

**Signs and symptoms of dehydration do not work in older people living in care homes, so supporting residents to drink well is crucial**

***Abstract***

Low-intake dehydration is common in all older people because of age-related physical, physiological, cognitive and psychological changes. Risk of dehydration increases in care home residents because of increased need for care and dependence on staff for drinks or help with drinking. Commonly-used signs and symptoms of dehydration are ineffective in identifying dehydration in older people, so should not be used, because they may lead to inappropriate care. Low-intake dehydration can only be diagnosed using directly measured serum osmolality or calculated osmolarity, both of which require venous blood samples. Therefore, preventing low-intake dehydration is key, and all older people should be supported to drink well using a range of strategies based on person-centred approaches to individualised care, by staff trained in hydration care. Individualised approaches include offering preferred drinks more often during the day, using residents' preferred cups/glasses, increasing drinks intake with medications, drinks before breakfast and supporting excellent continence care.

***Keywords:***

aged, dehydration, drinking, screening tests

***Five key points***

1. Commonly-used signs and symptoms of low-intake dehydration are ineffective in older people, so should not be used.
2. All older people are at risk of low-intake dehydration due to drinking insufficiently.
3. European Guidelines recommend drinks intakes of 2.0L/d in men and 1.6L/d for women.
4. All older people should be supported to drink well.
5. Nurses and care workers should provide older adults with their preferred drinks in their preferred cup/mug or glass throughout the day.

This article summarises findings from recent studies demonstrating that commonly-used signs and symptoms of dehydration do not work in older people, so nursing care should focus on providing older adults with adequate fluids (ideally in the form of enjoyed drinks in a pleasant and social context) to prevent dehydration. We provide research and practice-based solutions for providing drinks to older people living in residential and nursing care homes (together called 'care homes'), although many of these solutions may be applicable to older people living in their own home or whilst residing in hospitals.

### ***Low-intake dehydration in older people***

Low-intake dehydration is due to not drinking enough, and it is very common in older people (Volkert et al, 2019). As low-intake dehydration is associated with increased risk of death, disability, hospital admission and longer hospital stays, it is important that health professionals and care home staff accurately identify whether older people in their care are drinking enough, or becoming dehydrated (Hooper et al, 2016a). Low-intake dehydration is characterised by low fluid levels mainly within cells (intracellular dehydration) with only small falls in circulating fluids. Electrolyte levels rise slightly as osmolality rises (though individual electrolytes are usually still within the normal range). This rise in serum or plasma osmolality can be directly measured from a venous blood sample, analysed using osmometers (available in clinical biochemistry laboratories) which assess the depression of freezing point. Alternatively, serum osmolarity can be calculated from sodium, potassium, urea and glucose using recommended equations (Hooper et al, 2016a; Volkert et al, 2019; also see subsequent section). Clinically, low-intake dehydration is a different condition to salt-loss dehydration, or hypovolaemia, which results from both fluid *and* electrolyte loss, leading to extracellular dehydration and smaller circulation which may be reflected in postural hypotension (Volkert et al, 2019). Hypovolaemia may occur as a consequence of excessive vomiting, diarrhoea or bleeding, for example, and is not due to insufficient drinking (Volkert et al, 2019). In this article, we are discussing only low-intake dehydration because it is more common in older people.

Nurses, care home staff, informal carers and other health professionals routinely rely on clinical signs and/or symptoms of dehydration, having been taught them in training, textbooks (Dougherty and Lister, 2011) and NHS websites (NHS Choices, NHS Direct Wales).

These signs and symptoms include feeling thirsty; dryness of the skin, hands, armpits, eyes, or oral mucosa; loss of skin elasticity; fever; rapid pulse; hypotension; urine changes (low volume, high specific gravity, dark colour); and increasing confusion, lethargy, agitation. These signs and symptoms are frequently used because they are easy to assess, require little training, provide instantaneous results and are inexpensive. However, many of these tests were developed for assessing dehydration in children and young adults (Armstrong et al, 2007; Hooper et al, 2014) , but do we know whether these signs and symptoms work in identifying low-intake dehydration in older adults? A recently published study, the Dehydration Recognition in our Elders (DRIE), addressed this crucial question (Bunn & Hooper, 2019).

