

## Urinary Tract Infections

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### ABSTRACT

*The urinary system can be divided into upper urinary tract which they do kidneys who create urine bladder urinary and ureters through which urine is coming to the bladder, and lower urinary which they do bladder and urethra. This division is important because infections of the upper urinary tract are considered complicated infections and often require hospitalization.*

**Keywords:** *Infections, Urethra, Bladder*

### INTRODUCTION

Vulvovaginal symptoms are among the most frequent reasons why a woman seeks care from a clinician [1]. Women perceive vulvovaginal symptoms such as discharge, odor, pain, and itching in unique ways. One woman may be extremely uncomfortable with these symptoms, another may feel only minor distress, a third may be very anxious, and a fourth may be mildly concerned. Women's reactions depend on many factors, including their previous experiences or knowledge; concurrent or chronic medical conditions; societal, religious, and cultural beliefs; and the number and severity of symptoms.

Genital tract infections affect millions of people worldwide, and clinicians may encounter a variety of clinical presentations in both men and women [2]. Diagnostic modalities have advanced rapidly with the development of polymerase chain reaction (PCR) and other highly sensitive techniques, and it is essential for clinicians to quickly and accurately recognize presenting symptoms of the various infections and select the appropriate diagnostic tests. In addition, antibiotic resistance has made treatment selection more challenging, and recent recommendations have changed. Pregnancy further complicates the picture of genital tract infections, both for diagnosis and management.

### SECRETIONS

During reproductive years, vaginal secretions are a normal, regularly occurring experience [1]. The numerous variations in the amount and characteristics of vaginal secretions are determined by physiology, timing in relation to

the menstrual cycle, use of local or systemic medications, sexual practices, and pathology. Women who have adequate endogenous or exogenous estrogen will have vaginal secretions. The major source of these secretions is the cervical mucosa, although small amounts are also secreted by the Bartholin, sebaceous, sweat, and apocrine glands of the vulva. Unique combinations of organisms in the vagina are believed to protect a woman by providing an initial line of defense against infection through production of lactic acid by *Lactobacillus* species, which maintain the vaginal pH between 3.5 and 4.5. Conversely, the growth of opportunistic and pathogenic organisms is facilitated when the woman uses antibiotics, vaginal lubricants, hormonal contraceptives, or douching, and is affected by other behavioral and intrinsic factors. However, at least some women with minimal *Lactobacilli* populations are otherwise healthy and do not report vaginal symptoms.

### URINARY TRACT INFECTIONS

Urinary tract infections (UTIs) are among the most common bacterial infections encountered in medicine [3]. Accurately estimating incidence is difficult because UTIs are not reportable, but estimates range from 650,000 to 7 million office visits per year.

A UTI is defined by urologists as any infection involving the urothelium, which includes urethral, bladder, prostate, and kidney infections. Some of these are diseases that have been clearly characterized (eg, cystitis and pyelonephritis), whereas others (eg, urethral and prostate infections) are not as well understood or described.

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The epidemiology of urinary infection varies with age, gender, and underlying risk factors [4]. During the first year of life, the cumulative prevalence of UTI in men is approximately 0.2%. These infections are frequently symptomatic, and require urologic investigation because of the possibility of underlying congenital anomalies. Urinary infections are subsequently rare in male children, with a cumulative incidence by the age of 10 years of less than 1%. The presence of a foreskin increases by at least 5-fold the probability of urinary infection during childhood. Among girls, the cumulative incidence of UTI during the first 10 years of age is 3%. UTIs in infancy and early childhood can be associated with symptomatic pyelonephritis, persisting renal infection with failure of renal growth, and extensive renal scarring. As a result, urinary infections in early childhood are investigated and managed more aggressively. Treatment is usually prescribed, and follow-up cultures should be done to ensure cure. However, asymptomatic bacteriuria in a normal urinary tract in girls older than age 6 years is usually benign, and aggressive investigation and management only warranted with recurrences.

