

Guidelines to Effective Hydration in Aged Care Facilities

Prepared by Associate Professor Michael Woodward

Medical Director, Aged & Residential Care Services
Heidelberg Repatriation Hospital

April 2013

Over 160,000 Australians receive permanent residential aged care services¹ and the vast majority of these are either physically or cognitively impaired. The illnesses that lead to admission into residential care may in turn make it more difficult for care staff to maintain the residents' nutrition and hydration. There has been very public community concern about the quality of residential care, and both poor nutrition and inadequate hydration have been appropriately cited as indicators of inadequate care²⁻⁴. These clinical guidelines have been developed as a practical tool for residential care staff to better manage one aspect of quality care – hydration – and to better prevent and manage dehydration in this setting.

Definition

Dehydration is a reduction in total body water volume and may be defined as significant when over 3% of body weight is lost. However, it is often difficult to determine precisely how much weight has been lost and whether it is all due to water loss. Dehydration is usually regarded as present when it is accompanied by changes in biochemical indices and by clinical features (see below, under diagnosis).

Prevalence of dehydration in institutional care

Studies within nursing homes have found that dehydration is frequent. One prospective study found dehydration events occurred in 31% of residents over 6 months⁵, and another found that 98% of residents consumed less than the daily recommended fluid intake⁶. In another study some 91 of 339 elderly nursing home residents who became ill had biochemical features of dehydration⁷.

Many hospital admissions of nursing home residents are associated with dehydration and the electrolyte disturbances that may indicate dehydration. In one study, 34% of nursing home patients admitted to hospital were diagnosed with dehydration⁸. Another study found 84% of hypernatraemic patients developed this during admission to hospital – only 16% were hypernatraemic on admission⁹.

Consequences of dehydration

Dehydration is associated with increased hospitalisation and mortality. It may not be easy to distinguish between poor outcomes due to an underlying illness and poor outcomes from dehydration itself. In one study of 130 nursing home residents there were 48 febrile episodes over a 4 month period and 14 febrile residents had biochemical markers of dehydration. Of the 5 febrile residents who died, all had markers of dehydration¹⁰. This unintended dehydration and associated increased mortality should be distinguished from the dehydration that frequently accompanies terminal illnesses such as cancer and renal failure¹¹.

Risk factors for dehydration

The greatest risk factor for dehydration is poor oral intake. In the study of 48 febrile episodes in nursing home residents, 11 patients were noted by staff to have poor oral intake and nine of these (82%) developed biochemical markers of dehydration¹⁰. In a study of hospitalized patients, 86% of patients who developed hypernatraemia in hospital lacked free access to water⁹.

Other significant risk factors for dehydration in a study of 339 elderly residents who became ill included female gender, age over 85, four or more chronic conditions, use of more than four medications and being bedridden⁷. Among those who were most severely dehydrated, inability to feed oneself and impaired functional status were additional risk factors. In another study, diuretic use was a risk factor for electrolyte disturbances in elderly people requiring hospitalization¹². Diuretic use is a recognised risk factor in the genesis of renal impairment and electrolyte disturbances, especially in older people¹³, and is likely to increase the risk of dehydration in nursing home residents.

The availability of appropriately skilled staff to assist residents is also a factor that contributes to the risk of dehydration. Dr Kayser-Jones' research in the USA has repeatedly revealed that inadequate staffing, lack of assessment and disregard for personal and cultural preferences contribute to inadequate fluid intake and dehydration in residential care^{3,6,14}. These findings have been replicated by others – in a recent study weight loss and dehydration were 17% less likely in facilities that provided residents with at least 3 hours of nursing assistant care daily compared with those providing less than 3 hours daily¹⁵.

Risk factors for dehydration are summarised in Table One and should alert care staff to being more attentive to fluid intake and the signs of dehydration.

