



# Best Practice

Evidence Based Practice Information Sheets for Health Professionals

## Maintaining Oral Hydration in Older People

### Information Source

This Best Practice Information Sheet has been based on a systematic review of research published by The Joanna Briggs Institute entitled "Maintaining Oral Hydration in Older People"<sup>1</sup>. The primary references on which this information sheet is based are available in the systematic review report which is available from the Joanna Briggs Institute (contact details on page 6).

### Definitions

#### Osmolality:

Concentration of a solute described in terms of osmoles per kg of water.

#### Osmole:

1 gram molecular wt of undissociated solute

e.g. 1gm molecular wt of NaCl

(58.5gms) = 2 osmoles

(23gNa<sup>+</sup> 35.5gCl<sup>-</sup>, 1 osmole of each = 2 osmoles)

#### Osmolarity:

Concentration of a solute in osmoles per litre of water.

*Note: in dilute solutions such as plasma, differences between osmolality and osmolarity are less than 1%*

### This information Sheet Covers the Following Concepts:

- Background
- Objectives
- Risk Factors
- Assessment
- Management
- Recommendations

### Background

Dehydration has been reported to be the most common fluid and electrolyte imbalance in older people. In a study of nursing home residents admitted to hospital for an acute illness, 34% were diagnosed with dehydration. In another study 23% of patients over 70 years of age who were admitted to hospital were determined to be dehydrated.

These numbers are a concern as hospitalised older people with dehydration have been reported to have mortality rates as high as 45% to 46%.

### Levels of Evidence<sup>2</sup>

All studies were categorised according to the strength of the evidence based on the following classification system.

**Level I** - Evidence obtained from a systematic review of all relevant randomised controlled trials.

**Level II** - Evidence obtained from at least one properly designed randomised controlled trial.

**Level III.1** - Evidence obtained from well designed controlled trials without randomisation.

**Level III.2** - Evidence obtained from well designed cohort or case control analytic studies preferably from more than one centre or research group.

**Level III.3** - Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments.

**Level IV** - Opinion of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

No universal definition for dehydration exists. One proposed definition is "the rapid weight loss of greater than 3% of body weight". Dehydration has also been defined as a water/electrolyte disturbance arising from either a water depletion or a sodium depletion where there is an accompanying loss of water. In biochemical terms, dehydration is most often defined as a condition in which serum sodium osmolarity is

**Table 1: Classifications of Dehydration**

	Description	Possible Causes
<b>Isotonic</b>	sodium loss = water loss	complete fast episodes of vomiting or diarrhoea
<b>Hypotonic</b>	sodium loss > water loss serum sodium < 135mmol/L	overuse of diuretics
<b>Hypertonic</b>	sodium loss < water loss serum sodium > 145mmol/L	fever decreased fluid intake (iatrogenic cases) fluid deprivation, possible neglect

equal to or greater than 148 mmol/L and/or the blood urea nitrogen:creatinine ratio is greater than or equal to 25.

Dehydration can be classified into three different categories, isotonic, hypotonic and hypertonic dehydration (refer Table 1). Of note, hypertonic dehydration in older people, in the absence of any physiological reason, has been described as an indication of fluid deprivation, even neglect.

Older people have been identified as particularly susceptible to dehydration because of age related changes. Renal perfusion and sensitivity to antidiuretic hormone (ADH) have been shown to decrease in some older people. Sense of thirst also appears to be reduced, even in the healthy older person. Decreased mobility, confusion or dementia and pathological conditions such as hypertension, heart and renal disease, make older people highly sensitive to fluid and electrolyte imbalances.

Although numerous papers have been published to address the issue of managing hydration in older people, a systematic review to summarise the information has not previously been undertaken. This systematic review was initiated to identify and summarise

the best available research evidence related to maintaining oral hydration in older people.

## Levels of Evidence

For the determination of risk factors, only cohort and case-control studies (level III.2) were included. For the determination of the efficacy of oral hydration protocols, only randomised control trials (level II) were considered. Studies evaluating assessment tools were also considered in this information sheet. All other information included was based upon the expert opinion of the review panel.

## Objectives

The objectives of this information sheet were to describe risk factors most commonly identified for dehydration and/or decreased fluid intake in older people and how best to identify and manage older people at risk of dehydration and/or inadequate fluid intake. It was assumed that inadequate fluid intake could be directly associated with a risk for dehydration and was therefore examined as an outcome. Only oral rehydration management protocols were considered because techniques such as subcutaneous,

intravenous and feeding tube fluid replacement are less common in community or nursing home settings.

## Risk Factors

The first step in addressing the problem of dehydration in older people is to identify what characteristics, or risk factors, are most likely to be associated with a higher risk of dehydration and/or inadequate fluid intake. Possible risk factors that were most frequently discussed were age, mobility/functional ability, gender, visual impairment, speaking ability, incontinence and number of times that fluids are offered.

### Age

The effect of age on risk of dehydration was found to be variable and dependent on the location of the patient. In a nursing home, dehydrated residents were significantly older than their adequately hydrated counterparts. In contrast, in an emergency department, there was no significant age difference between dehydrated and adequately hydrated older adult patients.