Acute cystitis is by far the most common clinical presentation of urinary infection in adults. Urinary infections are extremely common in sexually active women, with at least one third of women having had an episode of symptomatic UTI within 10 years of the initiation of sexual activity. In a prospective study of sexually active women in a health management organization, 50 of every 100 women, had acute cystitis each year. Extrapolating from these data would suggest that at least 25 million episodes of acute cystitis occur annually in the United States. Studies have shown that sexual intercourse and the use of spermicides, with or without a diaphragm, are predisposing factors for UTIs among sexually active women. Condoms coated with nonoxyl-9 also increase the risk of cystitis. Many other factors have been studied and seem not to be significant in predisposing to acute cystitis. These include voiding habits, bathing, intake of fluid, voiding after intercourse, the direction of wiping after defecation, douching habits, types of menstrual protection, or perineal hygiene. However, recent antecedent antimicrobial use, and in particular the use of beta-lactam antibiotics, alters normal vaginal flora and predisposes women to cystitis.

There are two primary routes by which bacteria invade the urinary system [5]. In what is by far the most common route of infection, bacteria gain access to the bladder via the urethra.

Urinary tract infections are common in women because the relatively short female urethra allows retrograde passage of bacteria into the bladder. In contrast, urinary tract infection in men is a rare event in the absence of a urethral catheter or unless there is obstruction of the urethra (eg, prostatic hyperplasia), preventing adequate bladder drainage. Once bacteria have entered the bladder, they may under some circumstances ascend the ureters to the renal pelvis and parenchyma. This process is facilitated by the presence of vesicoureteral reflux. For example, in the renal transplant patient, the transplanted kidney is placed in the pelvis with the ureter surgically implanted in the bladder; as a result, simple cystitis frequently leads to acute transplant pyelonephritis.

The majority (70–95%) of cases of community-acquired acute urinary tract infections are caused by *E. coli*, with *Staphylococcus saprophyticus*, enterococci, *Proteus mirabilis*, *Klebsiella* species, and *Enterobacter* species identified in most of the remaining cases. The list of etiologic agents is modified by factors such as use of indwelling urinary catheters, residence in an institutionalized setting, urinary tract instrumentation, immunosuppression, or recent broadspectrum antibiotic administration. In any of these settings, multidrug-resistant gram-negative bacilli, coagulase-negative staphylococci, or *Candida* species may be responsible for infection.

## PELVIC INFLAMMATORY DISEASE

There have long been concerns that use of intrauterine methods increases a woman's risk of developing pelvic inflammatory disease (PID) [6]. As pelvic inflammatory disease is largely the result of a bacterial infection ascending from the cervix into the upper reproductive tract, the concern is predominantly that insertion of an intrauterine device may facilitate this process. The evidence supporting this concern is lacking and generally much of the available evidence in this area is subject to limitations, confounding, and bias.

The insertion procedure and a woman's background risk of sexually transmitted infections (STIs) are the most likely contributing factors to the development of PID in intrauterine device users. In the first 20 days following insertion, the risk of PID is increased sixfold but remains low thereafter. The risk of PID is lower amongst women who have an IUD inserted in the absence of chlamydia or gonorrhoea; the risk for women with an STI

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appears similar, regardless of whether an intrauterine contraceptive device is inserted or not. NICE reports that PID may occur in fewer than 1 in 100 in women who are at low risk of sexually transmitted infections. Even in young women for whom their age means they are at increased risk of sexually transmitted infections and consequently PID, the benefits of IUD use are felt to outweigh any potential or theoretical risk.

## VAGINITIS AND CERVICITIS

Infections of the genital tract are common [7]. Frequently involved sites are the vagina, the cervix, and the fallopian tubes. In addition, certain virus infections of the genital tract cause highly characteristic lesions, called condylomas. Most of the infectious agents of the female genital tract are sexually transmitted and are discussed in the presentation on those diseases.

Vaginal infections are common. They frequently cause vaginal discharge, together with vulvovaginal itching and irritation. These infections are caused by the fungus *Candida albicans*, the protozoan parasite *Trichomonas vaginalis*, or a small gram-negative bacterium called *Gardnerella (Haemophilus) vaginalis*, in conjunction with various anaerobic vaginal bacteria.