Table One
RISK FACTORS FOR DEHYDRATION
POOR ORAL INTAKE
<ul style="list-style-type: none"> • Inability to feed independently • Refusing oral intake • Poor access to fluids • Oro-pharyngeal disease
INCREASED FLUID LOSS
<ul style="list-style-type: none"> • Febrile Illness • Diarrhoea and vomiting • Diuretics • Illnesses increasing urine output <ul style="list-style-type: none"> • unstable diabetes • hypercalcaemia • hypokalaemia
OTHER FACTORS
<ul style="list-style-type: none"> • Female gender • Older age • Greater number of medications • Impaired functional status • Dementia and other confusional states • Greater number of illnesses/chronic conditions
INADEQUATE STAFFING
<ul style="list-style-type: none"> • Inadequate staff training / awareness of hydration

Older people have a reduced thirst in response to fluid deprivation¹⁶ and their hormonal response to dehydration (secretion of anti-diuretic hormone) may also be impaired¹⁷. These changes may be even more pronounced in residents with Alzheimer's disease¹⁸, a common condition in residential care. These factors both make older people more prone to dehydration and also indicate that thirst cannot be relied upon as an indicator of dehydration.

Normal fluid intake

Fluid intake must replace measurable losses (urine, faeces and occasionally others such as drain tubes) and insensible (not easily measured) losses from respiration and through the skin. The recommended minimum total fluid intake is 1500–2000 mL, (equivalent to 6–8 250 mL cups) a day. This comes from all sources including soups and beverages.

A formula used to calculate fluid requirements for older people is:

- 100 mL fluid per kg body weight for the first 10 kg
- 50 mL fluid per kg for the next 10 kg
- 15 mL fluid per kg for each kg after 20 kg.

Table Two shows these recommended fluid requirements.

Table Two

Patient Weight (kg)	≤30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
Fluid requirement (litres/day)	1.7	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.6	2.6	2.7	2.8

Other formulae for recommended fluid intake are less accurate and may underestimate fluid requirements, especially in underweight residents¹⁹. These include 30 mL/kg body weight and 1 mL/kcal energy consumed.

Presentation of dehydration

Signs of dehydration include dry mucous membranes, reduced tissue turgor (elasticity), reduced sweating, sunken eyes, tachycardia, low blood pressure and postural blood pressure drop, altered consciousness including confusion, increasing functional impairment, weakness, constipation, reduced urine output and more concentrated (darker) urine. Unfortunately many of these signs are quite subjective, with no defined “normal” ranges, and thus poor positive and negative predictive values for the diagnosis of dehydration. Some of these signs can be present in other conditions – for instance, low blood pressure can be due to over treatment with medications that lower blood pressure, in cardiac failure and when there is autonomic neuropathy. Indeed, over-reliance on low blood pressure as a sign may lead to over diagnosis of dehydration.

In a study of 102 consecutive medical admissions in people older than 65 with a diagnostic coding of dehydration (16% admitted from nursing homes), only 17% had biochemically confirmed dehydration (serum osmolality above 295 mOsmol) suggesting over-diagnosis by physicians, probably due to over-reliance on physical signs or other less accurate biochemical indices²⁰. Another study of 150 elderly patients and residents with dehydration (defined as hypernatraemia) found that most of the classical signs of dehydration were irregularly present²¹. There were four signs that were significantly and independently associated with hypernatraemia – abnormal subclavicular and thigh skin turgor, dry oral mucosa and recent changes in consciousness.

Axillary sweating has been found to be a reproducible and reliable sign of hydration²² – tissue or blotting paper is placed in the axilla for a few minutes and if it is not moistened by perspiration dehydration is strongly suggested. Experts also support a recent darkening of urine as a useful sign, as it correlates well with serum osmolality²³ but may be difficult to monitor in incontinent residents²⁴.

The more useful clinical signs of dehydration are shown in Table Three.

Table Three

More useful clinical signs of dehydration

- Reduced axillary sweating
- Reduced skin turgor
- Dry oral mucosa
- Recent change in consciousness
- Darker urine

Diagnostic tests for dehydration

The most accurate test is serum osmolality – a value above 295 mOsmol is diagnostic of reduced body water in all but very exceptional circumstances. Other tests that are used include an elevated blood urea nitrogen to creatinine ratio and an elevated serum sodium although these tests are more liable to be abnormal for reasons other than dehydration.

