Urinary tract infections (UTIs) are an increasingly prevalent problem for women. The diagnosis and management of uncomplicated acute cystitis is relatively straightforward, while complicated and recurrent infections require more specialized assessment and treatment. This article will review the current management of UTIs.

**Key Words:** Urinary tract infections, cystitis, epidemiology, pathophysiology, diagnosis, treatment, prophylaxis, management, bacteruria.

**Objectives**
1. Define cystitis.
2. Discuss the evaluation and diagnosis of UTIs.
3. Identify several treatments for patients with UTIs.

This definition may simply be a clinical diagnosis in the setting of irritative voiding symptoms and dysuria. When infectious in etiology, “cystitis” will often refer to a bacteriologic finding from a urine culture, but cystitis may also be based on histologic or cystoscopic findings. Non-bacterial cystitis may occur after radiation exposure or in a disease known as interstitial cystitis, which by definition, has sterile urine (Karram & Siddighi, 2008). Complicated infections refer to those which occur concomitant with the conditions listed in Table 1, such as UTIs in men, patients with diabetes mellitus, women who are pregnant, relapsing or recurrent infections, hospital-acquired infection, or UTIs commensurate with indwelling catheters or recent urinary tract instrumentation. UTIs not fitting into one of these scenarios are commonplace and are considered “uncomplicated” (Johnson & Stamm, 1987).

Other definitions relevant to the topic of UTI include urethritis, trigonitis, bacteriuria, and urethral syndrome. Urethritis indicates inflammation of the urethra; in women, this is clinically indistinguishable from cystitis. Trigonitis refers to a localized hyperemia of the bladder trigone. Bacteriuria denotes the presence of bacteria in the urine. A UTI may be diagnosed when as

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**Definitions and Epidemiology**

Cystitis refers to any inflammatory condition of the bladder.

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few as $10^2$ colony forming units of bacteria per milliliter (cfu/mL) are found in a symptomatic patient. Asymptomatic bacteriuria refers to greater than $10^5$ cfu/mL in a patient without complaints consistent with a UTI (Norden & Kass, 1968; Stamm et al., 1982). Finally, “urethral syndrome” is a term that has been ascribed to patients with urinary frequency, urgency, dysuria, suprapubic discomfort, voiding difficulties, and pyuria (white blood cells in the urine) but in the absence of organic pathology (for example, negative urine cultures) (Maskell, 1974; Maskell, Pead, & Allen, 1979).

UTIs are mostly found in women, occurring in a 8:1 ratio in women to men (Cox, Lacy, & Hinman, 1968). Aside from being common in the community, 2% of hospitalized patients acquire UTIs, accounting for more than 500,000 nosocomial infections per year (Mayer, 1980; Turck & Stamm 1981). There are at least 100,000 annual hospitalizations for renal infections, which are usually the result of ascending infection from the lower urinary tract. Beginning at about 1 year of age, there is only about a 1% infection rate until puberty. Bacteriuria is found in 2% to 3% of women 15 to 24 years of age, 20% in women 65 to 80 years, and 25% to 50% in women greater than 80 years (Mulholland, 1986). The U.S. population of women greater than 65 years of age is projected to double between 2000 and 2030, increasing to more than 40 million women (U.S. Census Bureau, 2008). Therefore, one may anticipate that UTI diagnoses will increase in coming years.

Pathophysiology

Approximately 80% of the bacteria isolated in UTIs are gram-negative bacilli from the large family Enterobacteriaceae. These include Escherichia coli, Klebsiella, Enterobacter, Proteus, and Serratia. Another gram-negative bacteria, Pseudomonas, and many gram-positive bacteria (Staphylococcus epidermidis, S. aureus, S. agalactiae, S. saprophyticus, and Enterococcus) are other common pathogens (Echols, Tosiello, Haverstock, & Tice, 1999; Hooton, Besser, Foxman, Frisch, & Nicolle, 2004). Less common pathogens include anaerobic bacteria as well as yeast, trematodes, and tapeworms (Nash, Cheever, Oettesen, & Cook, 1982). A recent study of nearly 2,000 outpatient urinary isolates sampled from 41 centers from various geographic regions in the U.S. and Canada presented the most common urinary pathogens (see Table 2) (Zhanel et al., 2005).

Urinary tract infections may rarely result from hematogenous or lymphatic spread of an existing infection elsewhere in the body, but the most common route is an infection ascending from vaginal/perineal or perianal areas. This likely explains the markedly higher rate of infection in women compared with men (Cox et al., 1968).

