

## ORIGINAL ARTICLE

# Water, water everywhere: dehydration in the midst of plenty – An observational study of barriers and enablers to adequate hydration in older hospitalized patients

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## ABSTRACT

While dehydration is common in older patients and is associated with poor outcomes, it has been infrequently studied in the hospital setting. Thus, the aim of this study was to identify potential barriers and enablers to the maintenance of adequate hydration in older patients in an acute hospital environment. An observational study, involving patients aged 60 years and older admitted to an acute care hospital in Queensland, Australia, was undertaken. Forty-four patients were observed during mealtimes, and chart and room audits were performed to identify hydration management strategies, weight records and the presence or absence of fluid balance charts. Results revealed a number of system and practice-related barriers including patient difficulties with opening fluid containers and low levels of documentation of hydration management strategies. Addressing these issues is an important first step towards improving the management of hydration in medically ill older hospital patients.

**Key Words:** Aged, Dehydration, Dementia, Hospitals, Prevalence

## 1. INTRODUCTION

Dehydration is common in older people, particularly amongst older patients admitted to hospital, and is associated with serious adverse outcomes. Studies have reported the prevalence of dehydration to be between 10% to 40% in older patients at admission to hospital,<sup>[1-4]</sup> while dehydration in

this population is associated with confusion, delirium, constipation, poor wound healing, increased rates of falls and fractures, increased mortality, as well as longer lengths of stay and increased hospital costs.<sup>[5-7]</sup>

While illness including infections and associated symptoms such as fever increases the risk of dehydration in older peo-

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ple, they are also more susceptible to dehydration due to a reduced thirst response wherein they fail to recognize the need to drink more fluids in response to fluid loss.<sup>[8]</sup> Hence, older patients are often reliant upon staff reminding and assisting them to increase fluid intake in order to maintain adequate hydration.<sup>[9]</sup> Other factors that increase the risk for dehydration in this population include physical or cognitive impairments (CI) that may impair a person's ability to independently access and drink fluids; insufficient staff to regularly offer fluids and assist residents to drink; and lack of accessibility to fluids in general but, particularly preferred fluids.<sup>[9]</sup> Older people, including those with both acute and chronic CI such as delirium and dementia, often fail to drink adequate fluids whilst in hospital for a variety of reasons, including changes in environments, changes in functional status, physical inaccessibility of drinks (*e.g.* inability to easily reach or visualize provided drinks), a lack of required drinking aids (*e.g.* straws or sipper cup), and a lack of reminders to regularly drink fluids.<sup>[10,11]</sup>

Although hydration management guidelines for older people are available, *e.g.*<sup>[12]</sup> the majority of studies that have assessed the implementation of guidelines or strategies to promote hydration in older people have been conducted in nursing homes,<sup>[13]</sup> and few have explored their implementation in the acute hospital setting.<sup>[10]</sup> Prior to the effective implementation of any practice change intervention it is essential to identify barriers and enablers that exist in that setting,<sup>[14]</sup> and currently, a sound understanding of the barriers and enablers to achieving optimal hydration in older hospitalized patients is lacking. Hence, the aim of this observational study was to better understand everyday practice and system-related factors that promote and impede adequate hydration in older patients within an acute hospital environment.

## 2. METHODS

This sub-study involved direct observations of hospitalized patients during mealtimes to identify potential barriers and enablers to the maintenance of adequate hydration in older inpatients (patients aged 60 years and older). In addition, audits of charts and patient care plans were undertaken to identify levels of documentation about interventions to promote adequate hydration in older hospitalized patients.

A prospective, observational study of patients admitted to the internal medical unit of a large teaching hospital in South-East Queensland, Australia was undertaken with recruitment occurring between July 2013 and November 2014. As comprehensive details of the methods including recruitment methods and participant characteristics have been published elsewhere,<sup>[15]</sup> only brief details are provided in this manuscript.

