european hydration institute

**SCIENTIFIC DOSSIER ON:**

# Hydration amongst nurses and doctors on-call (the HANDS on prospective cohort study)

# INDEX



**Notes:**
Data are presented as MEAN (SD) throughout.
Dehydration was defined as urine osmolality >800 mosmol/kg.
Oliguria (the production of abnormally small amounts of urine) was defined as urine output <0.5 ml/kg/hour.





# 1. Citation

El-Sharkawy AM, Bragg D, Watson P, Neal K, Sahota O, Maughan RJ, Lobo DN. (In Press) Hydration amongst nurses and doctors on-call (the HANDS on prospective cohort study). *Clinical Nutrition*.

# 2. Published paper's abstract


**Background & aims**: Dehydration of as little as 2% of total body weight may impair physical and cognitive performance. The aim of this study was to investigate the prevalence of dehydration at the start and end of shifts in nurses and doctors on-call. The secondary aims were to assess the relation between hydration status and cognitive function.

**Methods**: This prospective cohort study was conducted on nurses and doctors working on medical and surgical admissions wards at a university teaching hospital. Participants arrived on the ward approximately 20 min before their shift and were asked to provide a urine sample. Height and weight were then measured. A 10 mL blood sample was analysed for full blood count, serum urea and electrolytes, and blood glucose. Cognitive function was assessed using a series of computer-based tests including the Stroop Colour Naming Interference Test and Sternberg Memory Paradigm. Participants then worked normally but were asked to keep a fluid diary for the duration of their shift and fluid balance was estimated. Tests were repeated at the end of the shift. Dehydration was defined as urine osmolality >800 mosmol/kg and oliguria was defined as urine output <0.5 ml/kg/hour.

**Results**: We recruited 92 nurses and doctors, of whom 88 completed the study, amounting to 130 shifts. 52% participated for one shift, and 48% for two shifts. Thirty-six percent of participants were dehydrated at the start of the shift and 45% were dehydrated at the end of their shift. Mean (SD) urinary osmolality was significantly greater at the end of the shift when compared with the start [720 (282) *vs.* 622 (297) mOsm/kg, $P = 0.031$). Moreover, 41% were oliguric at the end of the shift. Single number and five-letter Sternberg short-term memory tests were significantly impaired in dehydrated participants ($P < 0.05$).

**Conclusions**: This study highlights that a significant proportion of nurses and doctors were dehydrated at the start and end of medical and surgical shifts. Dehydration was associated with some impairment of cognitive function.

# 3. Background

Doctors and nurses, (health care professionals (HCPs)) are involved in highly demanding work that requires optimum physical and mental function. The challenges and difficulties that frontline UK National Health Service (NHS) staff face on a daily basis are aggravated by the requirement to work long hours during on-call shifts.

An appropriate body water content, and thus hydration status, is essential for physical health and mental wellbeing. When this is not the case, a number of effects have been reported:

- Dehydration of around 2% of total body mass may be detrimental to physical, visuomotor, psychomotor and cognitive performance.
- Dehydration may also result in increased errors of visual vigilance as well as reduced latency of visual working memory response.
- Mild dehydration, due to water loss equivalent to 1.4% of body mass can result in lowered mood, increased perception of task difficulty, and reduced ability to concentrate.
- A modest restriction in fluid intake has been associated with increased subjective feelings of fatigue, headache, tension, anxiety and deterioration in cognitive performance, including short-term memory impairment, have also been associated with modest restriction of fluid intake.

However, it is important to note that the link between dehydration and cognitive impairment is inconsistent, and some studies have failed to report significant impairment in cognition associated with dehydration.





# 4. Study aims and objectives

**Primary aim**: To assess the prevalence of dehydration in doctors and nurses (HCPs) working "on call" on acute medical and surgical wards using objective markers of hydration.

**Secondary aims**: To assess associations between hydration status and changes in cognitive function and subjective feelings.

# 5. Methods

**Study**: Prospective cohort study completed after Ethics Committee Approval and written informed consent of subjects.

**Subjects**: 92 subjects were recruited and 88 completed the study. These were 40 nurses and 48 doctors (60 females, 28 males).

- Age: 29 (7) years
- Inclusion criteria: Working on acute medical (n=50) or emergency surgical (n=38) wards
- Exclusion Criteria: Pregnant females, current illness or illness in previous 6 weeks, renal disease, consumption of diuretics or antihypertensive medication

**Protocol outline:**

- Subject arrival 20min prior to start of work.
- Urinary bladder emptied and 5ml sample provided.
- Height and body mass measured.
- 10mL venous blood sample collected.
- Subjective feelings recorded by visual analogue questionnaire.
- Computer-based cognitive function tests completed.
- Commencement of normal work shift except:
  - a food/fluid intake diary was kept by all subjects.
  - subjects recorded the time and mass of each of their urine voids with scales provided.
- At end of work shift body mass, blood, urine, subjective feeling and cognitive function measures were repeated.

Data were collected for 130 shifts: 46 subjects provided data during one shift and 42 subjects provided data during two shifts i.e. a day and night shift.

# 6. Key results

Dehydration was defined as urine osmolality >800 mosmol/kg.

**a) HYDRATION DATA**

Pre-shift urine was collected from 87 subjects: 31 (36%) were dehydrated.

End of shift urine was collected from 80 subjects: 36 (45%) were dehydrated.

From urine osmolality data, 22% of subjects started euhydrated and became dehydrated over the course of their shift; 13% of subjects started their shift dehydrated but were euhydrated at the end. A similar pattern emerged from body mass data.

Greatest drink volumes over the course of the shift were consumed by the subjects who started and ended the shift euhydrated (927(433)ml) and by those who started dehydrated but ended euhydrated (915(317)ml).

79 subjects provided urine output data for their shifts. 32 (41%) were deemed to be oliguric for the shift.

**b) COGNITIVE FUNCTION DATA**

There was a trend for more errors in only one of the cognitive function tests, which assessed short-term functional working memory, in dehydrated subjects.



# 7. Practical implications/advice

1. This study highlights that a significant number of nurses and doctors were dehydrated at the start (approx. 1/3), and/or end (approx. 1/2) of their work shift on medical or surgical wards and many (1/3) were oliguric.

    **A.** The possible implications of this were not fully investigated by the present study and warrant further research.

2. When dehydration was assessed to be present, a limited water consumption (from all sources) appeared to be a major contributing factor with approximately 30% less being consumed over the shift by these individuals.

    **A.** Whilst the reasons for this can be postulated i.e. missing or limiting breaks, limited access to staff rooms, dissuasion from drinking in view of patients and/or visitors, further work is needed to identify these.

    **B.** The prevalence of warm, dry rooms in a hospital environment, and any contribution these may make to increased sweat and respiratory water losses in the hospital staff, should be considered by the HCPs.

# 8. Study limitations

**A.** The study was originally planned to investigate doctors and nurses working on-call over two shifts, one day and one night shift. However, many staff only worked one shift, either day or night, so the study protocol was modified to include staff working only one shift too.

**B.** The data have been collected at a single site and thus may be influenced by local practices and norms.

**C.** Hydration status was assessed by a single marker (urine osmolality) and it has the potential to be influenced by preceding eating and drinking behaviour and will reflect hydration status over the time period the urine was being produced rather that at the time of collection.

**D.** The self reporting of dietary intake and urine output data has the potential for increased errors but it did allow a greater number of subjects to be studied in the time available.