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Dipstick Urinalysis for the Diagnosis of Acute UTI

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Clinical Question

How accurate is dipstick urinalysis for the diagnosis of acute urinary tract infection (UTI)?

Evidence-Based Answer

Approximately two-thirds of women who present with classic symptoms of acute UTI have bacterial infection of the bladder.[1] Dipstick urinalysis moderately improves the accuracy of clinical symptoms in establishing or excluding acute UTI in women. (Strength of Recommendation [SOR]: A, based on systematic reviews of cross-sectional studies and a validated clinical decision rule.) A positive nitrite test is more useful than a positive leukocyte esterase (LE) test, although both increase the odds of a UTI diagnosis. If nitrite and LE tests are negative, the odds of a UTI decrease by 40 to 60 percent. (SOR: A, based on systematic reviews of cross-sectional studies including men and women.)

Evidence Summary

A meta-analysis evaluating the diagnostic value of individual signs and symptoms in diagnosing UTIs in females older than 14 years showed that findings of nitrite and LE on dipstick urinalysis improved diagnostic accuracy compared with symptoms alone.[2] Investigators evaluated 11 cross-sectional studies (n = 2,831) performed in primary care settings from 1971 to 2003. The prevalence of UTI was 28 to 83 percent, based on a reference standard of 10^5 colony-forming units (CFU) per mL on urine culture. Three symptoms (dysuria, urgency, and nocturia) had a positive likelihood ratio (LR) significantly greater than 1.0 (1.1, 1.2, and 1.3, respectively). Dipstick urinalysis was more accurate than any individual symptom (*Table 1*).[1-3]

A systematic review and meta-analysis assessing whether a negative result on dipstick urinalysis was sufficiently accurate to exclude a UTI found that it reduced the odds of UTI by about 50 to 80 percent, but there was considerable variation among the included studies.[3] The review pooled 23 observational studies performed in inpatient, emergency, and primary care settings (n = 12,544) from 1984 to 2001; the studies included males and females of all ages, pregnant women, and patients with spinal cord injuries or catheters (proportions of each patient category were not given). The researchers compared dipstick urinalysis with culture (reference standard = 10^5 CFU per mL) and calculated the positive and negative LRs for various combinations of nitrite and LE results.

A Health Technology Assessment investigation prospectively evaluated three components of dipstick urinalysis (nitrite, LE, and blood) to determine whether they independently predicted UTI.[1] Investigators studied 408 symptomatic, nonpregnant women 18 to 70 years of age in an outpatient setting, 254 (62 percent) of whom had UTIs (reference standard = 10^3 CFU per mL).[1] The researchers created the moderately predictive Dipstick Decision Rule based on positive nitrite results or positive LE and blood results. The rule missed 58 of 254 UTIs (23 percent); the overall diagnostic accuracy was 75 percent. Investigators validated the decision rule in a similar study (n = 429), which found a slightly lower diagnostic odds ratio, indicating slightly lower discriminative ability.[1] In both studies, the negative LR improved to approximately 0.2 when all three components (nitrite, LE, and blood) were negative, but the diagnostic accuracy was only 62 to 66 percent. Similarly, the

Table 1. Likelihood Ratios for Urinary Tract Infection Based on Dipstick Urinalysis Results

Study type (total subjects)	Dipstick urinalysis component	LR+ (95% CI)	LR– (95% CI)	Diagnostic odds ratio
Meta-analysis[2] (2,831 women)	Nitrite alone	6.5 (4.2 to 10)	0.58 (0.56 to 0.64)	11.2
	LE alone	1.4 (1.2 to 1.6)	0.44 (0.35 to 0.56)	3.2
Systematic review, meta-analysis[3] (12,544 men and women)	Nitrite alone	29.3 (14.4 to 59.7)	0.48 (0.37 to 0.62)	61
	LE alone	4.9 (3.3 to 7.3)	0.31 (0.18 to 0.51)	15.8
	Either nitrite or LE*	4.27 (2.8 to 6.5)	0.22 (0.14 to 0.35)	19.4
	Both nitrite and LE†	9.6 (5.4 to 17)	0.54 (0.26 to 1.1)	17.8
Dipstick Decision Rule,[1] initial study (408 women)	‡	2.58 (2.01 to 3.32)	0.33 (0.25 to 0.42)	7.8
Dipstick Decision Rule,[1] validating study (429 women)	‡	2.21 (NA)	0.38 (NA)	5.8

CI = confidence interval; LE = leukocyte esterase; LR– = negative likelihood ratio; LR+ = positive likelihood ratio; NA = not available.

*—LR+ indicates abnormal results for at least one component; LR– indicates normal results for both.

†—LR+ indicates abnormal results for both components; LR– indicates normal results for at least one.

‡—LR+ indicates either abnormal nitrite results, or abnormal LE and blood results; LR– indicates normal results for all.

Information from references 1 through 3.

positive LR improved to 7 when all three components were positive, but diagnostic accuracy was only 49 percent. The authors recommend empiric antibiotic treatment if nitrite results are positive, or if LE and blood results are positive. They also recommend delayed prescribing or follow-up for women with negative dipstick criteria whose symptoms have not resolved.

Recommendations from Others

An evidence-based guideline from the University of Michigan estimates that dipstick urinalysis for LE is 75 to 96 percent sensitive and 94 to 98 percent specific.[4] Nitrite testing is less useful because it is positive only if bacteria-producing nitrate reductase is present; results can also be confounded by ascorbic acid consumption. The American College of Obstetricians and Gynecologists states that dipstick urinalysis for LE or nitrite is a rapid and inexpensive screening test, with a sensitivity of 75 percent and specificity of 82 percent.[5] In women with symptoms but negative test results, a urine culture and/or urinalysis should be performed because false-negative results are common. The European Association of Urology recommends dipstick urinalysis to detect pyuria, hematuria, and nitrite if UTI is suspected.[6] Pyuria is present in almost all women with an acutely symptomatic UTI; its absence strongly suggests an alternative diagnosis.

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