All three values are stable in non-ill residents of nursing homes, so a change from baseline values can be relied on to suggest dehydration has occurred²⁵. A single elevated value in a resident in the absence of clinical features of dehydration is not diagnostic of dehydration – some elderly people appear to have an elevated central osmolality setting²⁵. Elevated urine specific gravity may also be a useful sign but has not been carefully evaluated.

These biochemical signs of dehydration are shown in Table Four

Table Four

Biochemical signs of dehydration*

Sign	Value
• Raised serum osmolality	• Above 295 mOsmol
• Raised serum sodium	• Above 145 mmol/L
• Raised blood urea/creatinine ratio	• Above 50 (urea in mmol/L and creatinine also in mmol/L)

* Only diagnostic in the presence of clinical signs of dehydration

Prevention of dehydration in residential care

General

Staff in residential care facilities need to be trained to recognise the importance of maintaining adequate hydration, normal fluid requirements and how to monitor intake. They should also be able to identify situations where a resident is at greater risk of dehydration, clinical features of dehydration and strategies to increase fluid intake. There needs to be adequate staffing levels to attend to hydration needs, but volunteers and visitors should also be involved in this task. A wide range of strategies to maintain and increase fluid intake have been utilized. Some have been subjected to research studies – including regular rounds with a hydration cart²⁶, using volunteers and providing a “happy hour”²⁷ and prompting residents to drink and providing preferred fluids²⁸. Many other approaches are utilized and the key to success appears to be tailoring a program to suit local conditions. Some of the strategies that can be considered are shown in Table Five. A typical daily fluid intake plan is shown in Appendix One, and two case studies are presented in Appendices Two and Three.

Table Five

Strategies to maintain / increase fluid intake

- Ensure all staff are adequately trained in the importance of hydration.
- Regularly offer fluids – e.g. every 1 ½ hours by day
- Offer fluids at specific routine events
 - before / after showering or washing after toileting
 - before / after physiotherapy or other activity program
 - medication rounds
- Regular hydration cart rounds
- Offer residents their preferred drinks
- Prompt residents to drink at meal times
- Ensure fluid is within residents’ reach
- Educate families / visitors to offer fluids when visiting
- Encourage “wet” foods such as jelly, custard, yoghurt, ice cream, soup, pureed fruit
- Have a social hour where fluids are offered
- Keep a fluid intake chart especially for at risk residents
- Use a symbol such as a drop of water on trays of residents who need to drink more, to prompt staff.
- Measure urine specific gravity monthly
- Measure osmolality, sodium and/or blood urea/creatinine ratio when bloods are being taken for other reasons.
- Identify at risk residents and pay more attention to them – e.g. confused, refusing fluids, febrile, on diuretics (see Table One).

Specific circumstances – e.g. gastroenteritis

There are a range of acute illnesses that increase the risk of dehydration. Gastroenteritis is possibly the most challenging, and unfortunately outbreaks in nursing homes and other residential care are not infrequent. Dehydration can occur very rapidly – within hours. Where vomiting and diarrhoea are increasing fluid loss, it is important to recognise that electrolytes are also being lost. Prevention of dehydration in these settings should also be combined with electrolyte replacement. There are a range of commercially available rehydrating fluids, including Hydralyte and Gastrolyte. The use of glucose and salt in these preparations ensures the most rapid absorption of water and electrolytes from the bowel – replacement fluids that are too high in sugars (e.g. lemonade) will not be absorbed as rapidly and replacement fluids with no sugar or electrolytes can actually increase gut loss of fluid. It is essential that these oral rehydration fluids are used early – from the beginning of an episode of gastroenteritis – and frequently to reduce the high risk of dehydration.