### 2.1 Participants

A convenience sample of patients aged 60 years and older participated in the study. This age was selected as the cut-off as frailty (a concept examined in the companion study) appears to accumulate more rapidly from the age of 60 years onwards.<sup>[16]</sup> Eligibility criteria included: (a) age  $\geq$  60 years, (b) English speaking, and (c) research staff were available to complete all baseline assessments within the first 24 hours of the admission. As project staff were unavailable to collect follow-up data on week-ends, participant recruitment was restricted to between Sunday afternoon and Tuesday evenings. Exclusion criteria included: (a) unstable congestive heart failure, (b) chronic kidney disease stage 5, (c) classified as nil by mouth on admission, and (d) had an expected length of stay of less than 24 hours.

### 2.2 Ethics

The project was approved by both the Hospital's and the University's Human Research and Ethics committees. Written consent was obtained from all participants and/or their legal representative prior to their participation.

### 2.3 Measures

#### 2.3.1 Demographic information

Trained research assistants collected basic demographic information from each participant or their proxy including age and gender, within the first 24 hours of admission. Full details are published elsewhere.<sup>[15]</sup>

#### 2.3.2 Cognitive status

The Rowland Universal Dementia Assessment Scale (RUDAS)<sup>[17]</sup> was administered to assess participant's cognitive functioning. The RUDAS is a brief, culture and language fair cognitive screening test that yields a score of between 0-30 with scores  $\leq$  22 indicative of CI (unless the low score is a consequence of another disability, *e.g.* visual impairment). It is psychometrically sound with demonstrated high sensitivity (89%) and specificity (98%) for identifying CI.<sup>[17]</sup> The RUDAS was administered by two gerontological nurses involved in the study (JMc, MM), each with more than 30 years experience caring for older patients. In this study, patients with RUDAS scores  $\leq$  22 were classified as having CI, while those with RUDAS scores  $\geq$  23 were considered to be cognitively intact.

#### 2.3.3 Hydration status

In this study, dehydration was defined by either clinical assessment or by calculated serum osmolality readings  $\geq$  295 mmol/Litre (mmol/L) and hence, patients with both impending (serum osmolality between 295 mmol/L-300 mmol/L) and current water-loss dehydration (serum osmolality  $>$  300 mmol/L) were identified as dehydrated.<sup>[8]</sup>

The clinical assessments were performed by experienced geriatricians (EE, KH), using assessments previously validated as practical and reliable indicators of dehydration in older hospital patients.<sup>[18]</sup> Patients were assessed for dehydration within the first 24 hours of their admission to hospital and on day 4 of their hospital stay or at discharge (whichever occurred first).

### 2.3.4 Observational/audit data

Observational data were collected throughout the first four days of each patient's admission, and audits of rooms and care plans were conducted by two experienced gerontological nurses (JMc, MM), as unobtrusively as possible. As no validated tools were identified as suitable, the observational and audit tools were developed by the researchers based upon their extensive experience of working with geriatric inpatients and evidence from the literature, in particular the Hydration Management guideline developed by Mentec.<sup>[12]</sup> While these tools were not formally assessed for validity and reliability, preliminary field testing was undertaken to assess their face validity and practicality by one of the study investigators (JMc), prior to study commencement, and the tools are available from the authors by request.

Participants were observed throughout each of one breakfast, one lunch and one dinner during their hospital stay with the specific meal-time observed being dependent upon the availability of research staff. On each occasion, patients were assessed for fluid intake dependency (the ability to drink fluids independently) using an item from the Minimum Data Set for Acute Care (MDS-AC) – a valid and reliable tool for the comprehensive assessment of older hospitalized patients.<sup>[19]</sup> The MDS-AC item assesses the functional ability to eat and drink independently, but for this study only drinking ability was assessed using this item (the ability to eat was not assessed). The item uses a scale ranging from "Independent" to "Total dependence":

- (1) Independent (No help of staff/oversight OR staff help/oversight provided)
- (2) Supervision (Oversight, encouragement, or cueing provided only 1-2 times)
- (3) Limited assistance (Physical help in guided maneuvering to drink 1-2 times)
- (4) Extensive assistance (Full staff assistance provided 3 or more times for patient to drink)
- (5) Total dependence (Full staff assistance provided to patient for drinking)