There are many host defenses to the development of a UTI. First, urine is high in osmolality and low in pH due to high concentrations of urea and organic acids (Kaye, 1968). Second, vaginal, periurethral, and perineal colonization by gram-positive bacteria, diphtheroids, and lactobacilli, and the normally acidic vaginal pH (4.0 in healthy premenopausal women) inhibit migration of microorganisms from the rectum to the bladder (Stamey, 1980). Third, normal periodic voiding limits the ability of bacteria to reach concentrations that are high.
enough in the bladder to establish a significant infection, and glycosaminoglycans of the bladder lining and Tamm-Horsfall proteins of the loop of Henle further decrease bacterial adherence (Cox & Hinman, 1961; Orskov, Ferencz, & Orskov, 1980). The known risk factors for the development of UTIs generally involve a breakdown in these protective barriers.

The physiologic changes associated with menopause result in decreased vaginal glycogen and an increase in pH. It has been found that intravaginal estrogen replacement in postmenopausal women results in reappearance of normal lactobacilli and a reacidification, with a decrease in uropathogen growth and decreased incidence of UTIs (Jackson et al., 2004; Raz & Stamm, 1993).

Any condition that results in inefficient bladder emptying and stagnant urine in the bladder increases the likelihood of infection, including uterovaginal prolapse or cystocele with obstructive voiding; neurogenic bladder as in patients with diabetes mellitus, multiple sclerosis, and spinal cord injuries; and anti-cholinergic medications, which are frequently prescribed for symptoms of overactive bladder.

Other risk factors include decreased functional ability, as found in patients with dementia, cardiovascular accidents, neurologic deficits, and fecal incontinence (Karram & Siddighi, 2008). Systemic factors may also include diabetes mellitus, severe vascular disease, gouty nephropathy, sickle cell trait, and cystic renal disease (Jackson et al., 2004). Sexual intercourse, especially when in combination with diaphragm and spermicide use, increases the likelihood of infection (Fihn et al., 1996, 1998; Hooton, Fennell, Clark, & Stamm, 1991; Hooton et al., 1996). Interestingly, some women appear to be more genetically predisposed to infection; there is a greater risk of infection in women with type B or AB blood, and recurrent UTIs correlate with women bearing the human leukocyte antigen A3 subtype (Lomberg et al., 1986; Stapleton, Nudelman, Clausen, Hakomori, & Stamm, 1992).

Bacteria have developed different means by which to overcome host defenses. The best studied of the bacterial virulence mechanisms are “adhesins” on bacterial surfaces and fimbriae, also known as pili. These adhesins enhance the ability of bacteria to adhere to mucosal cells of the bladder lining while bacterial motility is enhanced via flagellae (Bryan, Sutcliffe, & McGee, 1973; Lane & Mobley, 2007; Servin, 2005; Vaisanen et al., 1981). Other virulence factors include the ability of some bacteria to produce hemolysins and colicin V, while Proteus produces urease, which can ultimately contribute to the formation of struvite stones (Mobley, Island, & Massad, 1994). Multiple drug resistant bacteria are increasingly being observed in urinary isolates from community-dwelling women across North America (Zhanel et al., 2005).

**Evaluation**

**Clinical Presentation**
A UTI may present with diverse symptoms and signs. The most common complaints are acute painful voiding (dysuria), urinary frequency and urgency, nocturia, and suprapubic discomfort. Mild incontinence, hematuria, and systemic symptoms may be reported. On average, a UTI results in 6.1 days of symptoms, 2.4 days of decreased activity, 1.2 days of lost time at work or school, and 0.4 days in bed (Foxman, 2002). A progression to upper tract infection should be suspected when the patient also reports fever, chills, malaise, nausea and vomiting, and flank pain. On examination, it is important to note the patient’s temperature and to document the abdominal examination and presence or absence of costovertebral angle tenderness. Dependent on the patient’s complaints, a pelvic examination is required to evaluate for vaginitis or cervicitis.