In the DRIE study, the results of 56 clinical signs and symptoms were compared to the most accurate test for identifying dehydration, serum osmolality - the reference standard (Bunn and Hooper, 2019; Hooper et al, 2016a). Serum osmolality measures the concentration of blood components such as electrolytes, glucose and urea. In low-intake dehydration the blood becomes more concentrated because fluid levels fall. As serum osmolality can only be measured using a venous blood sample, the test has to be specifically requested, and so is only undertaken when there is a clinical indication.

In DRIE, 188 residents from 56 care homes in Norfolk and Suffolk participated in interviews where they answered questions about how they were feeling (headachy, tired, thirsty), were examined for clinical signs of dehydration (Table 1 – a list of signs and symptoms) and had a serum osmolality test (Hooper et al, 2016b). Residents were considered to have current dehydration if serum osmolality was  $>300\text{mOsm/kg}$ , or impending dehydration if serum osmolality  $>295\text{-}300\text{mOsm/kg}$ . Signs and symptoms with sensitivity and specificity of  $>70\%$  were considered potentially clinically useful (diagnostically accurate). Sensitivity assesses how accurately a test can positively identify people with dehydration, and specificity assesses how well the test correctly identifies people without dehydration. The higher the sensitivity and specificity, the more accurate the test is.

The DRIE study found that 20% of care home residents had current low-intake dehydration and a further 28% impending dehydration and that **none** of the commonly used clinical signs and symptoms were able to distinguish between residents with or without dehydration, because sensitivity and specificity for all tests was below 70% (Bunn and Hooper, 2019;

Hooper et al, 2016a). In other words the signs and symptoms do not work and they do not correctly identify who has low-intake dehydration and thus nurses and care workers using these tests are likely to provide the wrong care. This implies that many dehydrated older residents are not being identified, compromising their health and well-being (Figure 1).

This, and other recent studies, consolidate evidence that commonly used signs and symptoms of dehydration lack even basic levels of diagnostic accuracy in older adults when used in isolation, and currently, there is no evidence that a combination of tests may be diagnostically useful either (Fortes et al, 2015; Hooper et al, 2015a; Johnson and Hahn, 2018; Taniguchi et al, 2015).

We recommend that commonly-used clinical signs and symptoms are withdrawn from practice and that nurses, care staff and other health professionals, focus on supporting older people to drink well. In the next section we discuss research-based practical solutions about how best to do this.

### ***What is the recommended fluid intake for older people?***

Drinking adequate amounts of fluid is critical in preventing low-intake dehydration. The European Society for Clinical Nutrition and Metabolism (ESPEN) recently carried out detailed literature searches and reviewed the research evidence on hydration and nutrition in older adults. They assessed the quality of the research and developed 22 evidence-based recommendations for preventing, identifying and treating dehydration using a multistage consensus process. These recommendations set out the basic expectations of care for older people in care homes, health settings and at home around drinking and hydration (Volkert et al, 2019).

### **1. Fluid needs, prevention of low-intake dehydration**

- Men should be **offered** at least 2.0L/day of drinks, and women at least 1.6L/d over and above fluid in food (unless otherwise medically indicated).
- All older persons should be considered at risk of low-intake dehydration and encouraged to consume adequate amounts of drinks.
- Provide a variety of drinks, based on individual drinks preferences.

### **2. Prevention of low-intake dehydration in residential care**

As risk of dehydration increases for older people living in residential care, ESPEN recommends:

- Implementing multicomponent strategies to support drinking for all residents, including offering drinks frequently, increased availability and variety of drinks, increased staff awareness of importance of drinking and support for older residents. Strategies to support continence and quick access to toilets are also key.
- These multicomponent strategies should be developed with residents, not just about them, as well as with staff, management and policymakers.
- Assessments of barriers and promoters of drinking should underpin plans to support residents' drinking and recorded in personalised care plans.