In addition, the following were assessed: whether the patient had been provided with an appropriate drinking vessel (yes/no), the approximate volume of fluid consumed in

milliliters (ml) by the patient at each meal, whether the patient had been offered an alternative fluid if the volume consumed was less than 250 ml (yes/ no), whether the patient had received any encouragement to drink during the meal (yes/no; N/A if all fluids were consumed), and whether the patient was asked whether he/she had finished drinking all offered fluids before the meal tray was removed (yes/no/ N/A). The specified volume (250 ml) was based on a recommended fluid intake goal of 1,500 ml per day for older adults,<sup>[5]</sup> divided by six (meal-times and mid-meal breaks). Fluids were provided in standard containers and the volume consumed was evaluated visually and recorded using a five-point scale (0, 25%, 50%, 75%, and 100%), which was subsequently converted back to ml consumed. Any difficulties that patients were observed to experience in relation to fluid intake were also documented.

The patient charts and nursing care plans were reviewed within 48 hours of the patient's admission to identify whether: the patient's weight had been documented at the time of admission (yes/no), whether the patient's fluid intake had been documented within the past 24 hours (ml), whether fluid output had been documented at any time (yes/no), whether the patient's fluid output for the past 24 hours had been documented (ml), and whether the patient should be encouraged to increase his/her fluid intake (yes/no).

Finally, a room audit was performed during one meal-time for each study participant to determine whether: drinking water was available in the room (yes/no) and whether the patient could easily reach the water (yes/no). The room audit was performed at the same time as the chart and care plan audits. Nursing staff were informed about the nature and purpose of the research project and following completion of the study, were provided with a written project report and study findings were discussed at in-service presentations (see Discussion – Study impact).

### 2.4 Data analysis

Observational data are presented as descriptive data (text, percentages, means and *SDs*), while Chi-square tests were used to compare important patient characteristics according to CI status (CI versus no CI), and nursing actions according to dehydration status at admission (dehydrated versus euhydrated). Overall, missing data were less than 10% and the total numbers of cases available for analysis for each data item are reported within the results section.

### 2.5 Results

Of the 68 eligible patients invited to participate in the study, 45 initially agreed to participate in the study. Twenty-three patients, or their relatives declined participation while one

participant was withdrawn, soon after consenting, due to an acute deterioration in medical status. Thus, the final sample comprised 44 patients, with an average age of 81 years ( $SD = 8.5$ ). The majority were female ( $n = 24, 55\%$ ) and over half were cognitively impaired ( $n = 27, 61\%$ ) at baseline, with CI due to delirium in 3 patients. Almost one-third ( $n = 12, 29\%$ ) were found to be dehydrated at baseline which did not differ according to the patient's CI status (CI versus no CI;  $\chi^2 = 0.14, df = 1, p = .71$ ). By comparison, 21% of patients ( $n = 9$ ) were dehydrated at study exit which did not differ according to the patient's CI status ( $\chi^2 = 0.36, df = 1, p = .55$ ).

## 2.6 Meal-time observations

Observations of participants at meal-times indicated that 38% of participants at breakfast ( $n = 16/42$ ) and almost half at lunch (49%,  $n = 20/41$ ) and dinner (49%,  $n = 21/43$ ) were independent for fluid intake while the remainder required some staff assistance. A minority of patients required extensive assistance at breakfast (7%,  $n = 3$ ), lunch (7%,  $n = 3$ ) and dinner (11%,  $n = 5$ ), while two patients were fully dependent for fluid intake at dinner (5%). There were no significant differences in fluid dependencies at any meal-time for patients with CI versus those who were cognitively intact: Breakfast:  $\chi^2 = 3.5, df = 3, p = .32$ ; lunch:  $\chi^2 = 7.7, df = 3,$

$p = .05$ ; dinner:  $\chi^2 = 8.7; df = 4, p = .07$ . Similarly, there were no statistically significant differences in fluid dependencies at any meal-time for patients who, at baseline, were assessed as dehydrated compared to those who were not: breakfast:  $\chi^2 = 1.57, df = 3, p = .67$ ; lunch:  $\chi^2 = 0.86, df = 3, p = .83$ ; dinner:  $\chi^2 = 1.67, df = 4, p = .80$ .

