Acute Cystitis (Urinary Tract Infection, UTI) — Symptoms and Treatment

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Acute cystitis is defined as the acute infectious inflammation of the urinary bladder. Uncomplicated acute cystitis means that the patient does not have any structural abnormalities and is not immunocompromised. Patients usually present with dysuria, urinary urgency, urinary frequency and suprapubic pain/tenderness. Urine analysis usually reveals pyuria. Trimethoprim-sulfamethoxazole is the treatment of choice for uncomplicated cases, while ciprofloxacin should be preserved for complicated cases.

Definition of Acute Cystitis

Acute cystitis is defined as an acute inflammation of the urinary bladder. It is a type of urinary tract infection that is common among women.
**Acute uncomplicated cystitis** occurs in persons with a normal unobstructed genitourinary tract and without any history of instrumentation. It commonly occurs in young sexually active women.

**Epidemiology of Acute Cystitis**

Approximately 7 million people present to the outpatient clinic due to acute cystitis. This is associated with tremendous costs on the health care system, up to $1.6 billion. The urinary tract infections, including acute cystitis, are common among sexually active women. In the United States, 1 out of 3 women aged 20-40 years has a urinary tract infection.

The risk factors include recent use of antibiotics, sexual intercourse, abnormal urinary tract anatomy, urethral instrumentation and urinary tract obstruction by stones or other disease processes.

The most common identified causative organism is *Escherichia coli*. *Staphylococcus saprophyticus*, *Klebsiella* species, and *Proteus* are responsible for most of the remaining cases.

**Most common etiology:** *Escherichia coli*

Only a few serogroups cause most infections, e.g., “uropathogenic *E. coli***.”

**Pathophysiology of Acute Cystitis**

The urinary tract system should be sterile. *Escherichia coli* normally inhabits the periurethral vaginal opening and can ascend to the bladder and invade the bladder mucosal lining. The presence of pathologic *E. coli* would result in **inflammation of the bladder (cystitis)**.

**Adhesins** that are expressed on the bacterial surfaces play an important role in the adhesion of bacteria to the urinary epithelium.

**Host resistance** also plays a role in the pathophysiology of urinary tract infections’ predisposition.
Sexual intercourse, urinary tract obstruction and instrumentation for instance by urethral catheterization puts the patient at risk of developing urinary tract infections and cystitis.

Women have a higher incidence of acute cystitis because:

- Shorter urethra in women; closer to anus and colon flora.
- Causative organisms colonize the vaginal introitus and periurethral area.
- Massage of the urethra in women during sexual intercourse forces bacteria into the bladder.
- Motile bacteria can ascend the urinary tract against the urinary stream.

Lactobacilli are nonpathogenic bacteria that colonize the vagina in healthy premenopausal women. Recent use of antibiotics for any indication can eradicate this bacterium, allowing room for uropathogenic bacteria to grow and colonize the urogenital tracts.

### Clinical Presentation of Acute Cystitis

Patients with acute cystitis complain of irritative lower urinary tract symptoms i.e. burning micturition (dysuria), urinary urgency, and frequency. These patients may also complain of fever, lower abdominal or flank pain, and hematuria. These patients are often not toxic or severely ill. If the patient has fever, chills, and severe costovertebral angle tenderness the possibility of acute pyelonephritis should be excluded.

Urinary frequency is different from polyuria. In urinary frequency, the patient has to urinate multiple times, but the total volume of urinary output is not increased. In polyurea, the total volume of urinary output is increased, for instance, in patients with diabetes insipidus, diabetes mellitus or nephrotic syndrome.

Suprapubic tenderness is common in patients with acute cystitis. Because of the overlap of the symptoms with the pelvic inflammatory disease, a pelvic examination is indicated. Patients with acute cystitis in contrast to pelvic inflammatory disease should not have cervical tenderness or vaginitis.

### Diagnostic Workup of Acute Cystitis

Urine analysis is the first step towards the diagnosis. The presence of > 10 white blood cells per ml of urine or pus (pyuria) indicates urinary tract infection. Nitrate tests detect the presence of uropathogens by detecting the byproducts of the bacterial nitrate reductase enzymes. The specificity of this test can be as high as 100 %.

However, the gold standard for the diagnosis of urinary tract infections remains urine culture. Patients with > 100,000 colony-forming units per ml of urine are diagnosed with acute cystitis.

Complete blood counts may show elevated white blood counts with neutrophilia.

Presumptive diagnosis: presence of pyuria

- > 10 WBC/μl of mid-stream urine in counting chamber
- > 5-10 WBC/high-power microscopic field in a centrifuged urine sample
- Dipstick leukocyte esterase test:
  - Sensitivity: 75—96 %
  - Specificity: 94—98 %
Microscopic hematuria.
- Urine culture: > 10^5 bacteria/ml (most patients):
  - < 10^7/ml in some symptomatic patients
- Gram stain of uncentrifuged, mid-stream urine:
  - Presence of 1 organism/microscopic field = 10^5 organisms/ml

Treatment of Acute Cystitis

Antibiotics are the mainstay of treatment of acute cystitis but the recent data shows that symptoms can resolve without any specific treatment. Therefore, some experts are recommending allowing for a 48-hour delay with antibiotic treatment if the patient agrees to see if their symptoms would improve on their own.

![Image: "Structural formulae of dihydrofolate reductase inhibitor trimethoprim and sulfonamide antibiotic sulfamethoxazole. Both are components of a combination drug trimethoprim/sulfamethoxazole (BAN—co-trimoxazole), sold under the brand names Septa and Bactrim." By Vaccinationist - Own work. License: Public Domain](image-url)

If antibiotics are going to be used, the first-line therapy is usually trimethoprim-sulfamethoxazole. Ciprofloxacin should not be used in uncomplicated cases of acute cystitis to lower the risk of developing resistant organisms. Once antibiotic therapy is started, symptoms usually take six days to resolve.

Patients who cannot receive trimethoprim-sulfamethoxazole for some reason, such as allergic reactions to sulfonamides can receive fosfomycin or ciprofloxacin.

Patients with complicated acute cystitis due to a history of recurrent urinary tract infections, being pregnant or having diabetes mellitus should receive ciprofloxacin as first-line therapy.

More sick patients who cannot tolerate oral antibiotics should receive intravenous ciprofloxacin or ampicillin plus gentamicin.

Patients with asymptomatic bacteriuria who are not pregnant should not receive any specific treatment. On the other hand, pregnant women with asymptomatic bacteriuria might benefit from antibiotic therapy.
**Antibacterial agent choices**

Good activity against an offending pathogen with least effect on vaginal and intestinal flora:

- Nitrofurantoin (5 days), fosfomycin (1 day), TMP/SMX (3 days), pivmecillinam (3-7 days);
- Fluoroquinolones (3 days) – held in reserve.

**Management of recurrent cystitis**

- Trimethoprim/sulfamethoxazole (TMP/SMX) (single strength), nitrofurantoin or fluoroquinolone after intercourse
- Long-term prophylaxis: Nightly nitrofurantoin 50 mg, TMP/SMX (half tablet) or a fluoroquinolone

**References**


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