european hydration institute

**SCIENTIFIC DOSSIER ON:**

# Hydration and Outcome in Older Patients admitted to hospital (The HOOP prospective cohort study)

# INDEX



**Notes:**
Data are Mean ± SD unless otherwise stated.
Hypohydration/dehydration was defined as serum osmolality >300 mosmol/kg and impending hypohydration/dehydration as 295-300 mosmol/kg.





# 1. Citation

Hydration and outcome in older patients admitted to hospital (The HOOP prospective cohort study) Ahmed M. El-Sharkawy; Phillip Watson; Keith R. Neal; Olle Ljungqvist; Ron J. Maughan; Opinder Sahota; Dileep N. Lobo; Age and Ageing 2015; doi: 10.1093/ageing/afv119.

# 2. Published paper's abstract


**Background:** Older adults are susceptible to dehydration due to age-related pathophysiological changes. We aimed to investigate the prevalence of hyperosmolar dehydration (HD) in hospitalised older adults aged ⩾ 65 years, admitted as an emergency and to assess the impact on short-term and long-term outcomes.

**Methods:** This prospective cohort study was performed on older adult participants who were admitted acutely to a large UK teaching hospital. Data collected included the Charlson comorbidity index (CCI), national early warning score (NEWS), Canadian Study of Health and Aging (CSHA) clinical frailty scale and Nutrition Risk Screening Tool (NRS) 2002. Admission bloods were used to measure serum osmolality. HD was defined as serum osmolality >300 mosmol/kg. Participants who were still in hospital 48h after admission were reviewed, and the same measurements were repeated.

**Results:** A total of 200 participants were recruited at admission to hospital, 37% of whom were dehydrated. Of those dehydrated, 62% were still dehydrated when reviewed at 48h after admission. Overall, 7% of the participants died in hospital, 79% of whom were dehydrated at admission ($P = 0.001$). Cox regression analysis adjusted for age, gender, CCI, NEWS, CSHA and NRS demonstrated that participants dehydrated at admission were 6 times more likely to die in hospital than those euhydrated, hazards ratio (HR) 6.04 (1.64–22.25); $P = 0.007$.

**Conclusions:** HD is common in hospitalised older adults and is associated with poor outcomes. Coordinated efforts are necessary to develop comprehensive hydration assessment tools to implement and monitor a real change in culture and attitude towards hydration in hospitalised older adults.

# 3. Background

Older adults are susceptible to dehydration for a number of reasons including the pathophysiological changes that occur with normal ageing as well as a reduced replacement of water losses.

- The risk of dehydration is exacerbated by other factors including illnesses, of which more than one may be present at a time, consumption of multiple medications and presence of physical and mental disability.
- Perception of thirst changes with age and the age related increase in the thirst threshold results in a blunted sensation of thirst and reduced drinking.
- Changes occur in the renal system too and the kidney is less able to produce a highly concentrated urine required to conserve body water.
- The elderly may also have reduced renin-angiotensin-aldosterone system activity, which means they are less able to reabsorb sodium and conserve water from their filtrate as urine is produced.

Hypohydration (a state of body water depletion) is common in hospitalised patients and is often associated with disturbances in electrolyte balance. This dehydration has been linked with impairments in physical performance of tasks, coordination of movement and sight, and cognitive performances and also with cardiovascular, respiratory, renal and gastrointestinal disorders.

A retrospective study from 1991 conducted on over 10 million hospital records from a major US health care provider indicated that more than 17% of older people with the principal diagnosis of dehydration died within 30 days of hospital admission and the one year mortality was 48%. However, this retrospective study did not control for confounders such as age, comorbidities and frailty.

# 4. Study aims and objectives

To investigate the prevalence of hypohydration (determined from serum osmolality assessment) in hospitalised older adults, aged 65 years and over, admitted as an emergency to one of the largest UK teaching hospitals and to assess the impact on short-term and long-term outcomes.



# 5. Methods

**Study** = Prospective cohort study completed after NHS Research Ethics Committee approval and written informed consent.

**Subjects** = 200 older (≥ 65 years) adult patients admitted as an emergency admission to hospital.

- Age 81 ± 8 years
- 107 male; 93 female
- Body mass 71.0 ± 17.4 kg
- Height 165 ± 12 cm
- BMI 26 ± 6

Excluded were patients who were moribund, with terminal illness and a predicted life expectancy of less than 3 months, as well as those on end of life pathways.
The study was conducted over 20 months, between 31st August 2012 and 30th April 2014.