It is recommended that Hydralyte, for instance, be administered as 200 mL every 30 minutes (if using the liquid) or 3 x 62.5 mL ice blocks every 30 minutes. The risk of over-hydration is negligible in this situation.

As well as aggressive use of rehydration fluids, staff must remain attentive to the development of the signs of dehydration and consider medical review, hospitalisation or parenteral (subcutaneous or intravenous) fluids if dehydration is occurring. In addition, the cause of the acute illness may be amenable to specific therapy (e.g. pneumonia or a urinary infection may cause fever and confusion, increasing the risk of dehydration, but rapidly improve with antibiotics) – medical intervention may be required in these circumstances, along with rehydration. Other factors increasing the risk of dehydration should also be managed – for instance, temporary cessation of diuretic therapy (again, after medical consultation).

Treatment of dehydration

Despite preventive measures, dehydration may occur, especially with acute illnesses such as gastroenteritis. In this circumstance a decision to treat within residential care, or to transfer to hospital, needs to be made. Treatment within the facility is generally preferable but there may be insufficient resources / funding / staff skills to safely allow this. Oral rehydration should be continued but will often need to be combined with fluids administered via other routes – intravenous, subcutaneous or enteral. The latter (e.g. nasogastric tube) is usually inappropriate and certainly not appropriate if there is vomiting. Few residential care facilities have the resources and skills required to safely allow intravenous rehydration. A more acceptable form of parenteral rehydration is the administration of subcutaneous fluids (“hypodermoclysis”) and randomised trials have shown this to be both effective, well accepted by residents and easier to administer than the intravenous route²⁹. Subcutaneous fluid infusion can also be used for chronic maintenance needs when oral intake remains insufficient, and when used acutely can avoid transfer to hospital for rehydration³⁰. Up to 2 litres of dextrose-saline solution can be safely administered every 24 hours using this route³¹ but physician supervision and close patient monitoring is essential.

Dehydration as a clinical indicator

Whilst episodes of dehydration in residential care can be attributed to many factors, including terminal illness, most episodes are avoidable through the strategies outlined above. It is appropriate that dehydration be regarded as due to poor care unless planned (e.g. terminal illness) or other exceptional circumstances exist. Thus, dehydration can be used as a quality indicator – episodes of dehydration indicating (potential) neglect^{4, 32-34}. Such an approach further focuses staff and community awareness on the importance of maintaining hydration, and should improve the quality of life for residents.

Appendix one

Example Fluid Intake

(Italics indicates suggestions to increase daily intake)

Breakfast

Milk on cereal – 200 mL
Cup of tea – 200 mL
Juice 100 mL

After shower

Water offered – 100 mL

Morning tea

Cup of tea – 200 mL

Lunch

Cordial drink – 150 mL

Afternoon tea

Cup of coffee – 200 mL
Water – 50 mL encouraged when tray cup cleared away
(Hydralyte Ice Block offered on hot days – 62.5 mL)

Extra fluid offering

100 mL water/other beverage given by a staff member/visitor

Dinner

Soup – 150 mL
Milk drink – (e.g. plain, flavoured, supplement) – 200 mL

Bedtime

Water or Hydralyte – 50 mL offered prior to sleep

Medication rounds

50 mL x 3 per day = 150 mL

100 mL Hydralyte with one medication round, 100 mL water offered each other time = 300 mL

Total 1250 mL per day – inadequate

Total 2000 mL – adequate

Appendix two

Hydration Case Study #1

Joan is a 45 kg lady with mild dementia and urinary incontinence. She suffers with frequent urinary tract infections and is slightly underweight having lost 5 kg in the last 12 months. She feeds herself, however requires prompting and encouragement. A fluid intake chart shows Joan only consumed around 1 litre of fluid per day.

How can we improve Joan's nutritional status focusing on her fluid intake?

Plan: We would like Joan to maintain or gain some body weight, reduce the frequency of her urinary tract infections and have more enthusiasm about her eating, i.e. require less prompting. Joan may require prompting because she may be feeling lethargic due to dehydration and confusion that can be caused due to UTIs.

