groups median 2, P =.009) and by the doctors (IV/SC: median 4 vs all other groups: median 2, P =.001). Both methods of rehydration caused only few systemic adverse reactions; acute cardiac failure occurred twice in the SC group versus four times in the IV group (P =.68) and hyponatremia once in the SC group versus twice in the IV group (P = 1.0). Some patients experienced local side effects (SC, n = 29 vs IV, n = 24; P =.41), mainly to a mild extent (SC, n = 25 vs IV, n = 24; P = 1.0). Major local side effects (large edema, phlebitis, cellulitis, erythema and strong pain) occurred in nine SC and eight IV (P = 1.0) patients. The clinical and laboratory changes during therapy were similar in both trial arms. CONCLUSIONS:

Rehydration by hypodermoclysis is equally well accepted by geriatric patients as the IV therapy and offers a similarly easy feasibility. Additionally, in confused patients and in those in whom IV punctures are difficult to achieve, it represents the far superior method. Both techniques are comparably safe and effective.

**REF ID: 2645**

**Level IV: Non-experimental study**

**Topic 1: Risks**

**Spigt, M. G., Knottnerus, J. A., Westerterp, K. R., Olde Rikkert, M. G., & Schayck, C. P. (2006). The effects of 6 months of increased water intake on blood sodium, glomerular filtration rate, blood pressure, and quality of life in elderly (aged 55-75) men. *Journal of the American Geriatrics Society*, 54(3), 438-443.**

**Journal Article. Multicenter Study. Randomized Controlled Trial**

**OBJECTIVES:** To study whether there are any negative or positive effects of 6 months of increased fluid intake in reasonably healthy elderly men. **DESIGN:** Randomized trial. **SETTING:** Community-based. **PARTICIPANTS:** One hundred forty-one healthy participants aged 55 to 75. **INTERVENTION:** One group was given the advice to increase their daily fluid intake by 1.5 L of water; the other group was given placebo medication (8 mL inactive syrup per day). **MEASUREMENTS:** At 6 months blood sodium, glomerular filtration rate (GFR), blood pressure, and quality of life (QOL) were measured. The changes in water turnover were measured using deuterium. **RESULTS:** Most subjects did not manage to increase their fluid intake by 1.5 L. The average increase in the intervention group was approximately 1 L. Twenty-four-hour water turnover in the water group was 359 mL (95% confidence interval=171-548) higher than that of the control group at 6-month follow-up. Blood pressure, sodium level, GFR, and QOL did not change significantly in either group during the intervention period. In addition, the cases reporting a worsening on the effect measures were equally distributed over the two study groups. **CONCLUSION:** The advice to increase fluid intake by 1.5 L had no negative effects in reasonably healthy men aged 55 to 75.

**REF ID: 2616**

**Level IV: Non-experimental study**

**Topic 1: Risks**

**Stookey, J. D., Pieper, C. F., & Cohen, H. J. (2005). Is the prevalence of dehydration among community-dwelling older adults really low? informing current debate over the fluid recommendation for adults aged 70+years. *Public Health Nutrition*, 8(8), 1275-1285.**

**Journal Article; IM**

**OBJECTIVE:** The fluid recommendation for adults aged 70+ years has been criticised on the basis of a low prevalence of dehydration in community-dwelling older adults. This study explores whether the low prevalence might reflect limitations of individual dehydration indices. **DESIGN:** Cross-sectional data on plasma sodium, blood urea nitrogen (BUN), creatinine, glucose and potassium were used to classify 1,737 participants of the 1992 Established Populations for Epidemiologic Studies of the Elderly (EPESE) (70+ years) according to multiple dehydration indices. Associations between dehydration indices, health and functional status were evaluated. **RESULTS:** Depending on the indicator used, the prevalence of dehydration ranged from 0.5% for hypotonic hypovolaemia only (plasma tonicity  $\leq 145$  mEq l<sup>-1</sup>), BUN/creatinine ratio  $\geq 20$ , tonicity  $\geq 295$  mOsm l<sup>-1</sup>), or hypotonic hypovolaemia. Elevated tonicity and BUN/creatinine ratio were respectively associated with chronic disease and functional impairment. **CONCLUSIONS:** The true prevalence of dehydration among community-dwelling adults may be low or high, depending on the indicator(s) used to define dehydration. Before we can pinpoint a generalisable prevalence of dehydration for community-dwelling seniors and draw conclusions about fluid recommendations, validation studies of dehydration indices and longitudinal studies of dehydration, health and functional status are needed.

