

Ellen K. KendallCase Western Reserve University
School of Medicine, Cleveland, OH**Yael Mauer, MD, MPH**Department of Internal Medicine and
Geriatrics, Cleveland Clinic, Cleveland, OH;
Assistant Professor of Medicine, Cleveland
Clinic Lerner College of Medicine of Case
Western Reserve University, Cleveland, OH

Q: Does my patient need to be screened or treated for a urinary tract infection?

A: Patients with symptoms consistent with urinary tract infection (UTI) do not need to be tested and should be treated.

Patients with classical UTI symptoms that include new or acutely worsening dysuria, urinary frequency, urgency, suprapubic pain, and hematuria, particularly in the absence of vaginal symptoms, can be diagnosed and treated for UTI without the need of urine studies. The probability of UTI is approximately 50% in women with any one of these symptoms and greater than 90% in women with dysuria and frequency without vaginal symptoms.¹

When patients present with symptoms that are suggestive but not clearly diagnostic of UTI, urine studies should be obtained. Together with symptoms, the presence of bacteria, leukocyte esterase or white blood cells, nitrites, and hemoglobin or red blood cells in the urine support the diagnosis of UTI and its treatment.²

Patients with nonspecific findings such as malaise, altered mental status, and cloudy or malodorous urine, should not routinely be evaluated or treated for UTI, unless these acutely occur in patients with spinal cord injury or cognitive disability in which case urine studies are appropriate as the patient is unable to clearly express or experience classic UTI symptoms.^{2,3}

Screening and treatment for asymptomatic bacteriuria, or bacteria in the urine without symptoms, should only be done in patients who are pregnant or preparing for a procedure associated with urologic mucosal trauma.³⁻⁵ If a positive urinalysis or culture happens to be obtained in any other patient, anti-

biotics should not be prescribed, as this can lead to possible side effects from treatment, antimicrobial resistance, and undue financial burden.^{3,5,6}

■ UTI CLASSIFICATIONS

UTI is very common in US adults.^{7,8} Prevalence in the overall population is approximately 11%, with increased prevalence (20%) in women over age 65.⁷ In the outpatient setting, around 15% of antibiotic prescriptions are for UTI.⁸

UTI refers to the presence of bacteria in the urine combined with symptoms, and UTIs are classified according to the location of bacteria in the urinary tract.^{7,9} The term simple cystitis refers to an infection of the lower urinary tract (bladder and urethra), with patients typically presenting with acute or worsening dysuria, urinary frequency and urgency, suprapubic pain, and hematuria.^{1,7,9} Complicated UTI, or pyelonephritis, refers to UTI that has extended to the upper urinary tract (ureters and kidneys) and usually presents with symptoms of systemic illness, such as fever, malaise, nausea or vomiting, and new or worsening flank pain.^{7,9}

In men presenting with pelvic or perineal pain or voiding difficulties, prostatitis should be considered.¹⁰ Urethritis, typically caused by sexually transmitted pathogens, must be considered in sexually active men presenting with dysuria, pruritus, burning, or discharge at the urethral meatus.¹¹

In postmenopausal women, chronic urinary frequency, urgency, or dysuria, especially in combination with vaginal symptoms, should prompt the clinician to consider genitourinary syndrome of menopause as opposed to UTI.¹²

doi:10.3949/ccjm.89a.21121

■ INTERPRETATION OF URINALYSIS

When a patient presents with atypical urinary symptoms and thus the diagnosis is unclear, urinalysis is recommended (either by dipstick or microscopy).

Dipstick testing evaluates for presence of leukocyte esterase, hemoglobin, and nitrites in the urine. Positive leukocyte esterase suggests the presence of pyuria or white blood cells.^{13–15} Hemoglobin is suggestive of red blood cells in the urine. Nitrites are highly specific for infection with *Enterobacteriaceae*, the most common organism responsible for UTIs, but because not all bacteria reduce nitrates, a negative test does not exclude infection.¹³

