

Chapter 32: Urinary Tract Infections in Elderly Persons

Manisha Juthani-Mehta

Department of Internal Medicine, Section of Infectious Diseases, Yale University School of Medicine, New Haven, Connecticut

ASYMPTOMATIC BACTERIURIA

Because of physiologic changes related to aging and comorbid illnesses, asymptomatic bacteriuria (ASB) is a common occurrence in older adults. Neither short-term nor long-term adverse outcomes attributable to the high incidence and prevalence of ASB have been shown in this population.

Diagnosis

The diagnosis of ASB is based on the result of a urine culture from a urine specimen that minimizes contamination from a person without symptoms or signs referable to urinary infection.¹ For asymptomatic women, bacteriuria is defined as two consecutive voided urine specimens with isolation of the same bacterial strain in quantitative counts $\geq 10^5$ colony forming units (cfu)/ml. For asymptomatic men, bacteriuria is defined as a single, clean-catch voided urine specimen with one bacterial species isolated in a quantitative count $\geq 10^5$ cfu/ml. For women and men, a single catheterized urine specimen with one bacterial species isolated in a quantitative count $\geq 10^5$ cfu/ml defines bacteriuria.²

Prevalence

Population studies throughout the world have shown a rise in the prevalence of asymptomatic bacteriuria with age. Young women have a prevalence of ASB of 1 to 2%. For women 65 to 90 yr of age, the prevalence of ASB ranges from 6 to 16%. The prevalence is highest for women over the age of 90, ranging from 22 to 43%. ASB is very uncommon in young men, but for men over the age of 65, the prevalence ranges from 5 to 21% and is highest in those men over the age of 90.³ Among the institutionalized elderly, 25 to 50% of women and 15 to 35% of men have ASB. The prevalence is highest among those most severely disabled. Up to 90% of institutionalized adults also have asymptomatic pyuria (*i.e.*, white blood cells in the urine in the absence of urinary tract-specific symptoms).⁴ For those

residents with long-term indwelling catheters, 100% have ASB.⁵ Elderly persons with condom catheters *versus* indwelling catheters have a lower incidence of ASB or urinary tract infections (UTIs).⁶

Management

For elderly persons, routine screening and treatment for ASB are not recommended. Based on recommendations of the Infectious Diseases Society of America, screening for and/or treatment of ASB are not recommended for the following persons: (1) diabetic women; (2) older persons living in the community or institutionalized; (3) persons with spinal cord injury; and (4) catheterized patients while the catheter remains *in situ*.² Although a 3-d course of antibiotic therapy has been shown to decrease the prevalence of bacteriuria at 6 mo,⁷ no benefits in morbidity, mortality, and chronic urinary incontinence have been shown to date. Screening and treatment of ASB in older persons is only recommended in the following two circumstances: (1) before transurethral resection of the prostate and (2) before urologic procedures in which mucosal bleeding is anticipated.² Although it has been shown that nonurinary symptoms and signs are an important factor in the prescription of antibiotics for ASB,⁸ there is no evidence to date to support this practice.

Prevention

Few studies have been performed examining prevention strategies for ASB. In a randomized, double-blind, placebo-controlled trial in older female community-dwelling and nursing home residents, cranberry juice reduced the frequency of bacteriuria plus pyuria in this population.⁹ However, be-

Correspondence: Manisha Juthani-Mehta, Department of Internal Medicine, Section of Infectious Diseases, Yale University School of Medicine, PO Box 208022, New Haven, CT 06520. E-mail: manisha.juthanimehta@yale.edu

Copyright © 2009 by the American Society of Nephrology

cause of several study design issues in this trial, the use of cranberry juice has not been fully advocated for the prevention of ASB. In a controlled trial of intravaginal estriol therapy in postmenopausal women with recurrent UTI, the estriol group had fewer episodes of ASB than the placebo group.¹⁰ However, this study was conducted specifically among women with a history of recurrent UTI. Intravaginal estriol therapy is not recommended for all postmenopausal women. In men, changes in the bactericidal activity of prostate secretions has been reported and proposed as one factor contributing to bacteriuria. Last, avoiding long-term indwelling catheter use is optimal. If possible, using a condom catheter provides more comfort to the patient and fewer adverse outcomes.⁶