**REF ID: 2621**

**Level V: Case report**

**Topic 1: Risks**

**Stotts, N. A., & Hopf, H. W. (2003). The link between tissue oxygen and hydration in nursing home**

**residents with pressure ulcers: Preliminary data. *Journal of Wound, Ostomy, and Continence Nursing : Official Publication of the Wound, Ostomy and Continence Nurses Society / WOCN, 30(4), 184-190. Journal Article; N***

Pressure ulcers are prevalent in nursing home residents. They heal slowly and result in pain and impaired quality of life. Strategies to enhance healing of pressure ulcers are critical to the treatment regime in nursing homes. This article explores the possibility that nursing home residents with pressure ulcers may experience low tissue oxygen and impaired hydration. Pilot data are presented suggesting that some proportion of nursing home residents with pressure ulcers experience low subcutaneous oxygen and that fluid administration increases the low tissue oxygen. Further research in this area is warranted.

**REF ID: 2601**

**Level V: Literature review**

**Topic 2: Prevention**

**Suhayda, R., & Walton, J. C. (2002). Preventing and managing dehydration. *Med Surg Nursing : Official Journal of the Academy of Medical-Surgical Nurses, 11(6), 267-78; quiz 279.***

**Journal Article; Review; N**

Sufficient body water and electrolyte homeostasis are essential for healthy physiologic functioning. Nurses are key to preventing, detecting early, and treating fluid and electrolyte imbalances. Dehydration significantly alters both physical and psychological functioning, and older adults are at increased risk. Identifying fluid disorders early can prevent complications and reduce hospital stays. Understanding the mechanisms of fluid homeostasis enables nurses to assess, prevent, and collaborate in managing isotonic, hypertonic, and hypotonic dehydration.

**REF ID: 2611**

**QM: Quality Measures**

**Topic 5: Evaluation/follow-up**

**Sullivan, R. J., Jr. (2005). Fluid intake and hydration: Critical indicators of nursing home quality. *North Carolina Medical Journal, 66(4), 296-299.***

**Journal Article; IM**

Hydration issues are important considerations for the elderly and infirm. What was previously taken for granted often becomes the focus of daily attention. Nursing homes must take a proactive stance in designing systems and training staff to deal with hydration. The minimum daily fluid requirements, and the steps necessary to investigate suspected dehydration, should be well known and understood by all members of the staff.

**REF ID: 2574**

**Level IV: Non-experimental study**

**Topic 2: Prevention**

**Taylor, K. A., & Barr, S. I. (2006). Provision of small, frequent meals does not improve energy intake of elderly residents with dysphagia who live in an extended-care facility. *Journal of the American Dietetic Association, 106(7), 1115-1118.***

**Journal Article; Randomized Controlled Trial; AIM; IM**

Malnutrition and dehydration are potential consequences of dysphagia, a common swallowing disorder among elderly individuals. Providing smaller, more frequent meals has been suggested (but not demonstrated) to improve energy intake among this group. Accordingly, this study was designed to assess whether the same energy content in five vs three daily meals would improve energy intake. Thirty-seven residents of an extended-care facility, aged older than 65 years, previously evaluated for dysphagia, and receiving a texture-modified diet, agreed to participate in a crossover study with random assignment to three or five meals during an initial 4-day study period, followed by the opposite meal pattern in a second period. Six were excluded from analysis, as their medical condition deteriorated before or during the study. Food and fluids consumed by participants during each study period were weighed before and after each meal. Average energy intakes were similar between the three- and five-meal patterns (1,325+/-207 kcal/day vs 1,342+/-177 kcal/day, respectively; P=0.565); fluid intake was higher with five meals (698+/-156 mL/day) vs three (612+/-176 mL/day; P=0.003). Because offering five daily feedings did not improve

energy intakes when compared with three, dietitians caring for this vulnerable group might need to consider other nutrition intervention strategies.

**REF ID: 2617**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Thomas, D. R., Tariq, S. H., Makhdomm, S., Haddad, R., & Moinuddin, A. (2004). Physician misdiagnosis of dehydration in older adults. *J.Am.Med.Dir.Assoc.*, 5(2 Suppl), S30-4.**