### **3. Identification of low-intake dehydration in residential care:**

- Simple signs and tests should not be used to identify (or rule out) low-intake dehydration.
- For residents who are in regular contact with, or referred into, the health system, additional steps may be needed, using venous blood samples:
  - (i) Directly measured serum or plasma osmolality (>300mOsm/kg) should be used to identify low-intake dehydration.
  - (ii) Where directly measured osmolality is not available, use the recommended equation to calculate osmolality from serum sodium, potassium, urea and glucose:  $\text{osmolality} = 1.86 \times (\text{Na}^+ + \text{K}^+) + (1.15 \times \text{glucose}) + \text{urea} + 14$  (all measured in mmol/L).

#### **4. Treatment of low-intake dehydration:**

Older adults with low-intake dehydration (measured osmolality >300mOsm/kg or calculated osmolality >295mmol/L) who appear **well** should be encouraged to increase their fluid intake in the form of their preferred drinks. Those who appear unwell or are unable to drink may require additional fluids, using alternative enteral or parenteral support, in consultation with the medical team, and this may require hospital admission.

#### ***How can we help older people to drink well?***

Older people are more at risk of developing dehydration because kidney function decreases so ability to concentrate urine and reduce water loss is reduced; water stores (in muscle) fall as muscle mass is reduced and older people may develop difficulties accessing, reaching, swallowing and remembering to drink. If an older person is concerned about continence or needs help getting to the toilet, they often choose to drink less, so further increasing their risk of low-intake dehydration. The DRIE study showed that at least one in five older adults living in care homes in Norfolk and Suffolk have low-intake dehydration, and the risk is higher for those with dementia, diabetes or kidney problems (Hooper et al, 2016b). In hospital 37% of 200 older patients admitted acutely were dehydrated on admission, and 48 hours later most were still dehydrated (El Sharkawy et al, 2015). Drinking enough prevents low-intake dehydration, but supporting older people to do this requires nurses, care staff and carers to use a range of different approaches, as no single strategy works on its own (Bunn et al, 2015; Hooper et al, 2015b; Abdelhamid et al, 2016; Bunn et al, 2016).

To help older care home residents become more aware of how much they drink, Jimoh et al (2015) developed and evaluated the accuracy of a Drinks Diary designed for physically and cognitively able older residents to complete themselves. The authors found that residents kept an accurate record (compared to direct observation by the researcher), much more accurate than care staff records or fluid charts and that this aided their understanding of how much fluids they were drinking and needed to drink.

Understanding the way in which residents drink, which patterns of drinking and which characteristics of drinks are most associated with better fluid intakes provides crucial insights for nurses and care workers about how best they can support their residents to

drink well. Researchers in the DRIE study interviewed 188 care home residents, and directly observed a sub-sample of 22 residents, to document how much, what and when residents were drinking. The researchers compared the patterns of those drinking enough (according to ESPEN guidelines) with those not drinking enough (Jimoh et al, 2019). Just over half (55%) of older adults in care homes were drinking as much as the ESPEN recommendations (2L/d for men, 1.6L/d for women). Most drinks were drunk between meals, although most drinks were offered at meals. Residents who drank enough:

- were offered drinks more frequently throughout the day
- drank more with medications
- enjoyed a drink first thing in the morning (before breakfast).

Drinking first thing in the morning, on waking, was particularly enjoyed, and waiting until breakfast to offer drinks is a missed opportunity to improve hydration. Offering a substantial drink with medications provides extra fluid, makes swallowing pills easier and reduces possible side effects from some medications. Findings also indicated that older adults in care homes drink more during the day, before 6pm, providing clues about windows of opportunity for offering drinks, which might be drunk. Some people in the study expressed worries about incontinence or difficulties accessing toilets, thus self-limiting their drinks intake.

Whilst most care homes provide facilities where residents can help themselves to drinks, the DRIE study found that residents rarely helped themselves, or asked for drinks, putting the onus on care staff and nurses to offer drinks. Drinks in care homes are often served in cups or small mugs which contain 150-180mls of drink. A man would need to drink 11-14 of these each day, and a woman 9-11 drinks (depending on size of cup/mug/glass; Figure 2). If these drinks are not finished, then more drinks need to be offered more frequently to improve fluid intake.

