

Signs of Water-Loss Dehydration in Older Adults: a Diagnostic Accuracy Systematic Review



Lee Hooper ¹, Phyllis M Gaspar ², Janet C Menten ³, Marcel GM Olde Rikkert ⁴, James Powers ⁵, David R Thomas ⁶ on behalf of all authors

(1) Norwich Medical School, University of East Anglia, Norwich, UK l.hooper@uea.ac.uk (2) Colleges of Medicine and Nursing, University of Toledo, Toledo, OH, USA (3) University of California Los Angeles, Los Angeles, CA, USA (4) Department of Geriatrics, Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands (5) Medicine, Vanderbilt University School of Medicine, Nashville, TN, USA (6) Department of Medicine, Saint Louis University, St Louis, MO, USA.

Objective

We aimed to assess the diagnostic accuracy of possible clinical and physical signs, symptoms and indications of water-loss dehydration in elders against serum osmolality or weight change (reference standards).

Introduction

Water-loss dehydration is common in elders and associated with increased risk of disability, mortality, respiratory infections, urinary tract infections, unplanned hospital admissions, constipation, pressure sores, falls and impaired cognition. We need to accurately diagnose water-loss dehydration to help protect older people.

Methods

Structured searches were run in seven databases. Assessment of inclusion, data extraction and assessment of validity were duplicated. Where data sets included index tests and a reference standard, but were not analysed for diagnostic accuracy, reviewers analysed the data.

Diagnostic accuracy of each indicator was assessed against the best reference standard, and data presented in sensitivity and specificity forest plots. Pre-set minimum sensitivity was 60%, specificity 75%. Secondary analyses created receiver operating characteristic (ROC) curves for continuous tests.

Publication: Hooper L et al, Cochrane Library (protocol) 2011: CD009647-DOI:1002/14651858.

Study	Alison 2005	Boonen 2005	Chassagnre 2006	Clapp 2003	Edoni 1984	Fisher 1999	Gaspar and LTC 2011	Jehon 2003	Kahl 2006	Li 2009	Mark 1984	McGee 2010	Murphy 2006	Patten 2011	Powers 2012	Royal 2011	Shimizu 2012	Silverman ED 2013	Silverman and Healy 2013	Source Error 2001	Stokely 2005	Stokely 2009	Wahlin 2012	
Representative spectrum?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Acceptable reference standard?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Acceptable delay between tests?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Partial verification avoided?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Differential verification avoided?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Incorporation avoided?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Reference standard results blinded?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Index test results blinded?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Relevant clinical information?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unintentional results reported?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Withdrawals explained?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Free of commercial funding?	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Table 1: Risk of bias summary. Green indicates low risk of bias, orange unclear risk of bias, red high risk of bias (as assessed by reviewers).

Potentially useful signs, which need further assessment	From primary analyses	Expressing fatigue (useful in 1 of 1 studies)
	From secondary analyses	Missing drinks between meals (useful in 1 of 1 studies)
Signs with good evidence of lack of diagnostic utility		BIA Resistance, 50kHz (useful in 2 of 4 studies)
		Axillary moisture (useful in 1 of 1 studies)
		Drinks intake (useful in 2 of 4 studies)
		Urine osmolality (useful in 1 of 6 studies)
		Dry mouth (not useful in 8 studies)
		Feeling thirsty (not useful in 6 studies)
	Heart rate (not useful in 4 studies)	
	Urine color (not useful in 4 studies)	
	Urine volume (not useful in 6 studies)	

Table 2: signs of dehydration in older people – results of a systematic review. “Useful” was pre-set in the review protocol to mean sensitivity of at least 60% and specificity of at least 75%.

Results

We included 24 studies (67 tests). No index tests were reproducibly usefully diagnostic of water-loss dehydration in older people, but promising tests included expressing fatigue, missing drinks between meals, BIA resistance at 50kHz, axillary moisture, drinks intake and urine osmolality.

There was sufficient evidence to suggest that some tests should not be used to indicate dehydration: dry mouth, feeling thirsty, heart rate, urine color and urine volume.

Conclusions

There is limited evidence of the diagnostic utility of any individual sign to indicate water-loss dehydration in elders. Individual signs should not be used in this population to indicate dehydration.

This recently completed systematic review is important to clinical practice since care providers currently use a variety of signs and symptoms to identify dehydration – but by doing so may be wrongly labelling people as well hydrated or dehydrated.

Acknowledgements: This poster summarises independent research funded in part by the National Institute of Health Research Fellowship programme (NIHR-CDF-2011-04-025). The views expressed are those of the authors and not necessarily those of the NIHR.



National Institute for Health Research