**Journal Article; IM**

**INTRODUCTION:** Dehydration is a difficult clinical diagnosis in older adults because the physical signs of dehydration are often confusing. The clinical consequences of a diagnosis of dehydration are critical, since dehydration implies increased morbidity and mortality and aggressive rehydration can improve clinical outcome. The diagnosis is a sentinel event for nursing homes, and often is made at transfer to a hospital. **OBJECTIVE:** To define the accuracy of the clinical diagnosis of dehydration during hospital admission, and to observe persons admitted from long-term care. **METHODS:** A total of 102 consecutive medical admissions in persons older than 65 years with a diagnostic coding for dehydration either on admission or during the course of hospitalization over a 3-month period at a university teaching hospital were reviewed. The diagnosis of dehydration was considered confirmed if the calculated serum osmolarity was greater than 295 milliosmols (mOsmol). Subjects were considered to have intravascular volume depletion if the ratio of blood urea nitrogen (BUN) to serum creatinine was greater than 20 or the serum sodium was greater than 145 milligrams per deciliter. Subjects were considered to have hypovolemia if the serum osmolarity was greater than 295 and the BUN/creatinine ratio was greater than 20. **RESULTS:** Among subjects with a clinical diagnosis of dehydration, only 17% had a serum osmolarity > 295 mOsm, and only 11% had a serum sodium greater than 145. A BUN/creatinine ratio greater than 20 was present in 68% of the subjects. Clinicians appear to be using the term dehydration synonymously with intravascular volume depletion. Even so, at least a third of the diagnoses of intravascular volume depletion in older adults were incorrect based on laboratory data. **CONCLUSION:** Physicians who diagnose dehydration during hospital admission may be relying more on physical signs than laboratory data. Little change in laboratory markers for hydration status occurs from the time of diagnosis to hospital discharge, suggesting that the clinical diagnosis does not affect fluid management. The data suggest a need for improvement in the differential diagnosis and management of volume changes in older persons.

**REF ID: 2620**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Thomas, D. R., Tariq, S. H., Makhdomm, S., Haddad, R., & Moinuddin, A. (2003). Physician misdiagnosis of dehydration in older adults. *J.Am.Med.Dir.Assoc.*, 4(5), 251-254.**

**Journal Article; IM**

**INTRODUCTION:** Dehydration is a difficult clinical diagnosis in older adults because the physical signs of dehydration are often confusing. The clinical consequences of a diagnosis of dehydration are critical, since dehydration implies increased morbidity and mortality and aggressive rehydration can improve clinical outcome. The diagnosis is a sentinel event for nursing homes, and often is made at transfer to a hospital. **OBJECTIVE:** To define the accuracy of the clinical diagnosis of dehydration during hospital admission, and to observe persons admitted from long-term care. **METHODS:** A total of 102 consecutive medical admissions in persons older than 65 years with a diagnostic coding for dehydration either on admission or during the course of hospitalization over a 3-month period at a university teaching hospital were reviewed. The diagnosis of dehydration was considered confirmed if the calculated serum osmolarity was greater than 295 milliosmols (mOsmol). Subjects were considered to have intravascular volume depletion if the ratio of blood urea nitrogen (BUN) to serum creatinine was greater than 20 or the serum sodium was greater than 145 milligrams per deciliter. Subjects were considered to have hypovolemia if the serum osmolarity was greater than 295 and the BUN/creatinine ratio was greater than 20. **RESULTS:** Among subjects with a clinical diagnosis of dehydration, only 17% had a serum osmolarity >295 mOsm, and only 11% had a serum sodium greater than 145. A BUN/creatinine ratio greater than 20 was present in

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**REF ID: 2622**

**Level IV: Non-experimental study**

**Topic 3: Assessment**

**Wakefield, B., Mentes, J., Diggelmann, L., & Culp, K. (2002). Monitoring hydration status in elderly veterans. *Western Journal of Nursing Research*, 24(2), 132-142.**

**Journal Article; IM; N**

Dehydration is a common water and electrolyte disorder in long-term care residents. Practical methods to detect and monitor dehydration are needed. This study determined whether urine color measured by a urine color chart reflects hydration status. The study employed a repeated measures design with two observations during a 10-hour period. Urine color was compared to the criterion standard of urine specific gravity and osmolality. The sample included 89 participants from two Veterans' Affairs facilities. Urine color was graded on an eight-level color chart. Urine specific gravity and osmolality, serum sodium and osmolality, hematocrit, blood urea nitrogen (BUN), and creatinine were measured using standard laboratory procedures. Significant positive associations existed between urine color and both urine specific gravity and urine osmolality and between urine osmolality and serum sodium and the blood urea nitrogen to creatinine ratio. Although further testing is needed, the color chart has potential as a low-cost technology to monitor dehydration.

**REF ID: 2579**

**Level V: Literature Review**

**Topic 4: Management**

**Walsh, G. (2005). Hypodermoclysis: An alternate method for rehydration in long-term care.**

***J.Infus.Nurs.*, 28(2), 123-129.**

**Journal Article; Review; N**

The hypodermoclysis technique of subcutaneous infusion has many benefits for long-term care patients and staff. Minor complications associated with the procedure are easily remedied, and studies have proved its effectiveness. Hypodermoclysis provides an easy-to-use, safe, and cost-effective alternative to intravenous hydration for the elderly long-term care patient.