Residents drank more when provided with their preferred drink. Preferred drinks were tea and coffee, all fruit juices (not often served) and hot milky drinks such as hot chocolate (reserved as an evening drink in many care homes). Alcoholic drinks were completely consumed when offered (beer and lager may provide additional enjoyable and hydrating beverages, provided that there are no medical or pharmaceutical contraindications). In contrast, squashes and cordials were left unfinished 86% of the time, and water 58% of the

time, so relying on residents to help themselves to water and squash provided in jugs does not work. Identifying and offering residents' preferred drink is an important factor in personalised approaches to hydration. For key tips for helping older people to drink well see Box 1.

### ***Role of Care Home Quality Improvement (QI) nurses in supporting care homes in hydration care***

In Norfolk, the Quality Improvement (QI) nurses work with care homes providing support and guidance for hydration and nutrition care. Good hydration underlies good quality of life. However, we know it is not easy for older people to drink enough fluid day-to-day in care homes, there are many challenges to achieving drinks intakes of 2.0L/d in men and 1.6L/d for women. The Care Home Quality Improvement nurses designed a hydration bundle to improve understanding around hydration in older people and support care workers to recognise barriers to drinking for older people. Setting blanket hydration targets for residents, without acknowledging personal habits and patterns of drinking, may lead to failures in achieving daily targets. This has implications for evidencing good practice for Care Quality Commission (CQC) Regulation 14 for hydration and nutrition (<https://www.cqc.org.uk/>). The QI nurses found that training and awareness around hydration, varied in Norfolk care homes, and this, coupled with a high workforce turnover, could contribute to sub-optimal hydration care.

The QI nurses developed a focused training session around good principles of hydration, outlining the main causes of dehydration with a particular emphasis on the need to provide hydration on a regular basis. They also promote good care, providing genuine person-centred care using Life Story (<https://www.dementiauk.org/for-professionals/free-resources/life-story-work/>), or similar. This ensures that the older person is at the centre of decisions which relate to their life. The person-centred process involves listening, thinking together, coaching, sharing ideas, and seeking feedback. The older person's preferences, needs and values guide decisions, providing care that is respectful of, and responsive to, them in order to achieve their hydration goals.

QI nurses work with all care home staff, recognising that hydration is the responsibility of every staff member, not just care support workers. Activities coordinators have an



invaluable part to play in encouraging drinks and supporting a positive, social role for drinking together. The chef/cook is often overlooked but is key in promoting hydration and nutrition for residents as the fluid content of food may become increasingly important if the resident simply does not want to drink. Paying attention to the mealtime experience and the environment of the home can encourage drinking. Many care homes are developing creative approaches to making drinking a social event. For example: 'Mocktail Monday', 'Thirsty Thursday', and 'Shandy Saturdays'. Care homes with 'Outstanding' CQC ratings often demonstrate a true person centred approach to hydration.

### ***Conclusion***

Low-intake dehydration is common in older people and all older people are at high risk because of age-related physical, physiological, cognitive and psychological changes. Commonly used signs and symptoms are ineffective in identifying dehydration, which can only be confidently diagnosed using directly measured serum osmolality or calculated osmolarity, both of which require venous blood samples. Therefore, prevention is key, and all older people need to be supported to drink well using a range of strategies based on a person-centred approach to individualised care. Involving specialist Care Home Quality Improvement Nurses ensures that care homes are supported to deliver high quality hydration care.