**Laboratory Diagnosis**
When a UTI is suspected by history, the initial laboratory evaluation is often an office urine kit, a “dipstick.” The gold standard for urine specimen collection is suprapubic aspiration, but this typically is not necessary nor well-tolerated by patients for the assessment of most UTIs (Stamm et al., 1980). The next most preferred method of urine collection is a midstream clean catch; this requires local disinfection followed by spreading the labia or holding back the foreskin and then collecting a midstream urine specimen in a sterile cup. In patients unable to negotiate a clean midstream collection, transurethral catheterization is permissible. For most office dipsticks, the presence of nitrates provides the most useful information. In order to have nitrates in the urine, bacteria with nitrate reductase must be present (for example, some E. coli and Proteus), and there must be dietary nitrate to convert. This test is very specific (92% to 100%) but not too sensitive (only 25%). False positives may occur when the urine is turned red, as with beets or phenazopyridine. Leukocyte esterase is an enzyme present in neutrophil granules. The sensitivity of this test is directly related to bacterial load (75% to 96%) and is very specific (94% to 98%) (Pappas, 1991; Rahn, Boreham, Allen, Nihira, & Schaffer, 2005).

Urine microscopy is then generally performed on an uncontaminated specimen. In an uncontaminated specimen, there are few epithelial cells. Pyuria (literally, pus in the urine) means there are more than 10 white cell per high power field.
blood cells per microliter (or 10,000 per milliliter); the presence of pyuria is 80% to 95% sensitive and 50% to 75% specific for an infection (Stamm, 1983; Wilson & Gaido, 2004). The absence of pyuria strongly suggests a non-infectious cause with the caveat that in pregnancy, the presence of pyuria is less sensitive for infection. In the setting of an infection with less than \(10^4\) cfu/mL, observing one or more bacteria on a gram-stained specimen correlates highly with the presence of a UTI, having a sensitivity of 80%, specificity of 90%, and positive predictive value of 85% (Fihn & Stamm, 1983).

The urine culture is often not necessary in the treatment of an uncomplicated infection. It may be collected as a screening tool if the dipstick and urinalysis are inconclusive, in settings of recurrent infection, prior infection unresolved with antibiotics, or if there are signs or symptoms of an upper tract infection. The traditional interpretation of urine cultures is that it is positive for an infection when greater than \(10^5\) cfu/mL are present. However, 46% of women with symptomatic UTIs have just \(10^1\) to \(10^4\) cfu/mL; therefore, a newer interpretation would be to deem a symptomatic woman with greater than \(10^2\) cfu/mL as positive (Kunin, White, & Hua, 1993). This distinction is not made by all laboratories, so it is important to know the local reporting practice of one’s diagnostic laboratory.

Differential Diagnosis

Most patients presenting with acute dysuria will have a UTI, but other diagnoses should be entertained. The presence of pyuria is not entirely specific for a UTI. White blood cells in the urine may also be noted in women with vaginitis, urethritis, or with certain sexually transmitted diseases. Patients need to be asked about vaginal discharge, odor, and associated dyspareunia. Appropriate testing should be undertaken to diagnose Trichomonas, candidiasis, Chlamydia trachomatis, Neisseria gonorrhoeae, or herpes simplex virus.

In patients with dysuria but without pyuria, the differential diagnosis includes trauma related to intercourse, estrogen deficiency, interstitial cystitis, or an irritant urethritis. Irritation may commonly occur with the use of a new contraceptive gel, condom, or tampon (Bergman, Karram, & Bhatia, 1989; Karram & Siddighi, 2008).

Imaging

To a limited extent, certain imaging modalities may be useful in the diagnosis and assessment of UTIs. For patients with recurrent or persistent UTIs or in patients with asymptomatic microscopic hematuria, cystourethrocscopy is used to evaluate the lower urinary tract for pathology, such as stones, diverticulae, polyps, cancer, or anatomical abnormalities. Cystitis may appear as diffuse inflammation throughout the bladder with erythematous, non-raised lesions, or multiple small clear cysts after a resolved UTI known as “cystitis cystica” (Engel, Schaeffer, Grayhack, & Wendel, 1980).

Evaluation of the upper urinary tract via intravenous pyelogram or computed tomography is indicated when there has been a history of prior upper tract infections, a history of childhood infections, or when there is recurrent infection caused by the same organism. For instance, urea-splitting organisms, such as Proteus, are often associated with infected stones. These studies are also appropriate in the evaluation of painless hematuria, with a history of prior stones or ureteral obstruction, and in rapidly recurrent infections. When one specifically wants to assess for the presence of a urethral diverticulum, most authors recommend magnetic resonance imaging or a voiding cystourethrogram (Karram & Siddighi, 2008).

Treatment

General Measures, Initial or Uncomplicated Infections

For the patient with an uncomplicated acute UTI, preliminary interventions may include rest and hydration (Pollen, 1995). Short-term use of urinary analgesics is often helpful with agents such as phenazopyridine (Pyridium®) and urised (Urisept®). Pyridium should be avoided in patients who are allergic to sulfa. (Amit & Halkin, 1997). There is some evidence that cranberry juice or its extract may be protective in developing cystitis via decreasing bacterial adherence (Schmidt & Sobota, 1988; Sobota 1984).