Dipstick urinalysis provides quick semiquantitative results and is usually performed in emergency and ambulatory settings. However, it is dependent on bacterial and cellular concentrations and thus often lacks sensitivity. The presence of nitrates or leukocyte esterase plus hemoglobin, has been shown to have a sensitivity of 77% and specificity of 70% for UTI in female patients, with positive predictive value of 81% and negative predictive value of 65%.¹⁴ The positive predictive value increases to 92% if nitrites plus blood or leukocyte esterase are present. The negative predictive value increases to 73% if all three are negative.¹⁴ In males aged 60 years and older, dipstick findings have been reported to have a positive predictive value of 83% and a negative predictive value of 60%.¹⁵

Urine microscopy examines urinary sediment and can most accurately detect and quantify cells in the urine, as well as identify casts, crystals, and pathogens.^{16–18} It can confirm findings on a dipstick or detect abnormalities missed by chemical testing, providing additional clues toward different diagnoses. For example, white blood cell casts are formed in the kidneys and thus suggest pyelonephritis rather than simple cystitis.

Urine culture can help guide antibiotic therapy in patients with pyelonephritis or cystitis that has failed empiric therapy, as well as in a number of other settings, such as pregnancy, compromised immunity, urologic abnormalities, presence of an indwelling catheter, stay in an inpatient healthcare facility, recent antibiotic use, or history of prior infection with antibiotic resistant urinary pathogens.^{17–20}

■ SCREENING FOR ASYMPTOMATIC BACTERIURIA

Asymptomatic bacteriuria is characterized by bacteria in the urine without UTI symptoms, representing bacterial colonization instead of infection and is dis-

tinct from UTI.⁴ Thus, the term asymptomatic UTI is incorrect and should be avoided.

Screening for bacteriuria in asymptomatic patients is only recommended if a patient is pregnant (B recommendation, fair evidence) or will undergo a procedure that involves urologic mucosal trauma (strong recommendation, moderate-quality evidence).^{3,4} Although urine testing is frequently done for screening purposes in populations such as the elderly, those with indwelling catheters, and during perioperative management, evidence suggests that screening in these populations can lead to harm.^{3,5,21} If a positive urine test has been obtained in these populations, the patient should not be treated with antibiotics.^{3,5,6,20}

Infectious Diseases Society of America recommendations

According to the 2019 Infectious Diseases Society of America Asymptomatic Bacteriuria Screening Guidelines,³ the following populations should be screened:

- Pregnant patients (moderate-quality evidence)
 - Patients undergoing procedures associated with urologic trauma (moderate-quality evidence).
- The following should not be screened:
- Healthy nonpregnant patients (moderate-quality evidence)
 - Patients in long-term care facilities (moderate-quality evidence)
 - Functionally impaired older individuals (low-quality evidence)
 - Patients with diabetes (moderate-quality evidence)
 - Patients with indwelling urethral catheters (low-quality evidence)
 - Patients undergoing elective nonurologic surgery (low-quality evidence)
 - Older patients with altered mental status (very low-quality evidence)
 - Patients with solid-organ transplant other than kidney (moderate-quality evidence)
 - Patients who have received a kidney transplant more than 1 month prior (high-quality evidence)
 - Patients with impaired voiding following spinal cord injury (low-quality evidence).

There is insufficient evidence to recommend for or against screening in the following:

- Patients with high-risk neutropenia (< 100 cells/mm³, ≥ 7 days duration following chemotherapy)
- Patients undergoing indwelling catheter removal
- Patients within the first month following kidney transplant.

For older patients without urinary symptoms or systemic signs of infection who present with acute

mental status change, other causes should be assessed first, and supportive treatment is recommended over screening for UTI and subsequent antimicrobial treatment (very low-quality evidence).³ In a study of emergency room patients age 65 and older, the presence of altered mental status, malaise, or lethargy did not increase probability of bacterial infection.²²

Currently, there is only anecdotal evidence demonstrating benefit of antibiotic treatment in patients with altered mental status and asymptomatic bacteriuria.²³ In a recent study, antibiotic treatment was administered to 82.7% of 2,733 hospitalized adults (median age, 77 years) with asymptomatic bacteriuria, defined as a positive urine culture without symptoms attributable to UTI.²⁴ Patients who were older, had altered mental status, or abnormal urinalysis were more likely to receive antibiotics. Antibiotic treatment was not associated with improved clinical outcomes, but rather with 37% longer hospital length of stay.²⁴

