21. URINARY TRACT INFECTION

Eve A. Kerr, M.D., M.P.H.

The general approach to urinary tract infections (UTIs) was obtained from two ambulatory medical text chapters (Barker et al., 1991; Goroll et al., 1996), a textbook of diagnostic strategies (Panzer et al., 1991), and review articles which dealt with diagnosis and management of urinary tract infections. The review articles were chosen from a MEDLINE search which identified all English language review articles on urinary tract infection between the years of 1990 and 1997. Further, since the main controversy in UTIs concerns laboratory testing and therapy, we selected and reviewed references from the review articles which related to laboratory testing and antibiotic therapy. Finally, we performed another MEDLINE search (1990-1997) to identify any randomized controlled trials (RCTs) regarding treatment of UTIs. This chapter focuses on diagnosis and treatment of acute upper and lower tract infections. It does not specifically cover diagnosis or treatment of prostatitis nor of bacteriuria caused by indwelling catheters.

IMPORTANCE

UTIs are among the most common bacterial infections seen by physicians and are the most common bacterial infection in women (Winickoff et al., 1981). They affect ten to 20 percent of women in the United States annually and account for over five million office visits per year. The prevalence of UTI increases with increasing age, and the prevalence of bacteriuria in elderly men approaches that in women (i.e., 20-30%) (Lipsky

---

6 This chapter is a revision of one written for an earlier project on quality of care for women and children (Q1). The expert panel for the current project was asked to review all of the indicators, but only rated new or revised indicators.

SCREENING

There is no role for screening for UTIs or bacteriuria in otherwise healthy men and non-pregnant women (Pels et al., 1989; US Preventive Task Force, 1996). Treatment of asymptomatic bacteriuria has not been shown consistently to affect outcomes (Childs and Egan, 1996; Baldassarre and Kaye, 1991). Consequently, we will not address screening for UTI, nor treatment for asymptomatic bacteriuria, in this chapter.

DIAGNOSIS

The diagnosis of UTI is typically derived from the patient’s history. An uncomplicated UTI is suggested by symptoms of bladder irritation and occasionally hematuria. An upper tract infection is suggested by the concomitant presence of fever, chills, and/or back pain (Indicator 1). In addition, vaginal infections (due to candida and trichomonas) and urethritis (due to Chlamydia trachomatis, Neisseria gonorrhoeae, or herpes simplex virus) could present with UTI-type symptoms. Therefore, a history of vaginal (Indicator 2) or penile discharge and sexual activity should be sought. However, data on the positive predictive value of dysuria for urinary tract infection in men are limited. Work-up of penile discharge is covered in the chapter on sexually transmitted diseases. Since those with diabetes and immunosupression are treated differently, the history should specifically include these questions (Barker et al., 1991).

In men, acute and chronic prostatitis may also present with symptoms of dysuria (Lipsky, 1989). Men with acute prostatitis are often systemically ill and have pelvic pain and/or a tender prostate. Chronic prostatitis and prostatic hypertrophy may be underlying causes for recurrent UTI in men.

The urinalysis is the most important initial study in the evaluation of a patient suspected of having a UTI by history (Indicator 3). A negative urinalysis makes the diagnosis of UTI extremely unlikely (Barker et al., 1991). In women, a specimen should be collected by the “clean-catch” method to minimize likelihood of contamination (Barker et al.,
A "clean-catch" is thought to be unnecessary in men (Lipsky, 1989). A finding by microscopic examination using a high-power lens of bacteria of more than seven white cells/mm\(^3\) in unspun urine or more than two white cells per high-power field in spun urine is consistent with an UTI in women. The leukocyte esterase test has a sensitivity for defining UTI (if the test is positive) of between 62 and 68 percent, with a positive predictive value of only 46 to 55 percent and a negative predictive value of 88 to 92 percent (Pfaller and Koontz, 1985). A nitrite test has a sensitivity of 35 to 85 percent and specificity of 92 to 100 percent for the presence of bacteria (Pappas, 1991). The leukocyte-esterase nitrite combination has a sensitivity of 79.2 percent, a specificity of 81 percent and a negative predictive value of 94.5 percent for specimens with greater than \(10^5\) CFU/ml (Pfaller and Koontz, 1985). A combination of findings (i.e., bacteriuria, pyuria and a positive nitrite test) is more highly predictive for UTI (Bailey, 1995). The three or four-glass test for localizing source of infection in men has generally fallen out of favor due to high costs and low specificity (Goroll, 1995; Lipsky, 1989).

