

162 Urinary Tract Infections, Pyelonephritis, and Prostatitis

Kalpana Gupta, Barbara W. Trautner

strain of *C. difficile*. None of these biotherapeutic approaches has been approved by the FDA for use in the United States. Other non-FDA-approved antibiotic strategies include (1) sequential treatment with vancomycin (125 mg four times daily for 10–14 days) followed by rifaximin (400 mg twice daily for 14 days) and (2) treatment with nitazoxanide (500 mg twice daily for 7 days). IV immunoglobulin, which has also been used with variable success, presumably provides antibodies to *C. difficile* toxins.

SEVERE COMPLICATED OR FULMINANT CDI

Fulminant (rapidly progressive and severe) CDI presents the most difficult treatment challenge. Patients with fulminant disease often do not have diarrhea, and their illness mimics an acute surgical abdomen. Sepsis (hypotension, fever, tachycardia, leukocytosis) may result from severe CDI. An acute abdomen (with or without toxic megacolon) may include signs of obstruction, ileus, colon-wall thickening and ascites on abdominal CT, and peripheral-blood leukocytosis ($\geq 20,000$ WBCs/ μ L). With or without diarrhea, the differential diagnosis of an acute abdomen, sepsis, or toxic megacolon should include CDI if the patient has received antibiotics in the past 2 months. Cautious sigmoidoscopy or colonoscopy to visualize PMC and abdominal CT are the best diagnostic tests in patients without diarrhea.

Medical management of fulminant CDI is suboptimal because of the difficulty of delivering oral fidaxomicin, metronidazole, or vancomycin to the colon in the presence of ileus (Table 161-2). The combination of vancomycin (given via nasogastric tube and by retention enema) plus IV metronidazole has been used with some success in uncontrolled studies, as has IV tigecycline in small-scale uncontrolled studies. Surgical colectomy may be life-saving if there is no response to medical management. If possible, colectomy should be performed before the serum lactate level reaches 5 mmol/L. The incidence of fulminant CDI requiring colectomy appears to be increasing in the evolving epidemic; however, morbidity and death associated with colectomy may be reduced by performing instead a laparoscopic ileostomy followed by colon lavage with polyethylene glycol and vancomycin infusion into the colon via the ileostomy.

PROGNOSIS

The mortality rate attributed to CDI, previously found to be 0.6–3.5%, has reached 6.9% in recent outbreaks and rises progressively with increasing age. Most patients recover, but recurrences are common.

PREVENTION AND CONTROL

Strategies for the prevention of CDI are of two types: those aimed at preventing transmission of the organism to the patient and those aimed at reducing the risk of CDI if the organism is transmitted. Transmission of *C. difficile* in clinical practice has been prevented by gloving of personnel, elimination of the use of contaminated electronic thermometers, and use of hypochlorite (bleach) solution for environmental decontamination of patients' rooms. Hand hygiene is critical; hand washing is recommended in CDI outbreaks because alcohol hand gels are not sporicidal. CDI outbreaks have been best controlled by restricting the use of specific antibiotics, such as clindamycin and second- and third-generation cephalosporins. Outbreaks of CDI due to clindamycin-resistant strains have resolved promptly when clindamycin use is restricted. Future preventive strategies are likely to include use of monoclonal antibodies, vaccines, and biotherapeutics containing live organisms that will restore colonization protection in the microbiota.

Urinary tract infection (UTI) is a common and painful human illness that, fortunately, is rapidly responsive to modern antibiotic therapy. In the preantibiotic era, UTI caused significant morbidity. Hippocrates, writing about a disease that appears to have been acute cystitis, said that the illness could last for a year before either resolving or worsening to involve the kidneys. When chemotherapeutic agents used to treat UTI were introduced in the early twentieth century, they were relatively ineffective, and persistence of infection after 3 weeks of therapy was common. Nitrofurantoin, which became available in the 1950s, was the first tolerable and effective agent for the treatment of UTI.

Since the most common manifestation of UTI is acute cystitis and since acute cystitis is far more prevalent among women than among men, most clinical research on UTI has involved women. Many studies have enrolled women from college campuses or large health maintenance organizations in the United States. Therefore, when reviewing the literature and recommendations concerning UTI, clinicians must consider whether the findings are applicable to their patient populations.

DEFINITIONS

UTI may be asymptomatic (subclinical infection) or symptomatic (disease). Thus, the term *urinary tract infection* encompasses a variety of clinical entities, including asymptomatic bacteriuria (ASB), cystitis, prostatitis, and pyelonephritis. The distinction between symptomatic UTI and ASB has major clinical implications. Both UTI and ASB connote the presence of bacteria in the urinary tract, usually accompanied by white blood cells and inflammatory cytokines in the urine. However, ASB occurs in the absence of symptoms attributable to the bacteria in the urinary tract and does not usually require treatment, while UTI has more typically been assumed to imply symptomatic disease that warrants antimicrobial therapy. Much of the literature concerning UTI, particularly catheter-associated infection, does not differentiate between UTI and ASB. In this chapter, the term *UTI* denotes symptomatic disease; *cystitis*, symptomatic infection of the bladder; and *pyelonephritis*, symptomatic infection of the kidneys. *Uncomplicated UTI* refers to acute cystitis or pyelonephritis in nonpregnant outpatient women without anatomic abnormalities or instrumentation of the urinary tract; the term *complicated UTI* encompasses all other types of UTI. *Recurrent UTI* is not necessarily complicated; individual episodes can be uncomplicated and treated as such. *Catheter-associated bacteriuria* can be either symptomatic (CAUTI) or asymptomatic.

EPIDEMIOLOGY AND RISK FACTORS

Except among infants and the elderly, UTI occurs far more commonly in females than in males. During the neonatal period, the incidence of UTI is slightly higher among males than among females because male infants more commonly have congenital urinary tract anomalies. After 50 years of age, obstruction from prostatic hypertrophy becomes common in men, and the incidence of UTI is almost as high among men as among women. Between 1 year and ~50 years of age, UTI and recurrent UTI are predominantly diseases of females. The prevalence of ASB is ~5% among women between ages 20 and 40 and may be as high as 40–50% among elderly women and men.

As many as 50–80% of women in the general population acquire at least one UTI during their lifetime—uncomplicated cystitis in most cases. Recent use of a diaphragm with spermicide, frequent sexual intercourse, and a history of UTI are independent risk factors for acute cystitis. Cystitis is temporally related to recent sexual intercourse in a dose-response manner, with an increased relative risk ranging from 1.4 with one episode of intercourse to 4.8 with five episodes of intercourse in the preceding week. In healthy postmenopausal women, sexual activity, diabetes mellitus, and incontinence are risk factors for UTI.