Does this woman have an acute uncomplicated urinary tract infection?

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Authors' objectives
To review the accuracy and precision of history taking and physical examination for the diagnosis of urinary tract infection (UTI) in women.

Searching
MEDLINE was searched from 1966 to September 2001 using search terms such as 'urinary tract infection', 'diagnostic tests', 'physical examination', 'sensitivity' and 'specificity'. The complete search strategy is available from the authors on request. The references list of the identified articles were also examined. Further material was obtained by searching articles used to develop a recent guideline for treating acute uncomplicated UTI in women, and three commonly used clinical skills textbooks, and by contacting experts in the field.

Study selection

Study designs of evaluations included in the review
All study designs that contained original accuracy or precision data were eligible.

Specific interventions included in the review
Studies of the accuracy or precision of history taking, physical examination or dipstick testing for the diagnosis of acute uncomplicated UTI were included.

Reference standard test against which the new test was compared
The inclusion and exclusion criteria relating to the reference standard test were unspecified. In 8 of the included studies UTI was defined by the presence of at least 10,000 or 100,000 colony-forming units (CFU)/mL of a single uropathogen, while one study used a cut-off of at least 100 CFU/mL. The clinical symptoms and signs on physical examination that were used in the included studies were: dysuria, frequency, haematuria, fever, flank pain, lower abdominal pain, vaginal discharge, vaginal irritation, back pain, self-diagnosis, vaginal discharge on physical examination, costovertebral angle tenderness on physical examination, and dipstick urinalysis.

Participants included in the review
Healthy women suspected of having acute uncomplicated UTI were included. Studies were excluded if they evaluated infants, children or adolescents, pregnant women, nursing home patients, or patients with complicated UTI. The mean age was only reported in 4 studies (26, 24, 29 and 23 years).

Outcomes assessed in the review
The studies were only included if they contained sufficient data to allow the calculation of likelihood ratios (LRs) for signs or symptoms of acute UTI.

How were decisions on the relevance of primary studies made?
One of the authors screened the titles and abstracts.

Assessment of study quality
The studies were graded into 1 of 5 levels. Level I studies had an independent blind comparison of signs or symptoms with a 'gold' standard, and had 50 or more consecutive patients suspected of having a UTI. Level II studies were similar to those in Level 1 but had fewer than 50 patients. Level III studies were retrospective chart reviews. Level IV studies used 'grab' samples of patients (i.e. nonconsecutive patients who obviously have the target condition and possibly asymptomatic healthy individuals) or compared the signs or symptoms with diagnostic standards of uncertain validity among consecutive patients; Level V studies had both these features. The articles were independently assessed by two authors and any disagreements were resolved by a third author.
Data extraction
The data were independently extracted by two authors. The extracted data included: citation details; methodological quality; study inclusion criteria; the number of participants; mean age; incidence of UTI; setting and country; and the LRs for components of the clinical examination for UTI.

Methods of synthesis
How were the studies combined?
Summary measures and confidence intervals (CIs) for the LRs and estimates of disease prevalence were generated using random-effects models (see Other Publications of Related Interest nos.1-2).

How were differences between studies investigated?
When a summary LR included studies of lower quality, a sensitivity analysis was conducted to examine the impact of excluding lower quality studies on the summary LR and the effectiveness score.

Results of the review
Nine primary studies (n=2,331) and one systematic review were included. Of the primary studies, there were 5 level I studies (n=694), one level III study (n=452), 2 level IV studies (n=1,013), and one level V (n=172) study.

The symptoms of dysuria (positive LR 1.5, 95% CI: 1.2, 2.0), frequency (positive LR 1.8, 95% CI: 1.1, 3.0), haematuria (positive LR 2.0, 95% CI: 1.3, 2.9) and back pain (positive LR 1.6, 95% CI: 1.2, 2.1), and the sign costovertebral angle tenderness (positive LR 1.7, 95% CI: 1.1, 2.5), significantly increased the probability of UTI. The symptoms of absence of dysuria (negative LR 0.5, 95% CI: 0.3, 0.7), absence of back pain (negative LR 0.8, 95% CI: 0.7, 0.9), a history of vaginal discharge (positive LR 0.3, 95% CI: 0.1, 0.9) and a history of vaginal irritation (positive LR 0.2, 95% CI: 0.1, 0.9), and the sign vaginal discharge on examination (positive LR 0.7, 95% CI: 0.5, 0.9), significantly decreased the probability of UTI. The symptoms of flank pain, abdominal pain and fever had positive and negative summary LRs with 95% CIs overlapping 1.0, and are therefore not useful as diagnostic tests.