A urine specific gravity test or simple observation of urine colour could be done if a few drops of urine can be collected which we would predict will show dehydration due to the low fluid intake.

Using the above formula Joan's fluid minimum requirement is 1875 mL per day. Below shows some of the opportunities where Joan can consume fluid and easily achieve her fluid requirement. Many more opportunities could be available. Therefore trial and error should be used to see what suits the resident best.

Proposed fluid intake for Joan

Breakfast

Cereal – milk 150 mL
Juice (cranberry) – 100 mL
Cup of Tea – 200 mL

Pre/post shower

100 mL x 2 water offered = 200 mL

Morning tea

High energy supplement milk base drink – 200 mL
Yoghurt (full cream) – 200 g (basically a fluid) = 150 mL

Lunch

Cordial drink – 150 mL
Custard (100 mL) and pudding

Afternoon tea

Cup of Tea – 150 mL
Milk Shake – 150 mL

Dinner/Tea time

Soup – 200 mL

Supper time

60 mL Hydralyte
Cup of tea – 100 mL

Medication rounds

Lunch – 100 mL Hydralyte
Two others – 150 mL water = 300 mL

Total 2310 mL

References

1. Department of Health and Ageing Report on the operation of the Aged Care Act 1997: 1 July 2009 - 30 June 2010 2010.
2. Thompson M. Fatal neglect. In possibly thousands of cases, nursing-home residents are dying from lack of food and water and the most basic level of hygiene. *Time* 1997; 150: 34-8.
3. Kayser-Jones J. Malnutrition, dehydration and starvation in the midst of plenty: the political impact of qualitative inquiry. *Qualitative Health Research* 2002; 12: 1391-405.
4. Sullivan RJ. Fluid intake and hydration: critical indicators of nursing home quality. *North Carolina Med J* 2005; 66: 296-9.
5. Mentes JC. A typology of oral hydration problems exhibited by frail nursing home residents. *J Geront Nurs* 2006; 32: 13-9.
6. Kayser-Jones J, Schell ES, Porter C, Barbaccia JC, Shaw H. Factors contributing to dehydration in nursing homes: inadequate staffing and lack of professional supervision. *J Am Geriatr Soc* 1999; 47: 1187-94.
7. Lavizzo-Mourey R, Johnson J, Stolley P. Risk factors for dehydration among elderly nursing home residents. *J Am Geriatr Soc* 1988; 36: 213-8.
8. Hodgkinson B, Evans E, Wood J. Maintaining oral hydration in older people. The Joanna Briggs Institute for Evidence based Nursing and Midwifery. Adelaide 2001.
9. Palevsky PM, Bhagrath R, Greenberg A. Hyponatremia in hospitalised patients. *Ann Int Med* 1996; 124: 197-203.
10. Weinberg AD, Pals JK, Levesque PG, Beal LF, Cunningham TJ, Minaker KL. Dehydration and death during febrile episodes in the nursing home. *J Am Geriatr Soc* 1994; 42: 968-71.
11. McCann RM, Hall WJ, Groth-Junker A. Comfort care for terminally ill patients. The appropriate use of nutrition and hydration. *J Am Med Assoc* 1994; 272: 1263-6.
12. Byatt CM, Millard, PH, Levin GE. Diuretics and electrolyte disturbances in 1000 consecutive geriatric admissions. *J Royal Soc Med* 1990; 83: 704-8.
13. MacLennan WJ. Diuretics in the elderly: how safe? *Brit Med J* 1988; 296: 1551-2.
14. Amella EJ. Feeding and hydration issues for older adults with dementia. *Nurs Clin North Am* 2004; 39: 607-23.
15. Dyck MJ. Nursing staffing and resident outcomes in nursing homes: weight loss and dehydration. *J Nurs Care Qual* 2007; 22: 59-65.