The average volume of fluid consumed at each meal observed was 248 ml ( $SD = 85$ ) at breakfast, 190 ml ( $SD = 123$ ) at lunch, and 202 ml ( $SD = 141$ ) at dinner. At no meal-time did all patients drink the recommended minimum of 250 ml, although around one-quarter of patients (Breakfast: 17%,  $n = 7$ ; Lunch: 27%,  $n = 11$ ; Dinner: 23%,  $n = 10$ ) were encouraged to increase their fluid intake by nursing staff on each occasion. The majority of participants (93%) were provided with an appropriate drinking vessel at all meals, although one patient was provided with a cup with a broken handle on one occasion (see Table 1). In addition, most patients ( $n = 37, 92\%$ ) were observed to have drinking water available in their room although of those, 30% ( $n = 12$ ) were unable to access it easily at the time the room audit was undertaken. Of the 12, three (25%) were assessed as dehydrated at baseline and four (33%) were assessed as dehydrated at study exit.

**Table 1.** General observational findings during meal-times

Descriptions
<p><b>Water bottles and milk container issues</b></p> <ul style="list-style-type: none"> <li>• Three patients who had difficulty opening the milk received assistance by a nurse.</li> <li>• One patient who had difficulty opening the milk for her cereal and was unable to get the lid of her water was assisted by a cleaner who noticed the patient was having difficulty. The cleaner also made another cup of tea for this patient.</li> <li>• Two patients, assessed as requiring limited assistance for fluid intake, were unable to remove the lid from the water bottles.</li> <li>• One patient with severe arthritis was unable to open the milk and water containers. She attempted to open the yoghurt and fruit container by stabbing it with a knife until the researcher intervened and provided assistance. The same patient was given coffee with her dinner despite not liking coffee. No other fluids were offered by staff.</li> <li>• One patient was unable to open the milk and started to eat her cereal without milk.</li> <li>• Two patients who had a water bottle available didn't have a glass to pour it into. One of these patients reported "I don't drink out of bottles".</li> <li>• One patient was given two juice boxes (one containing juice and one milk), however, neither had a straw.</li> </ul>
<p><b>Other issues</b></p> <ul style="list-style-type: none"> <li>• One patient was given a mug with a broken handle and consequently held the mug by the outside.</li> <li>• On one occasion, a patient was left in a lying position and was unable to position himself to eat. The tray was consequently removed by the kitchen staff without the patient eating any of his breakfast.</li> <li>• On one occasion a participant was not able to finish her breakfast fluids because she was taken to the shower.</li> <li>• One patient did not receive a dinner tray so her daughter bought her sandwiches from the hospital café.</li> <li>• One patient informed research staff that she didn't drink tea or coffee and wasn't offered any alternative. This information was not documented in her care plan.</li> <li>• One patient was observed to rummage through her drawers trying to find another drink during one lunch-time</li> <li>• One patient only had a mouthful of her tea and as she stated, "It was cold and I prefer hot tea."</li> </ul>

Finally, several issues in relation to patient's fluid intake were documented by research staff (see Table 1). The most frequently observed issue was patients having difficulty opening milk, juice and other containers, while other issues included the non-delivery of meal-trays (one occasion), a patient being unable to re-position himself into a sitting position to eat (one occasion), a patient missing a meal as she was taken to the shower (one occasion) and patients given fluids they did not drink or did not like (three occasions).

### 2.7 Chart and care plan audits

Chart audits (n = 41, 3 missing) revealed that patient's weight following admission was documented in approximately three-quarters of cases (77%; n = 30), which differed according to patient's dehydration status at admission. While 84% of patients (n = 26) who were euhydrated at admission had their weight recorded ( $\chi^2 = 4.11$ , df = 1,  $p = .04$ ), only 50% of patients (n = 4) who were dehydrated at admission had their weight recorded,

Results of the nursing care plan audits showed that fluid intake monitoring was documented in less than one-third of cases (27%; n = 12/41), which did not differ according to the patient's dehydration status at admission ( $\chi^2 = 0.03$ , df = 1,  $p = .86$ ). Similarly, fluid output monitoring was documented in a minority of cases (14%; n = 6/40) and again the level of documentation did not differ according to dehydration status at admission ( $\chi^2 = 0.26$ , df = 1,  $p = .61$ ). Finally, documentation that patients should be encouraged to increase their oral fluid intake occurred in a minority of cases (11%; n = 5/38), which did not differ according to the patient's dehydration status at admission ( $\chi^2 = 1.06$ , df = 1,  $p = .3$ ).