Only one study provided data to calculate the LRs for combinations of the symptoms.

The LR for presence of dysuria and frequency without vaginal discharge or irritation was 24.6.

The LR for presence of vaginal discharge or irritation without dysuria was 0.3.

The LR for presence of dysuria or frequency and presence of vaginal discharge or irritation was 0.7.

Sensitivity analysis.
A sensitivity analysis was carried out on the largest study, which was of Level IV quality. The inclusion of this study always made the symptoms (dysuria, frequency, vaginal irritation and vaginal discharge) appear to be more powerful diagnostic tests. However, there was no case where the inclusion of this study improved a test with marginal discriminatory power into the highly effective range (effectiveness score greater than or equal to 3.0). The CIs for the LRs excluded 1.0 whether or not the study was included in all but one case. The positive LR for increased urinary frequency was 1.8 (95% CI: 1.1, 3.0) when all the studies were included and 1.4 (95% CI: 1.0, 1.9) when the largest study was excluded.

Authors’ conclusions
The probability of infection in women who present with at least one symptom of UTI is approximately 50%. Specific combinations of symptoms (e.g. dysuria and frequency without vaginal discharge or irritation) raise the probability of UTI to more than 90%, effectively ruling in the diagnosis on history alone. In contrast, history taking, physical examination and dipstick urinalysis are unable to reliably lower the post-test probability of disease to a level where a UTI can be ruled out when a patient presents with one or more symptoms.
The authors set out a clearly defined review question with associated exclusion and inclusion criteria. They made some attempt to identify unpublished studies through contact with experts. However, only one database was searched and this was restricted to English language publications. It is therefore probable that some studies may have been missed. Publication bias was not assessed.

There were limited details of the included studies, which makes it difficult to assess the potential impact of heterogeneity. Of particular concern is the lack of inclusion criteria for the reference standard and the lack of detail relating to the reference standards used; since very different cut-off thresholds were cited, it is difficult to assess their comparability without greater detail (e.g. urea sampling method and method of assessing culture or microscopy). One reviewer assessed the relevance of the studies, whereas two reviewers independently carried out the validity assessment and data extraction processes. The quality assessment would have benefited from addressing a wider range of quality criteria. Heterogeneity was not assessed systematically, although there was a limited sensitivity analysis. This looked at the impact of including and excluding only one of the poorer quality studies. Other sources of heterogeneity were not investigated.

This is a reasonable review with some limitations. In particular caution should be exercised when interpreting the LRs for combinations of symptoms, as these results were based on one poorer quality study.

**Implications of the review for practice and research**

**Practice:** The authors present a diagnostic algorithm for evaluating patients with symptoms of UTI. The authors state that for women presenting with risk factors for a complicated UTI or with back pain, fever, or malaise, a urine culture to establish diagnosis with initial empirical treatment is recommended. If a history of vaginal discharge is reported, a pelvic examination to rule out a vaginal infection should be considered in addition to a dipstick urinalysis and urine culture. Where women present with dysuria, frequency and haematuria, but without a history of vaginal discharge or irritation, the authors suggest that there is a very high probability of UTI and clinicians should consider empirical treatment without urine culture or dipstick analysis.

**Research:** The authors state that the included studies did not present sufficient data to calculate LRs or used a case-control design for other possible risk factors such as maternal history of UTI, a history of childhood onset of UTI and the presence of bacterial vaginosis. Therefore, further research is required to determine the diagnostic power of these risk factors. Further research is also required to determine the clinical outcomes, costs and patient satisfaction associated with different testing and treatment strategies.

**Bibliographic details**

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