16. Phillips PA, Rolls BJ, Ledingham JGG et al. Reduced thirst after water deprivation in healthy elderly men. *N Engl J Med* 1984; 311: 753-5.
17. Faull CM, Holmes C, Baylis PH. Water balance in elderly people: is there a deficiency of vasopressin? *Age Ageing* 1993; 22: 114-20.
18. Albert SG, Nakra BRS, Grossberg GT, Caminal ER. Vasopressin response to dehydration in Alzheimer's disease. *J Am Geriatr Soc* 1989; 37: 843-7.
19. Chidester JC, Spangler AA. Fluid intake in the institutionalised elderly. *J Am Diet Assoc* 1997; 97: 23-8.
20. Thomas DR, Tariq SH, Makhdomm S, Haddad R, Moinuddin A. Physician misdiagnosis of dehydration in older adults. *J Am Med Directors Assoc* 2004; 5(Suppl 1) S31-4.
21. Chassagne P, Druesne L, Capet C, Menard JF, Bercoff E. Clinical presentation of hyponatremia in elderly patients: a case control study. *J Am Geriatr Soc* 2006; 54: 1225-30.
22. Eaton D, Bannister P, Mulley GP, Connolly MJ. Axillary sweating in clinical assessment of dehydration in ill elderly patients. *Brit Med J* 1994; 308: 1271.
23. Mentes JC, Wakefield B, Culp K. Use of urine color chart to monitor hydration status in nursing home residents. *Biol Res for Nursing* 2006; 7: 197-203.
24. Colling JC, Owen TR, McCredy MR. Urine volumes and voiding patterns among incontinent nursing home residents. Residents at highest risk for dehydration are often the most difficult to track. *Geriatr Nursing* 1994; 15: 188-92.
25. Weinberg AD, Pals JK, McGlinchey-Burroth R, Minaker KL. Indices of dehydration among frail nursing home patients: highly variable but stable over time. *J Am Geriatr Soc* 1994; 42: 1070-3.
26. Spangler PF, Risley TR, Bilyew DD. The management of dehydration and incontinence in nonambulatory geriatric patients. *J Appl Behav Analysis* 1984; 17: 397-401.
27. Musson ND, Kincaid J, Ryan P et al. Nature, nurture, nutrition; interdisciplinary programs to address the prevention of malnutrition and dehydration. *Dysphagia* 1990; 5: 96-101.
28. Simmons SF, Alessi C, Schnelle JF. An intervention to increase fluid intake in nursing home residents: prompting and preference compliance. *J Am Geriatr Soc* 2001; 49: 926-33.
29. Slesak G, Schnurle JW, Kinzel E, Jakob J, Dietz K. Comparison of subcutaneous and intravenous rehydration in geriatric patients: a randomised trial. *J Am Geriatr Soc* 2003; 51: 155-60.
30. Dasgupta M, Binns MA, Rochon PA. Subcutaneous fluid infusion in a long-term care setting. *J Am Geriatr Soc* 2000; 48: 795-9.
31. Challiner YC, Jarrett P, Hayward MJ, Al-Jubouri MA, Julious SA. A comparison of intravenous and subcutaneous hydration in elderly acute stroke patients. *Postgrad Med J* 1994; 70: 195-7.
32. Morley J. Water, water everywhere and not a drop to drink. *J Gerontol A Biol Sci Med Sci* 2000; 55: M360.
33. Simmons SF, Babineau S, Garcia E, Schnelle JF. Quality assessment in nursing homes by systemic direct observation. Feeding assistance. *J Gerontol A Biol Sci Med Sci* 2002; 57:M665-71
34. Himmelstein DU, Jones AA, Woolhandler S. Hyponatremic dehydration in nursing patients: an indicator of neglect. *J Am Geriatr Soc* 1983; 31: 466-71.

Acknowledgment to contributors include:

Simone Austin BSc MND: Accredited Practising Dietitian

Gerald Quigley: Community Pharmacist

The Hydration Pharmaceuticals Trust: Manufacturers of Hydralyte Oral Rehydration Solution.