Data collection/screening (on admission [n=200] and repeated 48h later [n=116]):

1. From subjects, medical notes and/or relatives and used to calculate the Charlson comorbidity index included:
   - Demographics
   - Cause of hospital admission
   - Comorbidities
2. The Barthel activity of daily living index (ADL) score to assess the subjects' ability to perform daily activities necessary to independent living (0-20, with higher scores indicating a better ability to perform the ADL).
3. Cognitive function using the mini mental state examination (MMSE) (0-30, where lower scores suggest cognitive impairment).
4. The confusion assessment method (CAM) to assess for evidence of delirium.
5. The seven point Canadian Study of Health and Aging clinical frailty scale (CSHA), (higher scores indicating increased frailty).
6. Nutrition risk screening tool (NRS) 2002 to assess for malnutrition.
7. Typical fluid consumption habits by asking subjects to estimate the average number of cups of beverages consumed on a typical day. If subjects were unable to recall, efforts were made to obtain the information from relatives or carers.
8. A 10 cm visual analogue scale to indicate subjective feelings of symptoms associated with dehydration.

9. Serum osmolality (data for 187 subjects on admission, 95 subjects at 48h and 92 subjects at both time points).

10. 5 ml urine sample.

Following discharge, length of hospital stay, discharge destination and mortality were recorded. All the study subjects were followed up using the hospital's electronic records which were reviewed at 30 days, 90 days and 12 months.

# 6. Key results

**a) HYDRATION STATUS DATA**

On hospital admission 37% of subjects with known hydration status (n=69) were dehydrated. 62% of these subjects who were fully reassessed for serum osmolality (n=36) were still dehydrated 48h later, that is 22 subjects.

On hospital admission 21% (n=40) had impending dehydration, that is a serum osmolality of 295 to 300 mosmol/kg.

Hypohydration was recorded on medical notes in only 8% (n=15) of cases.

**Dehydration prevalence on hospital admission increased with age.**

- 23% (n=16) of 64-74 year olds compared to 36% (n=27) of those >84 years.

**Dehydration prevalence on hospital increased with comorbidity.**

- 17% with mild comorbidities compared to 43% of those with severe comorbidities.

**b) HYDRATION AND OUTCOME DATA**

7% (n=14) of the subjects died in hospital with this admission and 79% of these (n=11) were dehydrated at admission.

- The mortality rate at 30 days was also greater in those hypohydrated at admission (15%, n=11) than in those who were euhydrated (4%, n=5).

- Higher mortality rates also tended to be seen after 90 days: with hypohydration (23%, n=16), with euhydration (14%, n=16); and also after one year: with hypohydration (28%, n=19) with euhydration (24%, n=28).

Cox regression survival analysis adjusted for age, gender, comorbidity, frailty and nutritional status demonstrated that subjects dehydrated at admission to hospital were 5.5 times more likely to die in hospital than those euhydrated at admission.

- Each unit increase in serum osmolality was associated with a 5% increase in the in-hospital mortality and 4% in the 30 day mortality.

There were no significant differences in the length of hospital stay between those euhydrated and those dehydrated at admission.





# 7. Practical implications / advice

1. Given the apparent poorer outcome for older patients who were dehydrated on admission to hospital compared to those euhydrated, it is obvious that better education programs and the development of new tools for the assessment of hydration status should be prioritised.

2. A high prevalence of dehydration in older patients admitted to hospital in an emergency situation is a cause for concern. It may be that older adults, or in relevant situations those who care for them, would benefit from provision of information, in addition to or in a different format from that already available, related to the maintenance of hydration status in the elderly. This should include details of:

   - Reduced renal concentrating ability resulting in greater urine losses with waste products.
   - Changes in the sensing of thirst with age.
   - Less water being provided from food if appetite changes mean less is eaten.

3. The high prevalence of dehydration 48h after admission of these patients suggests that further research is required to determine if correction of this should become a greater priority compared to other treatments and assessments in these first days in hospital after emergency admission.

4. The reported mismatch between laboratory-determined dehydration from serum osmolality data and medical reporting of dehydration on medical notes should be investigated further.

# 8. Study limitations

**A.** No cause and effect conclusions can be drawn from this data on hydration status and outcome in the patients.

**B.** The use of serum osmolality data to classify hydration status of the subjects strengthens the study but missing data, particularly at 48h after hospital admission, reduces substantially subject numbers for full data analysis.

**C.** Additional tests for hydration status may enable dehydrations other than hypertonic dehydration, as used in the study, to be investigated.

**D.** Expanding the study to become a multi-centre study would strengthen the study.