URINARY TRACT INFECTIONS

UTIs are the second most common cause of infectious disease hospitalization in adults 65 yr or older after lower respiratory tract infections.¹¹ In 1998, UTIs were the most costly and resource intensive condition, causing >1.8 million physician office visits among Medicare beneficiaries. Total Medicare expenditures for UTIs in all venues of care amounted to more than \$1.4 billion, exclusive of medication costs.¹²

Diagnosis

The diagnosis of UTI in community-dwelling older adults follows a similar paradigm to the diagnosis of UTI in younger adults, requiring significant bacteriuria ($\geq 10^5$ cfu/ml) associated with genitourinary symptoms. In older adults that are cognitively intact and can report symptoms, the diagnosis of UTI is easily made. However, among institutionalized older adults that are often cognitively impaired, distinguishing ASB from UTI is often problematic.

In older institutionalized adults, multiple comorbid illnesses may present with symptoms similar to UTI, and older adults with cognitive impairment may not be able to report their symptoms.¹³ Laboratory confirmation of UTIs with significant bacteriuria ($\geq 10^5$ cfu/ml on urine culture) and pyuria (>10 white blood cells on urinalysis) is an agreed on minimum necessary but not sufficient criterion for diagnosis of UTI in this population.¹⁴ However, identifying symptoms that should be used for the diagnosis of UTI is challenging. Criteria for UTI surveillance and diagnosis in nursing home residents have been developed by infectious diseases consensus group recommendations.¹⁵ The only clinical features that have been associated with bacteriuria plus pyuria in nursing home residents with clinically suspected UTIs are dysuria, change in mental status (*i.e.*, change in level of consciousness, periods of altered perception, disorganized speech, or lethargy), and change in character of urine (*i.e.*, gross hematuria, change in color, or change in odor). Dysuria plus one of the other two clinical features predicts bacteriuria plus pyuria 63% of the time, similar to what current consensus criteria have shown.¹⁶

Management

For community-dwelling older adults presenting to an acute care hospital with presumed urosepsis, empiric therapy with a third-generation cephalosporin is appropriate single agent therapy until culture and susceptibility reports are available. Unless specific risk factors for a gram-positive infection are identified (*e.g.*, pressure sores, concomitant pneumonia), vancomycin therapy is not empirically required.¹⁷ For outpatient oral therapy, nitrofurantoin, trimethoprim-sulfamethoxazole, and fluoroquinolones are appropriate first-line drugs for older adults with UTIs.

An appropriate first step in the evaluation of a UTI in institutionalized older adults is performing a urinary dipstick. Among nursing home residents with suspected UTIs, the negative predictive value of the urinary dipstick is 100%.¹⁸ Performing this test in the nursing home setting obviates the need to outsource urine cultures and urinalyses. Clinical criteria for empiric treatment of UTIs in institutionalized adults are also consensus based. In 2001, Loeb *et al.*¹⁹ recommended a minimum set of clinical criteria necessary to initiate antibiotic therapy for UTIs. As per these criteria, for residents who do not have an indwelling catheter, minimum criteria for initiating antibiotics include acute dysuria alone or fever ($>37.9^\circ\text{C}$ [100°F] or 1.5°C [2.4°F] increase above baseline temperature) and at least one of the following: new or worsening urgency, frequency, suprapubic pain, gross hematuria, costovertebral angle tenderness, or urinary incontinence. For residents who have a chronic indwelling catheter, minimum criteria for initiating antibiotics include the presence of at least one of the following: fever ($>37.9^\circ\text{C}$ [100°F] or 1.5°C [2.4°F] increase above baseline temperature), new costovertebral angle tenderness, rigors (shaking chills) with or without an identified cause, or new onset of delirium.

Prevention

Although cranberry capsule or juice administration is an appealing prevention modality for UTIs because of its low side effect profile and ease of administration, it has not been studied for the purposes of preventing UTI in older adults. As such, no data exist to date to show a benefit of long-term cranberry ingestion for the prevention of UTIs. Intravaginal estriol therapy in postmenopausal women with recurrent UTIs has been shown to decrease the number of episodes of UTIs.¹⁰ Antibiotic prophylaxis is highly effective at reducing the risk of recurrent UTIs in older women. Continuous prophylaxis is recommended for women who experience two or more symptomatic UTIs over a 6-mo period or three or more over a 12-mo period, after an existing infection is eradicated. Most experts recommend a 6-mo trial of a once nightly prophylactic agent, after which the regimen is discontinued and the patient is observed for further infection. Some experts will advocate prophylaxis for up to 2 yr.²⁰ Antimicrobial agents used for prophylaxis include trimethoprim-sulfamethoxazole, nitrofurantoin, and cefalexin.²¹