Ultimately, antibiotics will be required. The ideal medication would have a higher concentration in the bladder than in other tissues, in particular, the vagina and bowel. Some commonly prescribed medications do adversely affect the normal vaginal flora. Ampicillin results in 25% of patients developing a yeast vaginitis; tetracycline results in 80% yeast vaginitis. However, nitrofurantoin (Macrobid®) has no significant serum level and excellent activity against E. coli. Trimethoprim/sulfamethoxazole (TMP-SMX) (Bactrim®, Septra®) has only a moderate effect on bowel and vaginal flora, and has the benefit of BID dosing, but up to 39% of E. coli are resistant to the medication in community-acquired UTIs (Gupta, Sahm, Mayfield, & Stamm, 2001; Kahlmeter, 2000).

With respect to specific medications, nitrofurantoin has been well studied. It has been used for several decades and is generally well tolerated. There is a low level of resistance among E. coli and gram-positive cocci and many gram-negative bacteria. It is inactive against most Proteus, some Enterobacter, and some Klebsiella. This medication still requires a 7-day treatment course; when comparing the 3-day regimens, TMP-SMX is more
effective than 3-day nitrofurantoin (Hooton, Winter, Tiu, & Stamm, 1995; Katchman et al., 2005; Norrby, 1990).

Quinolone derivatives (such as ciprofloxacin [Cipro®]) are very effective for gram-negative bacteria, with expanded coverage against P. aeruginosa and gram-positive bacteria. Some of the antibiotics in this family are available in intravenous form. High cost often limits routine use of this class, and bacterial resistance is increasing (Andriole, 1991). Quinolones are inappropriate in women who are pregnant, nursing mothers, and in adolescents less than 18 years old. Women who may become pregnant should consider contraceptive use concomitant with quinolone antibiotics.

When treating a first UTI or infrequent reinfection, 3-day antibiotic regimens have been shown to be superior to single-dose regimens and are usually equally as effective as 7-day regimens with fewer side effects and better compliance (Hooton et al., 1995; Katchman et al., 2005). Single-dose regimens have a higher treatment failure rate and are less likely to be effective if there is an undiagnosed complicating factor, such as diabetes mellitus, pregnancy, or an anatomical abnormality. This single dose type of treatment is also suboptimal in the setting of an occult upper tract UTI. Ideally, one will have knowledge of the local susceptibility profile of the community’s common pathogens and use this to tailor empiric treatment decisions. An initial treatment of TMP-SMX for 3 days is recommended for patients with an uncomplicated UTI if there is no allergy to sulfas medications and if local E. coli resistance is not greater than 20% (Hooton et al., 2004). Next, a fluoroquinolone is used for patients allergic to TMP-SMX, if there is significant TMP-SMX resistance, in cases of complicated cystitis, or if patients have moderate to severe symptoms. Finally, nitrofurantoin (7-day) may be used as a fluoroquinolone sparing agent for patients with mild to moderate symptoms who are allergic to TMP-SMX, or if the community is at risk for significant TMP-SMX resistance (Hooton et al., 2004).

**Recurrent Infection**

Recurrent infection refers to women with three or more culture-documented infections in a year, or two or more in six months (Schaffer, 2004). Of women who develop UTIs, 22% have recurrent infections. The urine culture and sensitivity is helpful for documenting whether the recurrence is a relapse of the same bacteria versus a reinfection with a different strain. Relapse occurring after an appropriate course of antibiotics, especially if the relapse occurs within 2 weeks, warrants a more thorough investigation of the upper and lower urinary tracts. For example, one may rule out an infected stone. Other sources contributing to relapse are listed in Table 3 (Karram & Siddighi, 2008). Re-infection with a new or different strain of bacteria almost always indicates a new ascending infection. The appropriate management of recurrent infections is to first obtain sterile urine. Then, the patient is encouraged to change behaviors that may contribute to reinfection; for instance, spermicides and diaphragms should be discontinued in favor of alternative contraception. Patients should also void after coitus, try liberal fluid intake, and perhaps initiate drinking cranberry juice (Schmidt & Sobota, 1988; Sobota, 1984). Thereafter, three options exist for antibiotic prophylaxis; these are continuous prophylaxis, postcoital prophylaxis, or self-start (patient-initiated) therapy (Foxman, 1990; Nicolle & Ronald, 1987).