**REF ID: 2573**

**Level I: Systematic review**

**Topic 1: Risks**

**Weatherall, M. (2004). The risk of hyponatremia in older adults using desmopressin for nocturia: A systematic review and meta-analysis. *Neurology and Urodynamics*, 23(4), 302-305.**

**Journal Article; Meta-Analysis; Review; IM**

AIMS: To estimate the incidence of hyponatremia in older adults who use nasal or oral desmopressin to treat nocturia. MATERIALS AND METHODS: A systematic review and meta-analysis of cohort studies and randomised controlled trials of the use of nasal or oral desmopressin for older adults with nocturia. The incidence of hyponatremia was estimated by a random effects model for binomial data. RESULTS: Seventy-five papers were identified by the literature review of which 14 were reports of randomised trials or cohort studies. Seven studies reported the incidence of hyponatremia. The pooled estimate for the incidence of hyponatremia was 7.6% (95% CI 3.7-15.1). CONCLUSIONS: Hyponatremia is a relatively common adverse effect of the use of desmopressin for the treatment of nocturia and caution and regular monitoring should be part of the use of this management option for nocturia in older adults.

**REF ID: 2603**

**Level II: Individual experimental study**

## **Topic 2: Prevention**

**Whelan, K. (2001). Inadequate fluid intakes in dysphagic acute stroke. *Clinical Nutrition (Edinburgh, Lothian)*, 20(5), 423-428.**

### **Clinical Trial; Journal Article; Randomized Controlled Trial; IM**

**BACKGROUND AND AIMS:** To investigate the fluid intakes of patients with dysphagic acute stroke and to evaluate the effect of disability, the ward speciality and the type of fluid given on oral intake.

**METHODS:** Patients were prospectively recruited and randomly assigned to receive powder-thickened fluids or ready prepared pre-thickened fluids. Parenteral, enteral and oral fluid intakes, urine output, clinical sequelae and the frequency of requests for biochemical measures of hydration were recorded for a maximum of fourteen days. **RESULTS:** 24 patients with dysphagic acute stroke requiring thickened fluids were recruited from a large teaching hospital. Mean thickened fluid intake was 455 ml/d (SEM+/-70) resulting in the use of an extra 742 ml/d (+/-132) of supplementary fluids. This did not result in an adequate total intake due to insufficient volumes being given for too short a period. Patients not on specialist stroke units who received pre-thickened fluids drank almost 100% more than those on powder-thickened fluids (P=0.04). **CONCLUSIONS:** Fluid intakes in this patient group are insufficient to achieve requirements. Hospital staff must ensure adequate fluid intakes in patients at risk of dehydration, which should include both an adequate prescription and provision of supplementary fluids. Pre-thickened drinks improve oral fluid intake in patients with dysphagic acute stroke on non-specialist wards.

**REF ID: 2599**

### **Level V: Literature review**

#### **Topic 3: Assessment**

**Woodrow, P. (2003). Assessing fluid balance in older people: Fluid replacement. *Nurs.Older People*, 14(10), 29-30.**

**Journal Article; Review; N**

**REF ID: 2625**

### **Level IV: Non-experimental study**

#### **Topic 1: Risks**

**Xiao, H., Barber, J., & Campbell, E. S. (2004). Economic burden of dehydration among hospitalized elderly patients. *American Journal of Health-System Pharmacy : AJHP : Official Journal of the American Society of Health-System Pharmacists*, 61(23), 2534-2540.**

**Journal Article; H; IM**

**PURPOSE:** The cost of unnecessary hospitalizations associated with dehydration in elderly patients was studied. **METHODS:** The study involved a retrospective examination of 1999 data on hospital discharges from the Healthcare Cost and Utilization Project Nationwide Inpatient Sample. The procedure code for volume depletion was used to extract hospitalization episodes for patients > or = 65 years of age who had a principal diagnosis of dehydration and were discharged alive. Hospitalizations with procedure codes unrelated to dehydration were omitted. **RESULTS:** The descriptive findings indicated that hospitalized older patients with a principal diagnosis of dehydration averaged 80.4 years of age, were primarily white (82.5%), and were more likely to live in the community than in a nursing home. Hospitalizations for dehydration were more common in the South and less common in the West. The average length of stay (LOS) was 4.6 days. The average total hospital charge was dollars 7,442, and the average per diem charge was dollars 1,628. Regression analysis explained nearly half of the variation in charges for dehydration (R<sup>2</sup> = 0.457). Average LOS and number of diagnoses were directly related to hospital charges, and age was inversely related. Higher charges were associated with being nonwhite, entering the hospital via the emergency room, having private insurance, having no insurance, having comorbidities, and being hospitalized in the West or in teaching or urban hospitals. In 1999, the potential national saving from avoidable hospitalizations in these patients could have been as much as dollars 1.14 billion.

**CONCLUSION:** The economic burden associated with avoidable hospitalizations due to dehydration in elderly patients was substantial.

**REF ID: 2619**

### **Level V: Literature review**

**Topic 3: Assessment**

**Zimmermann, P. G. (2003). Tricks for the ED trade. *Journal of Emergency Nursing: JEN : Official Publication of the Emergency Department Nurses Association*, 29(5), 453-458.**  
**Journal Article; Review; N**