■ HARMS OF TESTING FOR ASYMPTOMATIC BACTERIURIA

Screening asymptomatic patients or those with nonspecific symptoms not consistent with UTI often leads to the discovery of asymptomatic bacteriuria for which treatment is usually not required. Inappropriate screening and treatment of UTI is costly to the individual, healthcare system, and society.^{25–27} A US study analyzing preoperative urinalysis data from 2007 to 2017 found that total spending on inappropriate preoperative urinalysis was \$48,675,408, and the estimated cost for antibiotics following inappropriate urinalysis added an additional \$4,854,109.²⁵

Improper treatment of asymptomatic bacteriuria can also lead to antibiotic-associated complications,

such as *Clostridioides difficile* infections, ototoxicity, hepatic necrosis, Stevens-Johnson syndrome, anaphylaxis, and increased antibiotic resistance.^{5,26} Data from a 2012 US retrospective analysis of female outpatient urine cultures noted *Escherichia coli* antibiotic resistance to ciprofloxacin to be 11.8% among all patients and 29.1% among those age 65 and older. Resistance to trimethoprim-sulfamethoxazole was as high as 22.2% across all age groups and 26.7% in those 65 and older.²⁷ Rates of resistance are even higher in certain parts of the United States and continue to increase.

■ THE BOTTOM LINE

Treatment of UTI is always recommended when patients present with classical UTI urologic symptoms. In this case, urine studies are not needed to establish diagnosis.

Urine studies should be attained when patients present with symptoms that are not clearly diagnostic of UTI. In this case, the presence of bacteria, white or red blood cells in the urine supports treatment.²

Patients with nonspecific findings not consistent with UTI should not routinely be evaluated or treated for UTI unless they have mental or physical disability that precludes them from experiencing or expressing urologic symptoms (such as spinal cord injury or mental retardation).³

Asymptomatic patients should not be screened for or treated for asymptomatic bacteriuria unless the patient is pregnant or preparing for a procedure associated with urologic mucosal trauma. ■

■ DISCLOSURES

The authors report no relevant financial relationships which, in the context of their contributions, could be perceived as a potential conflict of interest.

■ REFERENCES

1. Bent S, Nallamothu BK, Simel DL, Fihn SD, Saint S. Does this woman have an acute uncomplicated urinary tract infection? JAMA 2002; 287(20):2701–2710. doi:10.1001/jama.287.20.2701
2. Bates B. Interpretation of urinalysis and urine culture for UTI treatment. US Pharm 2013; 38(11): 65–68.
3. Nicolle LE, Gupta K, Bradley SF, et al. Clinical practice guideline for the management of asymptomatic bacteriuria: 2019 update by the Infectious Diseases Society of America. Clin Infect Dis 2019; 68(10):e83–e110. doi:10.1093/cid/ciy1121
4. US Preventive Services Task Force, Owens DK, Davidson KW, et al. Screening for asymptomatic bacteriuria in adults: US Preventive Services Task Force recommendation statement. JAMA 2019; 322(12):1188–1194. doi:10.1001/jama.2019.13069
5. Nace DA, Drinka PJ, Crnich CJ. Clinical uncertainties in the approach to long term care residents with possible urinary tract infection. J Am Med Dir Assoc 2014; 15(2):133–139. doi: 10.1016/j.jamda.2013.11.009
6. Hooton TM, Gupta K. UpToDate: Acute simple cystitis in women. <https://www.uptodate.com/contents/acute-simple-cystitis-in-women>. Accessed November 7, 2022.
7. Medina M, Castillo-Pino E. An introduction to the epidemiology and burden of urinary tract infections. Ther Adv Urol 2019; 11:1756287219832172. doi:10.1177/1756287219832172
8. Kang CI, Kim J, Park DW, et al. Clinical practice guidelines for the antibiotic treatment of community-acquired urinary tract infections. Infect Chemother 2018; 50(1):67–100. doi:10.3947/ic.2018.50.1.67
9. Kranz J, Schmidt S, Lebert C, et al. The 2017 update of the German clinical guideline on epidemiology, diagnostics, therapy, prevention, and management of uncomplicated urinary tract infections in adult patients: part 1. Urol Int 2018; 100:263–270. doi:10.1159/000486138
10. Coker TJ, Dierfeldt DM. Acute bacterial prostatitis: diagnosis and management. Am Fam Physician 2016; 93(2):114–120. pmid:26926407
11. Jordan SJ, Aaron KJ, Schwabke JR, Van Der Pol BJ, Hook EW 3rd. Defining the urethritis syndrome in men using patient reported