**Prophylaxis**

Continuous prophylaxis is the recommended initial therapy for recurrent UTIs (Nicolle & Ronald, 1987). The most common options are for nitrofurantoin 100 mg, cephalaxin (Keflex®) 250 mg, or TMP-SMX 1 tablet every night for 6 months. These therapies are cost effective. After 6 months of therapy, patients may be frequently re-cultured as necessary. Postcoital prophylaxis involves the administration of a single antimicrobial tablet before or after intercourse (Stapleton, Latham, Johnson, & Stamm, 1990). In 135 sexually active perimenopausal women, post-coital therapy was as effective as daily prophylaxis but required only one-third the amount of drug (Melekos et al., 1997). As noted above, patients using diaphragms and spermicides should be encouraged to try alternative means of contraception. Finally, self-start therapy may be considered for motivated, compliant patients who have good relationships with their providers. Patients generally submit a urine culture at the outset of symptoms and then start an empiric 3-day antibiotic regimen. Patients should be notified to call their provider if symptoms have not improved within 48 hours (Gupta, Hooton, Roberts, & Stamm 2001).

As a final caveat, infections in post-menopausal women with recurrent UTIs should be treated,
but appropriate patients should also be started on vaginal estrogen replacement. A randomized controlled trial of 93 women with recurrent infections demonstrated that those women who received topical intravaginal estrogen significantly reduced the incidence of UTI compared to women using a placebo (0.5 versus 5.9 episodes per patient year, respectively) (Raz & Stamm, 1993).

**Other Clinical Scenarios**

**Asymptomatic Bacteriuria**

Asymptomatic bacteriuria (ASB) is diagnosed when two consecutive urine cultures grow greater than 10^5 cfu/mL in patients without the symptoms of an acute UTI. Studies have demonstrated that treatment is generally not required in these patients, and there is no increased risk of permanent renal injury or sepsis. There are exceptions, however. Women who are pregnant, patients with infections involving *Proteus*, patients with severe diabetes mellitus, and men about to undergo transurethral resection of the prostate all require treatment in the setting of ASB. ASB treatment is controversial but possibly indicated in the elderly and before urodynamic testing, or before other urologic procedures during which mucosal bleeding is anticipated (Nicolle et al., 2005).

**Catheter Associated Infections**

UTIs related to indwelling transurethral catheters are the most common cause of hospital-acquired infection. The first priority in catheter care and management should be aseptic technique in an attempt to avoid subsequent infection. Table 4 lists these guidelines; they include avoiding unnecessary catheterization, removing the catheter as soon as possible, and anchoring the catheter to the thigh to avoid traction against the urethra (Cravens & Zweig, 2000). For patients who require long-term indwelling catheters, bacteriuria is virtually inevitable. As in other patients with ASB, if these catheterized patients have no local or systemic signs or symptoms of infection, antibiotic treatment is not required. In patients with symptoms of infection, urine culture is the best means of diagnosing a UTI. Ideally, the urine specimen should be retrieved using a fresh catheter. If this is not possible, urine should be aspirated directly from the catheter and never from the collection bag. The treatment regimen should be a 10 to 14-day course of antibiotics based on the culture and sensitivity results, and a fresh catheter (or intermittent self catheterization) should be used while the infection is clearing (Niel-Weise & van den Broek, 2005; Tenney & Warren, 1988; Trautner & Darouiche, 2004; Shah, Cannon, Sullivan, Nemchausky, & Pachucki, 2005). Some authors argue for a routine exchange of the catheter every 8 to 12 weeks in an attempt to prevent infection.

**Pregnancy**

During pregnancy, there are many physiologic changes that occur that predispose a woman to UTI and to progression of a UTI or ASB to pyelonephritis. Hormonal effects, largely due to progesterone, of pregnancy include ureteral dilation, and sluggish peristalsis. Vesicoureteral reflux may also occur, and the enlarging uterus causes external compression of the ureters with particularly the right ureter being affected due to dextro-rotation of the uterus. During pregnancy, the bladder mucosa is hyperemic and edematous. All of these changes contribute to common urinary complaints during pregnancy, such as frequency, nocturia, and incontinence (Beydoun, 1985; Francis, 1960; Heidrick, Mattingly, & Ambert, 1967; Mattingly & Borkowf, 1978; Thorpe et al., 1999).

