Maintaining oral hydration in older people: a systematic review
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Authors' objectives
To present the best available evidence in relation to: how best to assess older people for risk of inadequate oral fluid intake, presence and/or risk of dehydration; and how best to maintain adequate oral fluid intake or hydration, or reverse dehydration, in older people.

Searching
Both published and unpublished studies were eligible for inclusion. The databases searched included MEDLINE, CINAHL, PsycLIT, Current Contents, the Cochrane Library, Expanded Academic ASAP, EMBASE, HealthSTAR, ERIC and Dissertation Abstracts International. The search terms included 'fluid', 'hydration', and 'dehydration'; the search dates were not reported. The reference lists of all relevant articles were screened for additional studies.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion. One uncontrolled study was also included. Studies that evaluated assessment tools were also considered for inclusion in the review.

Specific interventions included in the review
Studies of oral fluid replacement interventions were eligible for inclusion. Studies that evaluated assessment tools for assisting the determination of fluid intake and fluid status in older people were also eligible for inclusion.

Reference standard test against which the new test was compared
No inclusion criteria relating to the reference standard were specified. Some included studies compared biochemical indices of dehydration with physical assessment or urine specific gravity.

Participants included in the review
Studies that included adults aged over 60 years in an acute care, residential care or community setting were eligible for inclusion.

Outcomes assessed in the review
The primary outcomes of interest were the measurement of oral fluid intake, and those related to the identification of dehydration, the maintenance of oral hydration or the reversal of dehydration. For studies evaluating assessment tools, sensitivity, specificity and positive and negative predictive values were compared in the review.

How were decisions on the relevance of primary studies made?
Studies were assessed for relevance to the review based on the information provided in the title, abstract and MeSH terms. A full report was retrieved for all studies that met the inclusion criteria. Studies identified from reference lists were assessed for relevance based on the study title and a subsequent search for the abstract using the relevant database. The authors do not report how many of the reviewers were involved in this process.

Assessment of study quality
The methodological quality of RCTs was assessed using a checklist developed for the review. The following items were assessed: randomisation; whether the groups were treated the same other than the named intervention; outcome assessment; baseline comparability of the groups; blinding of randomisation; blinding of outcome assessment; adequate follow-up of the participants (at least 80%). Studies that failed the last three criteria were only included in the review if no other higher quality studies were identified. The authors did not state how the papers were assessed for quality, or how many reviewers performed the quality assessment.
Data extraction
The data were extracted using a data extraction tool developed specifically for the review. Data were extracted on: study focus; method; setting; participants; the number of participants in each intervention group; intervention details; outcome description and scale or measure used; description of the assessment tool evaluated; results; and the authors' conclusions. For RCTs, data were extracted on the number of patients responding for dichotomous data, and the mean and standard deviation for continuous data. The odds ratios and standardised mean differences and their 95% confidence intervals were calculated for each included study. For the risk assessment tools, data were extracted on the reliability, sensitivity, specificity, and positive and negative predictive values. The authors do not report how many of the reviewers were involved in this process.

Methods of synthesis
How were the studies combined?
If appropriate, and the data were available, the odds ratios (for dichotomous data) and standardised mean differences (for continuous data) from comparable groups were pooled. Where statistical pooling was inappropriate or was not possible, the findings were summarised in narrative form. For studies evaluating assessment tools, no statistical summary was attempted; data on the performance of the tools were listed for comparison with other similar tools.

How were differences between studies investigated?
Heterogeneity between the combined studies was tested using a standard chi-squared test.

Results of the review
There were 9 studies of assessment; the design of the studies was unclear. There were 3 studies of management: 2 RCTs and one uncontrolled study.

Assessment of fluid intake (3 studies).

The reviewers looked at these studies from the point of view of how much fluid was taken in, rather than at how effective different measures of fluid intake were. The results are therefore not presented here.

Assessment of dehydration (6 studies).

Omnibus Budget Reconciliation Act Minimum Data Set (1 study): no mention of the reliability or test performance of this tool was provided.

Axillary moisture (1 study, n=86): the axilla was graded as either dry or moist and was compared to a biochemical assessment of dehydration, which was considered the 'gold' standard. The reliability was 0.5, sensitivity 50%, and specificity 82%.

Intra-ocular pressure (1 study, n=13): the correlation of intra-ocular pressure with measures of dehydration was measured. There was no correlation between intra-ocular pressure and changes in serum osmolality or urea concentration.

Febrile episodes (1 study, n=130): the correlation between febrile episodes and biochemical measures was investigated. There was a significant association between febrile episodes and dehydration. However, sensitivity and specificity were not calculated, although the data to calculate these was available.

Physician and nursing evaluation (1 study, n=54): a physician's rating of dehydration was compared with biochemical evidence of dehydration. The physician assessment did not miss any dehydrated patients but did overestimate the number of patients with dehydration. Clinical indicators of dehydration, as assessed in the bedside hydration examination (e.g. longitudinal tongue furrows, sunken eyes, dry mucous membranes, upper body muscle weakness, speech difficulty and confusion), had the strongest correlations with dehydration severity, as determined by biochemical markers.

Biochemical tests (1 study, n=230): urine specific gravity was used as the 'gold' standard. The study found that the
serum urea nitrogen-to-creatinine ratio correlated with urine specific gravity as an accurate indicator of early hypo-hydration. Haematocrit and serum osmolality showed no correlation.

Management (3 studies).

Body position of the feeder (1 RCT, n=39): the position of the feeder had no effect on the food and fluid intake levels of residents. Improving hydration (1 RCT and 1 uncontrolled study, n=29): one RCT found that offering fluids 1.5 hourly, throughout the waking day, to bedridden residents maintained hydration at a significantly higher level than did 3-hourly bed checks with no prompt to residents for fluids. One uncontrolled study found that the use of oral hydration solution significantly improved the hydration of older adults.

Authors’ conclusions
The authors do not report any specific conclusion other than to report implications for research and practice.

CRD commentary
This was a reasonable review of the area. The authors clearly stated their objective and presented all the relevant inclusion criteria. However, the authors state that only RCTs would be included for the assessment of effectiveness, but one of the studies included in the review was uncontrolled. A thorough literature search was conducted that attempted to locate both published and unpublished studies. Some details of the review methodology were presented, although the authors did not report how many of the reviewers were involved in each stage of the review process. A method for assessing the quality of RCTs was reported, but this was not discussed in the 'Results' section or related to the study's results. The quality of the diagnostic studies was not assessed. Only a small number of studies were included in the review and these studies were all relatively small. Thus, the results of the review and the implications for practice should be interpreted with some degree of caution.

Implications of the review for practice and research
Practice: The authors state 'urine specific gravity may be the simplest, most accurate biochemical method to determine patient hydration status. As a biochemical measure the blood urea nitrogen (BUN): creatinine ratio may be most positively correlated with dehydration. Evidence of a dry furrowed tongue and mucous membranes, sunken eyes, confusion and upper body muscle weakness may indicate dehydration'. Research: The authors stated 'there is a need for future studies into the management of oral hydration in older people'.

Bibliographic details

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.