Age as a risk factor for decreased fluid intake also yielded variable results. One group of nursing home residents showed an inverse relationship of age with fluid intake, while another group of nursing home residents had similar fluid intakes for all age groups.

### Mobility/ Functional Ability

Bedridden nursing home residents have been identified as significantly more likely to be dehydrated than more mobile residents. However, it was also

reported that older adults who were dependent on assistance with eating were found to have similar fluid intake levels to independent residents and had significantly higher water intake when compared to older adults requiring only some assistance. Visual impairment also had a positive correlation with adequate fluid intake because staff anticipated the needs of older adults with this deficit. This was also found to be the case with older adults who had speech difficulties or evidence of drooling. This suggests that patients most at risk of dehydration may actually be semi-dependent older adults who appear to be capable of obtaining their own fluids but are not.

However, other research involving patients in a long term care unit, a psychogeriatric unit, and a geriatric admission unit, has suggested that there is an inverse relationship between dependency level and fluid intake, ie. the more dependent the older adult the lower the fluid intake.

### Gender

Gender as a risk factor of dehydration or decreased fluid intake is also an unresolved issue. Female nursing home residents have been suggested to be dehydrated more often than males, however, the evidence does not support this claim. Female nursing home residents were more likely to have a lower percentage of water intake than males. In contrast, older male residents (68-90 years) in both a long-term care unit and a geriatric admission unit received less fluid intake than older female adults while males in a psychogeriatric unit

appeared to receive more. However, these differences were not found to be significant.

### Incontinence

In an examination of incontinence in older adults in long term care or nursing homes, incontinence was not found to be a risk factor for dehydration. However, it was a risk factor for significantly lower fluid intake compared to continent older adults. It has been suggested that the reason for decreased fluid intake in incontinent patients is the conscious decision by the patient to limit fluid intake to reduce episodes of incontinence.

### Mental Status

Mental status as a risk factor for dehydration was measured on older adults admitted to a hospital emergency department. Mental scores were found to be inversely correlated to the level of dehydration encountered in these patients. It has been acknowledged that when patients with decreased cognitive status were excluded from trials many of the patients suffering from dehydration were eliminated.

Patients in long term care who were assessed by the Cognitive Assessment Scale (CAS) as confused, were found to have significantly lower intakes of

fluids over a 24-hour period than lucid patients.

In contrast, monitoring total fluid and food intake for three days in older nursing home residents found no correlation between cognitive ability and total fluid intake.

### Other Risk Factors

Single small observational studies have also hinted at other risk factors for dehydration and/or decreased fluid intake such as the number of diseases present, number of medications, number of ingestion periods and institutionalisation.

The presence of multiple diseases and/or medications put older nursing home residents at risk for dehydration. Being institutionalised was identified as a risk factor for reduced fluid intake as nursing home residents had significantly lower fluid intakes compared to matched older people living in the community.

The number of available times for fluid ingestion was positively correlated with actual fluid intake. In general it was determined that if fluids were made available to older adult residents or patients they would be more likely to drink higher volumes of fluids.

Finally, discussion papers have highlighted other possible risk factors

**Table 2: Calculations of RDI of Fluids**

<b>Standard 1</b>	RDI 30 mL/kg body weight
<b>Standard 2</b>	1 mL fluid/Kcal consumed
<b>Standard 3</b>	100 mL/kg for first 10 kg 50 mL/kg for next 10 kg 15 mL/kg for the remainder of weight.

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for dehydration such as difficulty eating and drinking, vomiting and diarrhoea, acute infection, multiple chronic diseases, depression and loss of interest in self-care.

### Summary of Risk Factors

Numerous studies have suggested factors for either a risk of dehydration specifically or for a risk of decreased fluid intake. However, many of the results are either contradictory between studies, identified from single small studies, or based on opinion.

## Assessment

Given the difficulties in identifying patients at risk of dehydration, the next step is to determine if patients are meeting their recommended daily intake (RDI) or are maintaining adequate hydration status.

### Measure of Fluid Intake

An in-house Intake/ Situation Modifier Sheet (used to determine the actual fluid intake of patients and any situations that would affect that intake) was used in evaluating the fluid intake of nursing home residents. The tool was determined to have an interrater reliability of 0.94. The validity, sensitivity or specificity of this tool was not reported and therefore it is difficult to recommend this tool for use. However, the tool did determine that only 8% of older adults met or exceeded their calculated RDI of fluids and indicated that half were ingesting less than 76% of their RDI of fluids.

### Recommended Daily Intake

What is clear from evaluated research is that there are several different RDI measures for fluid intake that are used for comparison against actual intake. Further, determination of adequate fluid intake is dependent upon the RDI measure used. For example, a study of nursing home residents who had their actual

daily intake compared with three standardised calculations of RDI (refer Table 2) found that actual intake was not significantly different than the RDI recommended by Standard 1, significantly higher than Standard 2, and significantly lower than Standard 3.