Bacteriuria develops in 2% to 7% of pregnancies; if left untreated, women who are pregnant have a greater propensity to progress to pyelonephritis (40%). These infections are associated with increased risk of preterm birth, low birth weight, and perinatal mortality (Naeye, 1979). Cystitis treatment requires a 7-day course of either penicillin/cephalosporin or nitrofurantoin. TMP-SMX is avoided in the first trimester because TMP is a folic acid antagonist, and it should also be avoided at term because sulfonamides can displace bilirubin causing kernicterus in the newborn. TMP-SMX is acceptable and effective in the second trimester. Quinolones and tetracyclines are contraindicated in pregnancy. If a pregnant woman with cystitis develops a fever or flank pain, pyelonephritis should be presumed. Most authors recommend admission for intravenous antibiotic therapy followed by antibiotic suppression for the remainder of the pregnancy (Kass, 1960; Patterson & Andrile, 1997; Sweet, 1977; Vazquez & Villar, 2000).

### Table 4.

**Guidelines for Aseptic Care of a Urinary Catheter**

<table>
<thead>
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<th>Guideline</th>
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<tbody>
<tr>
<td>Avoid unnecessary catheterization and remove catheter as soon as possible.</td>
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<tr>
<td>After sterile insertion, anchor catheter to prevent urethral traction.</td>
</tr>
<tr>
<td>Monitor urine level in bag q 4 hour; exchange catheter if cessation of flow for &gt; 4 hours</td>
</tr>
<tr>
<td>Fluid intake of 1.5 L or more per day.</td>
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<tr>
<td>Avoid catheter manipulation.</td>
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<tr>
<td>Exchange catheter if infection suspected.</td>
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UROLOGIC NURSING / October 2008 / Volume 28 Number 5
Acute Pyelonephritis

The diagnosis of pyelonephritis is suspected when patients present with flank pain, nausea and vomiting, fever greater than 38 degrees Celsius, and/or costovertebral angle tenderness. Patients may or may not also have classic cystitis symptoms (Fairley et al., 1971). Acute pyelonephritis accounts for greater than 250,000 annual hospitalizations per year in the U.S. (Stamm et al., 1989). In the diagnostic evaluation, urinalysis reveals pyuria in virtually all cases; blood cultures will be positive in 10% to 20% of cases. The same pathogens observed in cystitis patients are responsible for pyelonephritis.

The initial treatment decision is often whether these patients require inpatient versus outpatient management. Appropriate patients for hospital admission include severely ill or markedly debilitated patients, patients with an uncertain diagnosis, women who are pregnant, those unable to tolerate oral intake, and those for whom there is concern about compliance with the prescribed antibiotic regimen. Patients treated as outpatients must be available for contact in 2 to 3 days to assure symptoms are improving.

The empiric antibiotic choice is typically an aminoglycoside or a fluoroquinolone (such as ciprofloxacin 500 mg PO BID) because these achieve high tissue levels in the kidneys. Ampicillin and sulfonamides should be avoided because the level of resistance is too high in most communities. Patients need to complete a 14-day regimen in total, and antibiotics may be tailored once urine culture and sensitivity results are available (Stamm, McKevitt, & Counts, 1987). A spiral-computed tomography scan or renal sonogram should be considered to radiographically evaluate the upper urinary tract in patients after 2 recurrences of pyelonephritis or if the patient has any complicating factor (Warren et al., 1999; Wyatt, Urban, & Fishman, 1995).

Summary

UTIs are a very prevalent problem for women from puberty through their postmenopausal years, and the diagnosis will only become more common as the U.S. population ages. Acute cystitis is generally easily diagnosed by a consistent constellation of symptoms, including dysuria, frequency, urgency, and suprapubic pain. In uncomplicated infections, urine culture (the gold standard for diagnosing bacteruria and cystitis) is often not required because these UTIs respond well to multiple available antibiotic regimens. Microscopic urinalysis with assessment for pyuria is often helpful in narrowing the differential diagnosis. For patients with complicated or recurrent infections, however, urine culture is necessary because a relapsing infection of the same bacterial strain may prompt further imaging of the upper and lower urinary tracts to detect other abnormalities. These patients often require more rigorous regimens of antibiotic treatment, including long-term prophylaxis, postcoital therapy, or self-start therapy. Infections associated with transurethral catheterization or pregnancy require special attention and management in order to prevent progression to pyelonephritis, which may be associated with significant morbidity.

References


Raz, R., & Stamm, W.E. (1993). A controlled trial of intravaginal estril in postmenopausal women with recur-


New England Journal of Medicine, 307(8), 463-468.