## References

- Abdelhamid, A. et al., 2016. Effectiveness of interventions to directly support food and drink intake in people with dementia: systematic review and meta-analysis. *BMC Geriatr*, 16(26). Available at: <https://doi.org/10.1186/s12877-016-0196-3>.
- Armstrong L. Assessing Hydration Status: The elusive gold standard. *J Am Coll Nutr*. 2007;26(5):575s–584s.
- Bunn, D. et al., 2016. Effectiveness of interventions to indirectly support food and drink intake in people with dementia: systematic review. *BMC Geriatr*, 16(89). Available at: <https://doi.org/10.1186/s12877-016-0256-8>.
- Bunn, D. et al., 2015. Increasing Fluid Intake and Reducing Dehydration Risk in Older People Living in Long-Term Care : A Systematic Review. *J Am Med Dir Assoc*, 16(2), pp.101–113. Available at: <http://dx.doi.org/10.1016/j.jamda.2014.10.016>.
- Bunn, D.K. & Hooper, L. Signs and Symptoms of Low-Intake Dehydration Do Not Work in Older Care Home Residents - DRIE Diagnostic Accuracy Study. [Published online ahead of print March 11<sup>th</sup> 2019]. *J Am Med Dir Assoc*. Available at: <https://doi.org/10.1016/j.jamda.2019.01.122> (accessed 16/06/2019).
- Dougherty, L. & Lister, S. eds., 2011. *The Royal Marsden Hospital Manual of Clinical Nursing Procedures* 8th ed., Oxford: Wiley-Blackwell.
- El-Sharkawy, A. et al., 2015. Hydration and outcome in older patients admitted to hospital (The HOOP prospective cohort study). *Age Ageing*, 44(6), pp.943-7. Available at: doi: 10.1093/ageing/afv119.
- Fortes, M.B. et al., 2015. Is This Elderly Patient Dehydrated? Diagnostic Accuracy of Hydration Assessment Using Physical Signs, Urine, and Saliva Markers. *J Am Med Dir Assoc*, 16, pp.221–228. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S1525861014006148>.
- Hooper, L et al. (2014) Hooper L, Bunn DK, Jimoh F, Fairweather-Tait SJ. Water-loss dehydration and aging. *Mech Ageing Dev*. 2014;136-137:50–8. doi:10.1016/j.mad.2013.11.009.
- Hooper, L. et al., 2015(a). Clinical symptoms, signs and tests for identification of impending and current water-loss dehydration in older people. *Cochrane Database of Systematic Reviews*, (4), p.Art. No.: CD009647. Available at: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD009647>.
- Hooper, L. et al., 2015(b). Beating dehydration – one specialist dementia home shows how to do it. *Nurs Times*, 111(34/5), pp.16–19.
- Hooper, L., et al., 2016(a). Water-loss (intracellular) dehydration assessed using urinary tests : how well do they work? Diagnostic accuracy in older people. *Am J Clin Nutr*, 104, pp.121–131. doi: 10.3945/ajcn.115.119925.
- Hooper, L., et al., 2016(b). Which frail older people are dehydrated? The UK DRIE study. *J Gerontol A Biol Sci Med Sci*, 71(10), pp.1341–7. doi: 10.1093/gerona/glv205.
- Jimoh, F., et al., 2015. Assessment of a self-reported Drinks Diary for the estimation of drinks intake by care home residents: Fluid Intake Study in the Elderly (FISE). *J Nutr Health Aging*, 19(5), pp.491–496. doi: 10.1007/s12603-015-0458-3.
- Jimoh, O.F. et al., 2019. Beverage Intake and Drinking Patterns — Clues to Support Older People Living in Long-Term Care to Drink Well: DRIE and FISE Studies. *Nutrients*, 11(2); pii:E447. doi: 10.3390/nu11020447.
- Johnson, P. & Hahn, R.G., 2018. Signs of Dehydration in Nursing Home Residents. *J Am Med Dir Assoc*, 19(12), pp.1124–8. Available at: <https://doi.org/10.1016/j.jamda.2018.07.022>.
- NHS Choices, Dehydration - symptoms. Available at: <http://www.nhs.uk/Conditions/Dehydration/Pages/Symptoms.aspx> [Accessed April 30, 2019].
- NHS Direct Wales, 2019. Encyclopaedia: Dehydration. Available at: <http://www.nhsdirect.wales.nhs.uk/encyclopaedia/d/article/dehydration> [Accessed April 30, 2019].

Taniguchi, H. et al., 2015. Role of Prehydration as a Predictor of Dehydration : A Non-invasive Cross-sectional assessment of elderly individuals. *Jacobs Journal of Gerontology*, 1(3), pp.1–9.

Volkert, D. et al., 2019. ESPEN guideline on clinical nutrition and hydration in geriatrics. *Clinical Nutrition*, 38(1): pp10-47. Available at: <https://doi.org/10.1016/j.clnu.2018.05.024>.