- symptoms. *Sex Transm Dis* 2018; 45(7):e40–e42. doi:10.1097/OLQ.0000000000000790
12. **Gandhi J, Chen A, Dagur G, et al.** Genitourinary syndrome of menopause: an overview of clinical manifestations, pathophysiology, etiology, evaluation, and management. *Am J Obstet Gynecol* 2016; 215(6):704–711. doi:10.1016/j.ajog.2016.07.045
13. **Franz M, Hörl WH.** Common errors in diagnosis and management of urinary tract infection. I: pathophysiology and diagnostic techniques. *Nephrol Dial Transplant* 1999; 14(11):2746–2753. doi:10.1093/ndt/14.11.2746
14. **Little P, Turner S, Rumsby K, et al.** Dipsticks and diagnostic algorithms in urinary tract infection: development and validation, randomised trial, economic analysis, observational cohort and qualitative study. *Health Technol Assess* 2009; 13(19):iii–73. doi:10.3310/hta13190
15. **den Heijer CD, van Dongen MC, Donker GA, Stobberingh EE.** Diagnostic approach to urinary tract infections in male general practice patients: a national surveillance study. *Br J Gen Pract* 2012; 62(604):e780–786. doi:10.3399/bjgp12X658313
16. **Hitezman N, Greer D, Carpio E.** Office-based urinalysis: a comprehensive review. *Am Fam Physician* 2022; 106(1):27–35B. PMID:35839369
17. **Wilson ML, Gaido L.** Laboratory diagnosis of urinary tract infections in adult patients. *Clin Infect Dis* 2004; 38(8):1150–1158. doi:10.1086/383029
18. **Tan NC, Koong AYL, Ng LP, et al.** Accuracy of urinary symptoms and urine microscopy in diagnosing urinary tract infection in women. *Family Pract* 2019; 36(4):417–424. doi:10.1093/fampra/cmz108
19. **European Association of Urology.** Guidelines: urologic infections. <https://uroweb.org/guidelines/urological-infections/chapter/the-guideline> Accessed November 7, 2022.
20. **Hu CM, Lowder JL.** Diagnosis and treatment of urinary tract infections across age groups. *Am J Obstet Gynecol* 2018; 219(1):40–45. doi:10.1016/j.ajog.2017.12.231
21. **Colgan R, Jaffe GA, Nicolle LE.** Asymptomatic bacteriuria. *Am Fam Physician* 2020; 102(1):99–104. PMID:32667160
22. **Caterino JM, Kline DM, Leininger R, et al.** Nonspecific symptoms lack diagnostic accuracy for infection in older patients in the emergency department. *J Am Geriatr Soc* 2019; 67(3):484–492. doi:10.1111/jgs.15679
23. **McKenzie R, Stewart MT, Bellantoni MF, Finucane TE.** Bacteriuria in individuals who become delirious. *Am J Med* 2014; 127(4):255–257. doi:10.1016/j.amjmed.2013.10.016
24. **Petty LA, Vaughn VM, Flanders SA, et al.** Risk factors and outcomes associated with treatment of asymptomatic bacteriuria in hospitalized patients. *JAMA Intern Med* 2019; 179(11):1519–1527. doi:10.1001/jamainternmed.2019.2871
25. **Shenoy ES, Giuriato MA, Song Z.** Prevalence, costs, and consequences of low-value preprocedural urinalyses in the US. *JAMA Intern Med* 2021; 181(11):1533–1535. doi:10.1001/jamainternmed.2021.4075
26. **Cunha BA.** Antibiotic side effects. *Med Clin North Am* 2001; 85(1):149–185. doi:10.1016/s0025-7125(05)70309-6
27. **Sanchez GV, Babiker A, Master RN, Luu T, Mathur A, Bordon J.** Antibiotic resistance among urinary isolates from female outpatients in the United States in 2003 and 2012. *Antimicrob Agents Chemother* 2016; 60(5):2680–2683. doi:10.1128/AAC.02897-15

Address: Yael Mauer, MD, MPH, Cleveland Clinic Beachwood Family Health and Surgery Center, 26900 Cedar Road, Beachwood, OH 44122; maury@ccf.org