Other risk factors for recurrent UTIs have been identified in older postmenopausal women; however, these risk factors have

not been shown to be modifiable to date. In postmenopausal women, a history of UTI in the premenopausal period, incontinence, presence of a cystocele, and postvoid residual urine predispose to UTIs. In institutionalized older adults, catheterization, incontinence, antimicrobial exposure, and functional status are most strongly related to risk of recurrent UTIs.²²

Among older men, risk factors for UTIs include dementia, incontinence of bladder and bowel, and use of condom or indwelling catheters.^{23,24} Condom catheters are preferable to indwelling catheters; however, if an indwelling catheter is essential, staff should maintain a closed, dependent system to avoid introducing new organisms, be vigilant for the development of obstruction, and avoid trauma.²⁵ Severe benign prostatic hypertrophy is often implicated as a risk for recurrent UTI. When possible, resection of the prostate can assist in reducing recurrent episodes.

TAKE HOME POINTS

- Asymptomatic bacteriuria is highly prevalent in elderly persons; screening and treatment of asymptomatic bacteriuria is not recommended: the only two circumstances in which they are recommended are (1) before transurethral resection of the prostate and (2) before urologic procedures in which mucosal bleeding is anticipated
- Diagnosis of UTI in community-dwelling elderly persons is similar to younger adults, requiring the presence of genitourinary symptoms; however, among institutionalized adults, diagnosis is challenging: the only clinical features that have been associated with bacteriuria plus pyuria are dysuria, change in character of urine, and change in mental status
- Nitrofurantoin remains an effective outpatient oral therapy for UTI in elderly persons; for hospitalized elderly persons, a third-generation cephalosporin is an effective empiric treatment option for UTI
- There are few modifiable risk factors for asymptomatic bacteriuria or UTI in elderly persons; cranberry capsules and intravaginal estriol remain promising options

DISCLOSURES

Reprinted in part from Clinics in Geriatric Medicine, Volume 23, Issue 3, Manisha Juthani-Mehta, Asymptomatic Bacteriuria and Urinary Tract Infection in Older Adults, pages 585–594, 2007, with permission from Elsevier.

REFERENCES

*Key References

1. Nicolle LE: Asymptomatic bacteriuria: when to screen and when to treat. *Infect Dis Clin North Am* 17: 367–394, 2003
2. Nicolle LE, Bradley S, Colgan R, Rice JC, Schaeffer A, Hooton TM: Infectious Diseases Society of America guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults. *Clin Infect Dis* 40: 643–654, 2005*
3. Nicolle LE: Asymptomatic bacteriuria in the elderly. *Infect Dis Clin North Am* 11: 647–662, 1997
4. Nicolle LE: Urinary tract infections in long-term-care facilities. *Infect Control Hosp Epidemiol* 22: 167–175, 2001