Most experts agree that a routine urine culture is not warranted in women who present with non-recurrent acute dysuria without symptoms of upper tract infection and with a positive urinalysis (Hooten and Stamm, 1991; Forland, 1993). Some experts do recommend routine culture in men presenting with dysuria, and in the elderly (Lipsky, 1989; Baldassare and Kaye, 1991; Childs and Egan, 1996). However, we were unable to find any studies that demonstrate the usefulness of cultures versus empiric treatment in these populations, and have not created an indicator requiring cultures for all men and elderly patients. However, all authors agree that certain criteria for appropriate use of a culture exist for both genders and all age groups (Indicator 4). A summary of these criteria are shown in Table 21.1.
Table 21.1

Criteria for Appropriate Use of Culture

A culture should be obtained in patients who have:

- "Several" (three or more) infections in the past year
- Diabetes or immunocompromised state
- Fever, chills and/or flank pain
- Acute pyelonephritis
- Structural or functional anomalies of the urinary tract
- Symptoms for more than 7 days before presentation
- Pregnancy
- A relapse of symptoms after initial treatment
- Hospital acquired infection
- Indwelling foley catheter
- Recent instrumentation of the urinary tract


TREATMENT

Treatment currently rests with the appropriate use of antibiotics (Indicator 5). A single-dose or a three-day course of an oral antimicrobial has been shown to eradicate approximately 90 to 95 percent of cases of uncomplicated UTI in young women. However, therapy for three days or longer was more effective than single-dose therapy in most trials and in a meta-analysis (Stamm and Hooton, 1993; Elder, 1992; Johnson and Stamm, 1989; Norrby, 1990). Baldassare and Kaye (1991) recommend a similar approach to treatment for elderly women, although some recommend seven days of treatment in elderly patients with uncomplicated UTI (Stamm and Hooten, 1993). There are no good studies on the appropriate duration of treatment for men with acute lower tract infection, although some authors recommend seven days instead of the shorter three day regimens (Hooten and Stamm, 1991). Our indicator specifies that treatment of uncomplicated lower tract infection in women under age 65 should not exceed seven days (Indicator 7).
However, patients of both genders, regardless of age, who have “complicated lower tract infections”\(^7\) should receive antibiotic treatment for at least seven days (Indicator 10). Patients with mild to moderate acute uncomplicated pyelonephritis should be treated for 10 to 14 days as outpatients (Stamm et al., 1987) (Indicator 8). Severe pyelonephritis, with nausea and vomiting, or possible urosepsis, may require parenteral antibiotics, as does pyelonephritis in pregnancy (Indicator 9).

In general, trimethoprim/sulfamethoxazole double strength (160 mg/800 mg) is the most effective first-line agent for acute uncomplicated lower UTI in women under age 65, with resistance in five to 15 percent of cases (Indicator 6). It should be used unless there is documented resistance, allergy, or pregnancy. Amoxicillin and nitrofurantoin have higher rates of failure (Stamm and Hooton, 1993; Johnson and Stamm, 1989; Elder, 1992; Norrby, 1990). The use of quinolones, while effective (Stein et al., 1987; Hooton et al., 1991), should be reserved for patients with known resistance or allergy to other first-line agents to avoid unnecessary expense and the promotion of resistant strains (Sable and Scheld, 1993).

Empiric selection of antibiotics in men and the elderly is more complicated, because the causative agents of urinary tract infections are more diverse. More frequent use of catheterization, incontinence, and debilitation in the elderly, and concomitant prostatitis in men, makes the selection of antibiotics more dependent on the clinical situation. Therefore, our indicators will only suggest the use of trimethoprim/sulfamethoxazole double strength as the first line agent in non-elderly women.

**FOLLOW-UP**

Experts disagree on necessity for follow-up in lower tract infection. Some feel a follow-up culture is unnecessary if symptoms of uncomplicated UTI have resolved within three days of starting treatment (Stamm and

\(^7\) Complicated lower tract infections: Diabetes or immunocompromised state; functional or structural anomaly of the urinary tract; symptoms for longer than seven days; recent urinary tract infection; acute pyelonephritis or more than 3 urinary tract infections in past year; pregnancy (Stamm and Hooton, 1993; Johnson and Stamm, 1989).
Hooton, 1993; Patton et al., 1991; Winickoff et al., 1981; Schultz et al., 1984). Barker et al. (1991) stipulate that the urinalysis should be re-evaluated within seven days if a single-dose regimen was utilized or within four weeks if a seven to ten day course was used, even if symptoms have cleared. Most experts agree, however, that follow-up culture is indicated within two weeks of complicated cystitis or pyelonephritis (Stamm and Hooton, 1993) (Indicators 11 and 12).