*Candida* vaginitis is described along with other fungal infections in the discussion on pathogenic microorganisms. The protozoan parasite *Trichomonas vaginalis* is considered with the parasitic infections in the discussion on animal parasites. The third common type of vaginitis, often called nonspecific vaginitis, is usually associated with a profuse, foul-smelling vaginal discharge. So-called nonspecific vaginitis often results from *Gardnerella* infection. Highly specific methods of treatment are available for each type of vaginitis. Unlike *Trichomonas* and *Gardnerella* infection, candidiasis is not sexually transmitted but often occurs with diabetes, antibiotic use, or pregnancy.

Mild chronic inflammation of endocervical glands is very common in women who have had children. Cervicitis causes few symptoms and is of little clinical significance. More severe cervical inflammation may result from a gonococcal infection discussed in communicable diseases or a chlamydial infection in diseases caused by pathogenic microorganisms. Both infections are sexually transmitted and may be followed by the spread

of the infection into the fallopian tubes and adjacent tissues.

## CATHETER RELATED INFECTIONS

Catheter-related infections (CRIs) include exit-site and tunnel infections, catheter-associated bacteremia or sepsis, suppurative thrombophlebitis, endocarditis, and clavicular osteomyelitis [8]. The exact incidence for catheter-related bloodstream infections (CRBSIs) is difficult to determine due to a number of factors. However, it is estimated that 80 000 cases occur annually in intensive care units alone; and, of these, there is a potential mortality rate of 35%. Factors contributing to CRI include type of catheter and catheter material, number of insertion attempts, duration, location, type of dressing, experience of personnel, indication for catheter insertion and virulence of the infecting organism. Upper extremity locations for catheter insertions are less often associated with infection compared with those inserted in the lower extremities. Coagulase-negative *Staphylococcus*, followed by *Enterococcus* and *Staphylococcus aureus* are the organisms most commonly associated with catheter-related bloodstream infection. Unfortunately, antibiotic resistance is also more frequently encountered with these organisms.

Catheter-related bloodstream infection is suspected clinically when signs of infection at the exit site are seen (e.g. erythema, tenderness, purulent drainage) or systemic signs of infection (e.g. fever, rigors, fluid sequestration, rising peripheral WBC count) are noted, particularly in patients lacking another likely source of infection. Historically, when signs of catheter-related bloodstream infection became manifest, the catheter was removed for culture of the catheter tip. Unfortunately, many catheter tip cultures returned as negative and only a small percentage of infections could actually be linked to the catheter. Catheter lumen colonization is a prerequisite to CRBSI. This knowledge has prompted the development of in situ techniques to determine catheter colonization and possibly avoid catheter removal.

## SEXUALLY TRANSMITTED INFECTIONS

Three million adolescents acquire a sexually transmissible disease every year [9]. They are at greater risk than adults for several reasons: they are more likely to have multiple sex partners, more likely to have high-risk partners, and less likely to use barrier protection for intercourse. For adolescent women there is the additional

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issue of having an immature cervix, which does not provide the same barrier to infection that a more mature cervix provides and is more likely to be injured by sexually transmissible organisms. In fact, many of the serious health consequences of sexually transmissible diseases that appear in adults, such as cancer and infertility, are the result of infections acquired during adolescence.

The general approach to a patient with a suspected STI (Sexually Transmitted Infections) begins by obtaining a focused history [10]. In women this should include information about any vaginal discharge, vaginal bleeding particularly after intercourse, pelvic or abdominal pain, information concerning their menstrual cycles, any possibility she may be pregnant, and the presence of any painful or painless genital lesions or ulcers. In men the history should include: presence and character of any penile discharge, dysuria, pain in the scrotum or testicles, and the presence of any painful or painless genital lesions. For both men and women, information about generalized symptoms such as fevers, chills, sweats, myalgia, fatigue, and rash can provide insight into the severity of the STI.