5. Warren JW, Tenney JH, Hoopes JM, Muncie HL, Anthony WC: A prospective microbiologic study of bacteriuria in patients with chronic indwelling urethral catheters. *J Infect Dis* 146: 719–723, 1982
6. Saint S, Kaufman SR, Rogers MA, Baker PD, Ossenkop K, Lipsky BA: Condom versus indwelling urinary catheters: a randomized trial. *J Am Geriatr Soc* 54: 1055–1061, 2006
7. Boscia JA, Kobasa WD, Knight RA, Abrutyn E, Levison ME, Kaye D: Therapy vs no therapy for bacteriuria in elderly ambulatory nonhospitalized women. *JAMA* 257: 1067–1071, 1987
8. Walker S, McGeer A, Simor AE, Armstrong-Evans M, Loeb M: Why are antibiotics prescribed for asymptomatic bacteriuria in institutionalized elderly people? A qualitative study of physicians' and nurses' perceptions. *CMAJ* 163: 273–277, 2000
9. Avorn J, Monane M, Gurwitz JH, Glynn RJ, Choodnovskiy I, Lipsitz LA: Reduction of bacteriuria and pyuria after ingestion of cranberry juice. *JAMA* 271: 751–754, 1994
10. Raz R, Stamm WE: A controlled trial of intravaginal estriol in postmenopausal women with recurrent urinary tract infections. *N Engl J Med* 329: 753–756, 1993
11. Curns AT, Holman RC, Sejvar JJ, Owings MF, Schonberger LB: Infectious disease hospitalizations among older adults in the United States from 1990 through 2002. *Arch Intern Med* 165: 2514–2520, 2005*
12. Litwin MS, Saigal CS, Beerbohm EM: The burden of urologic diseases in America. *J Urol* 173: 1065–1066, 2005
13. Yoshikawa TT, Nicolle LE, Norman DC: Management of complicated urinary tract infection in older patients. *J Am Geriatr Soc* 44: 1235–1241, 1996
14. Garner JS, Jarvis WR, Emori TG, Horan TC, Hughes JM: CDC definitions for nosocomial infections, 1988. *Am J Infect Control* 16: 128–140, 1988
15. McGeer A, Campbell B, Emori TG, Hierholzer WJ, Jackson MM, Nicolle LE, Peppler C, Rivera A, Schollenberger DG, Simor AE: Definitions of infection for surveillance in long-term care facilities. *Am J Infect Control* 19: 1–7, 1991
16. Juthani-Mehta M, Quagliarello V, Perrelli E, Towle V, Van Ness P, Tinetti M: Clinical features to identify UTI in nursing home residents: a cohort study. *J Am Geriatr Soc* 2009, in press*
17. Ackermann RJ, Monroe PW: Bacteremic urinary tract infection in older people. *J Am Geriatr Soc* 44: 927–933, 1996
18. Juthani-Mehta M, Tinetti M, Perrelli E, Towle V, Quagliarello V: Role of dipstick testing in the evaluation of urinary tract infection in nursing home residents. *Infect Control Hosp Epidemiol* 28: 889–891, 2007
19. Loeb M, Bentley DW, Bradley S, Crossley K, Garibaldi R, Gantz N, McGeer A, Muder RR, Mylotte J, Nicolle LE, Nurse B, Paton S, Simor AE, Smith P, Strausbaugh L: Development of minimum criteria for the initiation of antibiotics in residents of long-term-care facilities: results of a consensus conference. *Infect Control Hosp Epidemiol* 22: 120–124, 2001*
20. Juthani-Mehta M: Asymptomatic bacteriuria and urinary tract infection in older adults. *Clin Geriatr Med* 23: 585–594, 2007*
21. Hooton TM: Recurrent urinary tract infection in women. *Int J Antimicrob Agents* 17: 259–268, 2001
22. Stamm WE, Raz R: Factors contributing to susceptibility of postmenopausal women to recurrent urinary tract infections. *Clin Infect Dis* 28: 723–725, 1999
23. Nicolle LE, Henderson E, Bjornson J, McIntyre M, Harding GK, MacDonell JA: The association of bacteriuria with resident characteristics and survival in elderly institutionalized men. *Ann Intern Med* 106: 682–686, 1987
24. Ouslander JG, Greengold B, Chen S: External catheter use and urinary tract infections among incontinent male nursing home patients. *J Am Geriatr Soc* 35: 1063–1070, 1987
25. Drinka PJ: Complications of chronic indwelling urinary catheters. *J Am Med Dir Assoc* 7: 388–392, 2006

REVIEW QUESTIONS: URINARY TRACT INFECTIONS IN ELDERLY PERSONS

1. It is appropriate to screen an elderly patient for asymptomatic bacteriuria if the patient:
 - a. Lives in a nursing home
 - b. Is older than 90 yr of age
 - c. Has diabetes mellitus
 - d. Is having a urologic procedure performed in which mucosal bleeding is anticipated
2. Treatment of asymptomatic bacteriuria is appropriate when a patient:
 - a. Has chronic incontinence
 - b. Is having a transurethral resection of the prostate
 - c. Has a spinal cord injury
 - d. Has an indwelling catheter in place
3. The presence of bacteriuria ($>100,000$ cfu/ml) plus pyuria (>10 WBC) is enough to make the diagnosis of UTI in an elderly patient. TRUE or FALSE?
 - a. True
 - b. False
4. The urinary dipstick is most helpful in identifying a patient that:
 - a. Does not have bacteriuria plus pyuria
 - b. Deserves treatment for UTI
 - c. Likely has bacteriuria
 - d. Likely has pyuria