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Title **Clinical Effectiveness and Cost-Effectiveness of Tests for the Diagnosis and Investigation of Urinary Tract Infection in Children: A Systematic Review and Economic Model**

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Aim

To determine diagnostic accuracy of tests for detecting urinary tract infection (UTI) in children under 5 years of age; to evaluate the effectiveness of tests used to further investigate children with confirmed UTI, the effectiveness of following up children with UTI, the cost effectiveness of diagnostic and imaging tests for diagnosis and followup UTI in children under 5; and to develop a preliminary diagnostic algorithm for healthcare professionals who manage these patients.

Conclusions and results

Diagnosis of UTI: *Clinical tests;* these studies examined a variety of clinical characteristics, and overall conclusions could not be drawn. *Urine sampling;* there was good agreement between culture of clean voided urine (CVU) and suprapubic aspiration (SPA) urine samples. Limited data suggested bag/pad/nappy samples may be suitable alternatives to SPA. *Dipstick;* there was insufficient info to assess accuracy of dipstick tests for protein or blood. Positive test for nitrite and LE was most accurate for ruling in disease, and negative test for both nitrite and LE was most accurate for ruling out disease. A glucose test, assessed in 3 studies, was more accurate than other dipstick tests, but its usefulness was limited. *Microscopy;* Microscopy positive for pyuria and bacteriuria was best for ruling in disease, and microscopy negative for both pyuria and bacteriuria was best for ruling out disease. *Culture;* dipslide culture was less accurate than combinations of dipstick or microscopy tests.

Further Investigation of UTI: *Localization of UTI;* studies of clinical and lab tests showed poor accuracy. Scintigraphic techniques were the only investigations able to accurately localize UTI. *Detection of reflux;* contrast-enhanced ultrasound was accurate both for ruling in and for ruling out reflux. *Prediction of scarring;* there was insufficient info to assess accuracy of tests to predict scarring. *Detection of scarring;* static renal scintigraphy and dynamic renal imaging were accurate. Ultrasound was reasonable for ruling in, but not for ruling out scarring. *Multiple aims;* accuracies of these studies were generally poor.

Effectiveness of Followup (1 abstract): Routine imaging after initial UTI lead to higher rates of imaging, identification of reflux, and prophylaxis than selected imaging after repeat infection, it did not lead to reduction in recurrent UTIs or renal scarring.

Economic Evaluation: Only 1 study, with several potential limitations for NHS decision making, met inclusion criteria. A decision analytic model was developed from an NHS perspective. This found that optimal diagnostic strategy for children with symptoms of UTI depends on several factors, eg, sex and age, and health service's maximum willingness to pay for additional QALYs.

Recommendations

Results of systematic review were used to derive an algorithm for diagnosing UTI in children under 5 years of age. This represents conclusions of review in terms of practice. Data were insufficient to propose an algorithm for further investigation of UTI in children under age 5.

Methods

See Executive Summary link above.

Further research/reviews required

Future studies should follow the STARD guidelines for reporting of diagnostic accuracy studies, and should consider relevant subgroups, eg, neonates. The following areas require further research for diagnosis of UTI: urine sampling methods in younger children; accuracy of combination dipstick tests for diagnosing UTI; handling of indeterminate nitrite and LE dipstick test results; usefulness of including microscopy in diagnostic work up of UTI; usefulness of universal confirmatory culture; and usefulness of culture to determine antibiotic sensitivities in children with confirmed UTI. (See Executive Summary link above for areas where further research may provide additional useful information.)

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