## 3. DISCUSSION

Although this study was relatively small, our findings identified several important practice and system-related enablers and barriers to older hospital patients accessing fluids while in hospital and maintaining adequate levels of hydration. Addressing these issues is likely to improve the quality of care and safety of older people admitted to acute hospitals.

The most frequently observed barrier was the inability of patients to access fluids because of product packaging, with many being unable to open milk or water containers, sometimes due to physical incapacity. Additional barriers included low levels of documentation and the sub-optimal use of effective hydration management strategies by nursing staff. For instance, while more than half of the patients in this study required some level of assistance with fluid intake at meal-times, fluid intake dependencies were documented in only a minority of patient care plans. The lack of fluid monitoring by way of fluid balance charts in this study was also low and

is consistent with previous findings that fluid balance charts are poorly completed.<sup>[20]</sup> While under-documentation was identified, and does not necessarily indicate that a particular activity was performed or not,<sup>[21]</sup> the completion of fluid balance charts is important for the early identification of dehydration and the ongoing monitoring of patient's hydration status.<sup>[12]</sup> Furthermore, accurate record keeping is integral to safe and competent nursing practice.<sup>[22]</sup>

The implementation of effective hydration management strategies by nursing staff was infrequently observed in this study. For instance, some patients reported that they were not offered preferred fluids, while nursing staff were infrequently observed to encourage patients to increase their fluid intake, despite not drinking an appropriate quantity at meal-times. Reminding older people to drink fluids has been shown to effectively increase fluid intake in nursing home residents<sup>[9]</sup> and is an easy intervention to implement, requiring minimal staff time. Similarly, the importance of providing preferred fluids to older people as a strategy to increase fluid consumption has been previously demonstrated<sup>[9]</sup> and could be readily addressed in the hospital setting by offering suitable alternatives and recording oral fluid preferences in nursing care plans.

Enablers to adequate hydration included the provision of appropriate drinking vessels, and drinking water was available in the vast majority of patients' rooms. However, almost one-third (30%) were unable to easily access the water when the room audit was undertaken and more than half of the patients were not asked if they had finished drinking the fluids provided, when meal trays were removed. Importantly, the latter issue is outside nurses' control as the delivery and removal of food trays is the responsibility of food service personnel. Nevertheless, this is an important issue to address.

### 3.1 Protected mealtimes

The hospital has a policy of protected mealtimes with all non-essential clinical assessments actively discouraged during meal-times and the provision of meal-time assistance to patients advocated. Despite this, our results showed that meal-time assistance was not always provided when needed, and although the aim of protected meal-times is to allow patients to eat in an undisturbed environment, unintentional consequences may include inadequate supervision or assistance. In this study, fluid intake strategies including encouragement to increase fluid intake, were most frequently implemented at breakfast. Whether this reflects nurse: patient ratios at that time or other factors requires additional research, although it is hypothesized that nursing numbers may be reduced during lunch and dinner times due to delegated staff meal breaks.