Specific information about the sexual history and potential contact information should also be obtained. This needs to be performed in a straightforward nonjudgmental manner and include information concerning recent or remote sexual contacts. Ask about multiple sexual partners, recent change in partners, patient's assessment of their partner's sexual habits, history of any STI, and patient's and partner's substance abuse history, particularly intravenous drugs. To be nonjudgmental, questions should be simple and, when possible, answered with one or two words. The following are some examples: Are you currently sexually active? If you are, is it with men, women, or both?

The physical examination of the genital region is approached with care. Chaperones should be present and the patient should be informed when you are going to perform certain aspects of the exam such as: You will feel me touch you here.

Women who may have an STI should have a pelvic examination. Observe the external genitalia, perirectal area, inner aspects of thighs and suprapubic areas for any lesions and/or visible discharge. During the speculum examination, observe the appearance of the cervix and any discharge from the cervix itself or any vaginal discharge or lesions. A

cervicalswab is used to obtain a specimen for chlamydia and gonorrhea screening. The bimanual exam is used to assess tenderness with cervical motion and over the uterus or ovaries and adnexal enlargement or mass.

## OLDER PATIENTS

In older patients the symptoms and signs of UTI may be atypical and difficult to distinguish from other urinary diseases [11]. Older adults with UTI are more likely to present to the ED with altered mental status rather than fever or classic urinary symptoms; however, when present, acute dysuria is more specific for UTI than urinary frequency or urgency. Atypical presentations also abound in older patients with pyelonephritis, but fever and chills are more consistently present. Another important symptom of UTI could be the pain in the suprapubic area, the flank, or the back, which in the non-cooperative patient could be suggested by agitation, irritability, and increased confusion (delirium) with increased incidence of falls. Even if incontinence could be a risk factor for UTI, it may also represent a symptom of the disease. When UTI evolves into sepsis or septic shock, typical symptoms—like hypotension, tachycardia, tachypnoea, anorexia, respiratory distress, and abdominal tenderness—may occur but can be delayed or onset abrupt.

## CLINICAL PRESENTATION

UTI is typically diagnosed by clinical presentation and a limited amount of physical examination findings [12]. In women, a specific combination of symptoms such as dysuria, frequency, hematuria, and cost over tebral angle tenderness raises the probability of UTI to more than 90%. Thus, the diagnosis can be ruled in based on history alone. On the other hand, the probability of UTI is significantly decreased in the absence of dysuria, especially if the patient reports vaginal discharge or other vaginal symptoms. If vaginal symptoms are present, a pelvic examination and cervical culture are indicated to rule out chlamydia, gonorrhea, and other vaginal infections.

Renal tenderness or costovertebral angle tenderness may be associated with cystitis because of referred pain. However, additional signs and symptoms such as fever, chills, nausea, and vomiting may indicate pyelonephritis.

In younger men, dysuria with urethral discharge usually indicates urethritis or sexually transmitted infection. Older males presenting



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with fever, dysuria, and back pain should be evaluated for acute bacterial prostatitis or pyelonephritis. If bacteriuria is present and not associated with a sexually transmitted infection or prostatitis, then treatment for UTI is indicated and a urological referral should be considered.

### CONCLUSION

Urinary tract infection is an inflammatory disease of any part of the urinary tract, and pathogens can be fungi, parasites, viruses, although they are most commonly bactericidal. The most common route of spreading infection and entering the urinary tract is through the outer orifice of the urethra. Bacteria fall into the urinary tract through the urethra and begin to multiply. Women are more prone to infections of the lower urinary tract than men, due to anatomical differences, because they have a short urethra near the colon, and bacteria are easier to enter. Statistics show that more than 30% of women have at least one uroinfect during their lifetime. The first symptoms occur in the form of frequent, painful, and difficulty urination with a feeling of pricking or annealing. Small amounts of urine are usually excreted and there is a feeling of unfulfilled bladder. There is also a need to urinate at night, and the urine is cloudy, changed in color and an unpleasant smell. Sometimes blood is also released in the urine, pain in the lower part of the back and in the lower part of the abdomen, and the temperature can be increased.

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