Review: capillary refill time, abnormal skin turgor, and abnormal respiratory pattern help to detect dehydration in children


Clinical impact ratings GP/FP/Primary care ★★★★★★☆ GP/FP/Emergency Medicine ★★★★★☆☆ Emergency Medicine (Specialist) ★★★★★☆☆ Paediatrics ★★★★★☆☆

Q In children, what is the accuracy of signs, symptoms, and laboratory tests for detecting dehydration?

METHODS

Data sources: Medline (January 1966 to April 2003), the Cochrane Library, reference lists, and experts in the field.

Study selection and assessment: studies in any language that compared signs, symptoms, and laboratory values with a recognised gold standard for diagnosing dehydration in children (age 0–18 y). Study quality was ranked from highest quality (level 1 = independent; blind comparisons of test with a valid gold standard) to lowest quality (level 5 = non-independent comparison of test with an uncertain standard of validity, which may incorporate the test result into the gold standard).

Outcomes: sensitivity, specificity, and positive and negative likelihood ratios (LRs).

MAIN RESULTS

13 studies (n = 1264) met the selection criteria (4 intermediate quality and 9 low quality). Clinically useful signs for detecting 5% dehydration were capillary refill time, abnormal skin turgor, and abnormal respiratory pattern (table). Dry mucous membranes, sunken eyes, and poor overall appearance are moderately useful in detecting 5% dehydration (table). 3 studies evaluated combinations of signs. In 1 study (n = 100), the combination of abnormal skin turgor, sunken eyes, dry mucous membranes, and a sunken fontanelle increased the likelihood of 10% dehydration (LR 3.7, 95% CI 1.6 to 8.1). Another study (n = 97) showed that classification of “severe” on an assessment scale detected > 5% dehydration in children who required intravenous fluids (LR 3.4, CI 1.5 to 7.7). In the third study (n = 225), the combination of ≥3 of 10 signs were useful for detecting 5% dehydration (sensitivity 87%, specificity 82%). In a pooled analysis of 3 studies (n = 398), history taking (eg, parental report of low urine output) was not accurate for detecting the likelihood of 5% dehydration (LR 1.3, CI 0.9 to 1.9). 6 studies evaluated laboratory tests; 5 studies (n = 465) assessed blood urea nitrogen (BUN) or serum creatinine ratio. BUN cut points of 2.85, 6.42, and 9.63 mmol/l were moderately useful (LR range 1.4 to 2.9). Acidosis was not a useful test for detecting dehydration in 2 studies (n = 221, +LR <2.0). Another study (n = 168) found that an absolute serum bicarbonate [SB] concentration <15 mmol/l was not helpful for diagnosing 5% dehydration (LR for low SB 1.5, CI 1.2 to 1.9).

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Table: Test characteristics of examination signs to detect 5% dehydration in children (age range 2 weeks to 15 years)*

<table>
<thead>
<tr>
<th>Tests</th>
<th>Number of studies (n)</th>
<th>Sensitivity (95% CI)</th>
<th>Specificity (CI)</th>
<th>-LR</th>
<th>-LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged capillary refill</td>
<td>4 (478)</td>
<td>60% (29 to 91)</td>
<td>85% (72 to 98)</td>
<td>4.0</td>
<td>0.47</td>
</tr>
<tr>
<td>Abnormal skin turgor</td>
<td>5 (602)</td>
<td>58% (40 to 75)</td>
<td>76% (59 to 93)</td>
<td>2.42</td>
<td>0.55</td>
</tr>
<tr>
<td>Abnormal respiratory pattern</td>
<td>4 (581)</td>
<td>43% (31 to 55)</td>
<td>79% (72 to 86)</td>
<td>2.05</td>
<td>0.72</td>
</tr>
<tr>
<td>Dry mucous membranes</td>
<td>4 (533)</td>
<td>86% (80 to 92)</td>
<td>44% (13 to 74)</td>
<td>1.54</td>
<td>0.32</td>
</tr>
<tr>
<td>Sunken eyes</td>
<td>4 (533)</td>
<td>75% (62 to 88)</td>
<td>52% (22 to 81)</td>
<td>1.56</td>
<td>0.48</td>
</tr>
<tr>
<td>Poor overall appearance</td>
<td>3 (398)</td>
<td>80% (57 to 104)</td>
<td>45% (10 to 102)</td>
<td>1.45</td>
<td>0.44</td>
</tr>
</tbody>
</table>

*Diagnostic terms defined in glossary. LRs were calculated from data in article.
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