Assessment

A clear urine specimen on visual inspection cannot totally exclude a diagnosis of urinary tract infection


QUESTION: Can visual inspection of urine specimen clarity be used to exclude a diagnosis of urinary tract infection (UTI)?

Design
Blinded comparison of visual inspection of urine specimen clarity with standard urinalysis (diagnostic standard).

Setting
The emergency department (ED) of a children’s hospital in Cincinnati, Ohio, USA.

Participants
Convenience sample of 159 previously healthy patients <21 years of age (mean age 5.8 y, 77% girls) who had either a catheterised (44%) or midstream (56%) urine specimen collected for urine culture. Exclusion criteria were referral for evaluation of an abnormal urinalysis or positive urine culture, current antibiotic use, an underlying medical problem requiring repeat catheterisation (eg, neurogenic bladder), inability to obtain 3 ml of urine in excess of that required for the laboratory, or underlying renal or genitourinary abnormality.

Description of test and diagnostic standard
One investigator, blinded to patient clinical information, visually inspected the samples by holding a standard blood tube with 3 ml of urine 1 cm from a standard white background with black printed 11 font text under normal fluorescent lighting. Another tube with water was viewed under the same conditions. If the printed text was as legible through the urine as through the water, the sample was considered to be clear. If the urine was not clear, acetic acid solution was added to dissolve any phosphates, and the visual inspection was repeated. A second observer blinded to clinical information and the findings of the first observer, did the same visual inspection. If the 2 observers disagreed, the specimen was considered cloudy. The diagnostic standard of laboratory urinalysis included dipstick testing for presence of nitrates and leukocyte esterase, bacteria on microscopy, and white cell count (per high powered field).

Main outcome measures
Sensitivity, specificity, and positive and negative likelihood ratios (LRs).

Main results
18% of urine samples had positive cultures (76% of these samples were positive for Escherichia coli). Girls accounted for 83% of positive cultures. The kappa for agreement between observers was 0.88. The table summarises the test characteristics for visual inspection.

<table>
<thead>
<tr>
<th>Method of specimen collection</th>
<th>Sensitivity (95% CI)</th>
<th>Specificity (CI)</th>
<th>+LR</th>
<th>-LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>All specimens</td>
<td>90% (73 to 98)</td>
<td>82% (76 to 89)</td>
<td>5.07</td>
<td>0.13</td>
</tr>
<tr>
<td>Catheterised specimens</td>
<td>83% (52 to 98)</td>
<td>86% (75 to 94)</td>
<td>6.04</td>
<td>0.19</td>
</tr>
<tr>
<td>Midstream specimens</td>
<td>94% (71 to 100)</td>
<td>79% (68 to 88)</td>
<td>4.52</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Conclusion
A clear urine specimen on visual inspection cannot totally exclude a diagnosis of urinary tract infection.

Test characteristics of visual inspection of urine specimen clarity (clear) for exclusion of a diagnosis of urinary tract infection*

COMMENTARY
Bulloch et al have posed an intriguing question about the usefulness of a urine clarity test to exclude a diagnosis of UTI. For children, UTIs rank second only to upper respiratory infections as a source of morbidity from bacterial infection. The study aimed to find a way to exclude UTI by checking urine clarity and showed the potential for this simple test. Based on a negative LR of 0.13 and a pretest probability of UTI of 1 out of 20, a clear urine sample may lower the likelihood of a UTI to a post-test probability of less than 1 in 100.

Overall, the usefulness of urine clarity to exclude a diagnosis of UTI should be studied further. Clinical decision rules, such as Gorelick and Shaw's model to identify young girls at risk for UTI, could explore the addition of urine clarity to the model. It is also important to ascertain under which conditions (eg, presenting to the ED with fever or to a primary care setting with symptoms) and for which children (eg, age and race) urine clarity can best be used to reliably exclude a diagnosis of UTI.

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