It was also observed that a number of patients received a significant proportion of their RDI with the dispensing of medications.

## Assessment of Dehydration

### *OBRA MDS Evaluation*

The Omnibus Budget Reconciliation Act (OBRA) Minimum Data Set (MDS) is used as a check sheet for health history and examines any recent changes in health status. Part of the form focuses on fluid intake and hydration and highlights any triggers for risk of dehydration. This form does not definitively identify older adults suffering dehydration but is used as a screening tool to highlight the possibility for further investigation. No mention of reliability or specificity, sensitivity, and positive or negative predictive value were made available and therefore this tool cannot be recommended for use by itself.

### *Axillary Moisture*

This method, to determine the skin moisture content, was compared to a biochemical assessment of dehydration (serum urea:creatinine ratio, plasma and urine osmolalities). The tool was found to have agreement between observers in 57% of cases. However, the tool could identify only half of the patients that were dehydrated and eliminated 82% of patients who were not.

### *Intra-ocular Pressure*

No correlation between intra-ocular pressure (IOP) and changes in serum osmolality or urea concentration have been found.

### Febrile Episodes

One or more febrile episodes (37.8°C if taken orally, and 38.3°C if taken rectally), may be an indicator of impending or existing dehydration.

### Physician and Nursing Evaluation

When a nurse led dehydration assessment tool was used on emergency department patients, it was found to identify longitudinal tongue furrows, sunken eyes, dry mucus membranes, upper body muscle weakness, speech difficulty and confusion as characteristics of dehydration.

A physician evaluation scale, based partially on biochemical results (e.g. serum sodium concentrations), was found to overestimate the number of older adults who were dehydrated.

### Biochemical Assessment

When determining the accuracy of bedside assessment tools (as above), they are compared with one or several biochemical measures of serum or urine electrolytes (or other solutes).

However, the biochemical benchmark measures used varied from study to study. When biochemical tests such as haematocrit, serum

osmolality, and serum urea nitrogen/creatinine ratio were compared with urine specific gravity only the serum urea nitrogen/creatinine ratio was determined to be an accurate indicator of early dehydration.

### Summary of Assessment

The method generally accepted for measuring fluid intake is simply to chart total fluids ingested over a 24-hour period. However, a problem arises in that the determination of whether an older adult is receiving adequate fluids can be dependent upon the RDI calculation or value that is chosen.

A disturbing observation is that fluid which institutionalised residents receive with medication represents a significant proportion of their daily intake.

Bedside tools that identify the presence or risk of dehydration were found to be either inaccurate or poorly evaluated. Biochemical measurements are still regarded as the benchmark for assessment of dehydration.

**Table 3: Composition of Oral Hydration Fluid\***

\*per 8 fl oz (237mL)

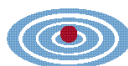
Calories	70
Protein	0g
Carbohydrate	17g
Fat	0g
Calcium	10mg
Magnesium	6mg
Sodium	50mg
Potassium	45mg
Chloride	80mg

### Management of Hydration

When the food and fluid intake of totally dependent nursing home residents was evaluated against the body position of the feeder (standing or sitting) it was concluded that feeder position had no effect.

A study where an oral hydration solution (refer Table 3) was provided to supplement fluid intake (to attain the patients pre-determined RDI), showed significant improvement in patient hydration as measured by biochemical analysis of patient blood samples.

In non-ambulatory nursing home residents, presenting fluids directly into the hands of residents every 1.5 hours throughout the waking day was found to significantly improve hydration (as measured by urine specific gravity) when compared to residents receiving the normal care of the institution.



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## Recommendations

- 1) There is no clear determination of the risk factors for dehydration and decreased fluid intake, therefore more studies are required.
- 2) Although fully dependent elderly are at a higher risk of dehydration, the semi-dependent resident should also be monitored for adequate fluid intake. (Level III.2)
- 3) No standard recommended daily intake (RDI) of fluids is available, but should be not less than 1600 mL/24 hours in order to ensure adequate hydration for the average older person. (Level IV)
- 4) A fluid intake sheet is the best method of monitoring daily fluid intake. (Level IV)
- 5) Urine specific gravity may be the simplest, most accurate method to determine patient hydration status. (Level III.2)
- 6) Evidence of a dry furrowed tongue and mucous membranes, sunken eyes, confusion and upper body muscle weakness may indicate dehydration. (Level III.3)
- 7) More research is required to determine the optimum, non-invasive method of maintaining adequate hydration in older people.

However, regular presentation of fluids to bedridden older people can maintain adequate hydration status. (Level II)

- 8) Due to the observation that medication time can be an important source of fluids, fluids should be encouraged at this time. (Level IV)

<sup>1</sup> Hodgkinson, B., Evans, D. & Wood, J. *Maintaining Oral Hydration in Older People*, The Joanna Briggs Institute for Evidence Based Nursing and Midwifery; 2001 Systematic Review No. 12.

<sup>2</sup> Based on NHMRC levels of evidence. National Health and Medical Research Council, A guide to the development, implementation and evaluation of clinical practice guidelines 1999 p56 Appendix B.

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