Our findings indicate the need for practice and system-related changes to promote adequate hydration and prevent dehydration in older hospitalized patients. This includes providing education for hospital staff regarding the importance of hydration in older patients, how to correctly monitor and record this information (*i.e.* how to correctly complete a fluid balance chart), and effective strategies to promote and maintain adequate hydration in this population. Increasing nurses' awareness of the difficulties many older patients face at mealtimes in accessing fluids (and possibly food, although food accessibility was not a focus of this study), is required in the first instance. In particular, older patients with arthritic hands or other disabilities are likely to encounter difficulties when opening food or fluid containers, and nurses need to be more aware of these issues. Alternately, easy-to-open containers, or the provision of fluids in appropriately designed vessels via regular fluid rounds, could be considered. In addition, clinical practice and individual care planning should more accurately reflect the needs of older people especially those with CI and other physical impairments. This includes the identification of fluid intake dependencies, patient's fluid preferences and fluid intake goals for patients and recording this information in the nursing care plan where it can be enacted.<sup>[12,13]</sup> A recent systematic review of interventions in long-term care reported that ensuring greater choice and availability of beverages, increased staff awareness, and increased staff assistance with drinking and toileting were effective in increasing fluid intake or reducing dehydration.<sup>[13]</sup> It is likely that those interventions may also have a positive impact on older hospitalized patients and the establishment of sound systems will not only improve the delivery of quality care but will also support staff through education and training.

### 3.2 Study impact

The implementation of this study and the presence of research staff on the wards during data collection have potentially raised awareness of hydration as an important issue for older hospitalized patients at the study hospital. This, together with the dissemination of the study findings at in-service presentations and informal discussions amongst staff have been the impetus for two small but important changes since the study's completion. The first was aimed at addressing patient's fluid preferences through the introduction of a chocolate flavored milk drink (served hot or cold) as an alternative to tea and coffee at mid-meal rounds, and the second has been the replacement of water bottles with jugs and glasses. These small changes have not been difficult nor expensive to implement and may assist to improve the hydration status of older hospital patients and we intend to evaluate the impact of these interventions.

### 3.3 Study strengths and limitations

An important strength of this study was the use of multiple data collection methods (direct observation and audit) to identify barriers and enablers to oral hydration in older medically ill hospital patients. In addition, the study reflects everyday clinical practice in a natural setting without research manipulation, and it is likely that the issues we identified also occur in many other hospitals. Hence, senior nursing staff may use our findings to assess the extent to which these or other issues occur in their hospital and perhaps consider implementing the strategies previously outlined to address them.

Primary limitations of the study include its small sample size and the relatively brief observation periods as well as the potential for the presence of research staff who performed patient observations to have influenced nurses' behaviors. The extent to which nurses' behavior may have been influenced by the presence of the data collectors cannot be known, although the potential impact was mitigated by ward nurses being unaware of the precise nature of the data being collected. Another limitation includes using the study investigators as data collectors (JM, MM), which is a potential threat to the validity of the data collected, due to the possibility of bias (known or unknown). Balanced against the risk, however, was the advantage of having very experienced gerontological nurses perform the data collection. Finally, while the use of a non-validated tool also limits the study's validity, the tool was evidence-based and as many of the data items required an objective "yes" or "no" answer, the risk of bias by relying on subjective interpretation was mitigated. Nevertheless, the reliability, validity and comprehensiveness of the tool used in this study is unknown, although the lack of such a tool identified in this study may provide the impetus for the development of an appropriate instrument for assessing hydration in older hospitalized patients.

In spite of these limitations, a number of practice and system-related barriers and potential enablers to the maintenance of adequate hydration in older hospital patients were identified, which if addressed, may prevent dehydration. Preventing dehydration may be as simple and cost-effective as providing fluids in receptacles that older people can easily open, documenting fluid preferences and fluid intake strategies in care plans and providing patients with preferred drinks. Strategies to improve hydration practices in acute hospitals should be explored using appropriate research methodologies and testing strategies in both cognitively impaired and cognitively intact populations. Importantly, sound research into the most effective ways of implementing and embedding such practices within everyday nursing practice is required. Finally, not all potential barriers and enablers may have been identified in this study and a larger scale study may iden-

tify additional barriers and enablers which may vary across different hospitals and wards.

#### 4. CONCLUSION

Dehydration appears to be common in older medically ill patients admitted to hospital, in patients both with, and without CI. Several practice and system-related issues including patients having difficulty accessing fluids due to product packaging, inadequate documentation and a lack of staff assistance were identified as barriers to patients accessing adequate hydration in hospital. Addressing these issues may improve the quality of care and safety of older people admitted to acute hospitals.

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