The issue of when to do further work-up in men with recurrent UTIs remains unresolved. Prostatic involvement accounts of the majority of instances of infection relapse (Goroll, 1995), and usually responds to a prolonged course of antibiotics. Previous recommendations for men with even one UTI have centered around urologic evaluation. However, there is considerable uncertainty about the clinical and prognostic significance of abnormalities detected by roentgenographic and urodynamic tests in men with one or more UTIs, and it is not clear which test is the most appropriate, even for men with recurrent infections or pyelonephritis (Lipsky, 1989; Goroll, 1995). Therefore, we have not included any specific indicators on testing or referral in men with UTIs.
REFERENCES


**RECOMMENDED QUALITY INDICATORS FOR URINARY TRACT INFECTIONS**

The following indicators apply to men and women age 18 and older without diabetes or immunocompromise. Only the indicators in bold type were rated by this panel; the remaining indicators were endorsed by a prior panel.

<table>
<thead>
<tr>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indicator</strong></td>
</tr>
<tr>
<td>1. In patients presenting with dysuria, presence or absence of fever and flank pain should be elicited.</td>
</tr>
<tr>
<td>2. In women presenting with dysuria, a history of vaginal discharge should be elicited.</td>
</tr>
<tr>
<td>3. Patients who present with dysuria and are started on antimicrobial treatment for urinary tract infection should have had a urinalysis or dipstick evaluation on the day of presentation.</td>
</tr>
<tr>
<td>4. A urine culture should be obtained for patients who have dysuria and any one of the following: a. &quot;several&quot; (three or more) infections in the past year; b. diabetes or immunocompromised state; c. fever, chills and/or flank pain; d. suspected diagnosis of pyelonephritis; e. structural or functional anomalies of the urinary tract; f. a relapse of symptoms, if no culture previously obtained; g. a recent invasive procedure.</td>
</tr>
<tr>
<td>Indicator</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>5. If a diagnosis of UTI (upper or lower tract) has been made, the patient should be treated with antimicrobial therapy.</td>
</tr>
<tr>
<td>6. Trimethoprim-sulfamethoxazole should be used as a first-line agent in women under age 65 with uncomplicated lower tract infection unless there is documented history of allergy or pregnancy</td>
</tr>
<tr>
<td>7. Treatment with antimicrobials for uncomplicated lower tract infections in women under age 65 should not exceed 7 days.</td>
</tr>
<tr>
<td>Indicator</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>8. At least 10 days of antimicrobial therapy should be prescribed for a suspected upper tract infection (pyelonephritis).</td>
</tr>
<tr>
<td>9. A patient with known or suspected upper tract infection who has uncontrolled vomiting in the office or ER should receive parenteral antibiotics.</td>
</tr>
<tr>
<td>10. Regimens of at least 7 days should be used for patients with complicated lower tract infections: that is, those with: a. diabetes, b. functional or structural anomaly of the urinary tract, c. symptoms for longer than 7 days, d. urinary tract infection in the past month, e. pregnancy.</td>
</tr>
<tr>
<td>Follow-up</td>
</tr>
<tr>
<td>11. For upper tract infection a repeat culture should be obtained within 2 weeks of finishing treatment.</td>
</tr>
<tr>
<td>12. For complicated lower tract infection, a repeat culture should be obtained within 2 weeks of finishing treatment.</td>
</tr>
</tbody>
</table>
Definitions and Examples

1 An uncomplicated infection includes episodes of acute cystitis in women who are otherwise healthy and who have none of the risk factors that are known to increase the risk of treatment failure listed in definition 2.

2 Complicated UTI includes cystitis in women and men who have the following risk factors for treatment failure:
   a. three or more infections in the past year;
   b. diabetes or immunocompromised state;
   c. fever, chills and/or flank pain;
   d. acute pyelonephritis;
   e. structural or functional anomalies of the urinary tract;
   f. symptoms for more than seven days before presentation;
   g. pregnancy;
   h. a relapse of symptoms after initial treatment;
   i. hospital acquired infection;
   j. indwelling foley catheter;
   k. recent instrumentation of the urinary tract.

Quality of Evidence Codes

I    RCT
II-1 Nonrandomized controlled trials
II-2 Cohort or case analysis
II-3 Multiple time series
III   Opinions or descriptive studies