

Urinary Tract Infections

Infections in the urinary tract are relatively common. These infections are often referred to as “bladder infections”. They are also known as “UTI’s” or urinary tract infections. When an infection is confined to the bladder, the correct term to use is cystitis.

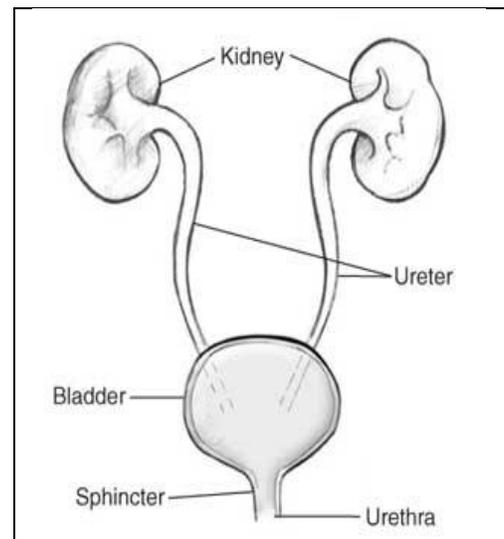
The kidneys can also become infected. This is referred to as pyelonephritis. To better understand the difference between the two, it is important to understand the anatomy of the urinary system.

The Urinary System

The urinary system (also called the excretory system) produces, stores and eliminates urine. It includes two kidneys, two ureters, the bladder, and the urethra as well as two sphincter muscles.

- **Kidneys:** located in the upper abdomen close to the spine, at the level of or just below the ribcage. Kidneys filter water soluble waste products from the blood and form urine.
- **Ureters:** thin tubes through which urine travels from each kidney to the bladder. Small muscles that are present in the walls of these tubes constantly tighten and relax to force urine away from the kidney.
- **Bladder:** hollow organ shaped like a balloon. It is located in the pelvis and held in place by ligaments that attach to other organs and the pelvic bones. Its function is to store urine. It can swell to be quite large but generally holds about two cups of urine comfortably for 2 to 5 hours.
- **Urethra:** tube that allows urine to pass from the bladder to outside the body.
- **Sphincters:** circular muscles that keep urine from leaking out of the bladder.

Nerves in the bladder signal the brain when it is time to urinate. The sensation to urinate becomes stronger as the bladder continues to fill and reaches its limit. When a person urinates, the brain signals the bladder muscles to tighten and squeeze the urine out of the bladder. It also signals the sphincter muscles to relax so that urine can exit through the urethra. Urine is normally clear, has no odor, and is the color of amber.



Causes of infection

Urinary tract infections typically occur when bacteria enter the urinary tract through the urethra. The bacteria then multiply in the bladder and can result in an infection. The bacteria that usually cause an infection come from the intestinal tract and live on the skin near the rectum or in the vagina in women. The most common organism is *E. coli* but other bacteria can also cause infections. Sexually transmitted diseases such as Chlamydia and Gonorrhea can cause urethritis.

Generally the infection is limited to the bladder or urethra. However, especially if left untreated, the bacteria can continue to multiply and travel up the ureters to one or both kidneys. This is a much more serious problem resulting in fever, chills, dehydration, and even sepsis.

Risk Factors

Gender:

- Females are more prone to urinary tract infections than are males. This is because the urethra is shorter which cuts down the distance that bacteria have to travel to reach the bladder. The urethral opening is also much closer to the anus and can come into contact with bacteria more readily. Females also lack the prostatic secretions which are present in males. Prostatic secretions are bacteriostatic which means that they keep the bacteria from growing and multiplying as readily.
- As males age, they often have enlargement of the prostate gland. This causes an obstruction to the flow of urine. When the bladder does not completely empty, bacteria are not fully flushed out and can multiply and cause an infection.
- In males who are not circumcised, there are more bacteria living closer to the opening of the urethra which increases their risk for developing an infection.
- After menopause, females are also more prone to infections due to lack of estrogen.

Sexual activity:

- Increased sexual activity leads to more frequent urinary tract infections in women especially when a spermicide is used and there is more than one sexual partner.

Urinary tract abnormalities:

- Neurological abnormalities such as a neurogenic bladder can lead to recurrent urinary tract infections as the bladder does not empty correctly.
- Other anatomical variations that block the flow of urine and emptying of the bladder cause an increase in infections.
- Having to use a catheter to empty the bladder leads to infections mostly due to introducing bacteria to the inside of the bladder when the catheter is inserted. When a catheter is left in the bladder for more than a couple of

days, the bladder becomes colonized with bacteria and is prone to more infections.

Suppressed immune system:

- Diabetes and other diseases can impair the immune system and increase the risk of infection. The immune system is the body's defense against bacteria and developing infections.

Symptoms of infection

Most infections involve the lower urinary tract: the bladder and urethra. Infections in the urinary tract don't always cause symptoms. Frequent symptoms of an infection include:

- Strong, persistent urge to urinate
- Burning sensation when urinating
- Passing urine frequently in small amounts
- Cloudy, pink, or brown urine
- Strong-smelling urine
- Pelvic or rectal pain

More specific symptoms may depend on which part of the urinary system is infected:

Kidneys (pyelonephritis):

- Upper back and side (flank) pain
- High fever
- Shaking and chills
- Nausea and/or vomiting

Bladder (cystitis):

- Pelvic pressure
- Lower abdomen discomfort
- Frequent, painful urination
- Bloody or discolored urine

Urethra (urethritis):

- Burning with urination

Sometimes no symptoms are present. Elderly individuals may not have discomfort of any type. However, a new onset of confusion or worsening of confusion can frequently be seen when an infection is present in the elderly.

Diagnosis of infection

Diagnosis of an infection is usually done by testing a urine sample. The sample will be tested for the presence of white blood cells, red blood cells, and bacteria. There are “test strips” that have reagents on the strip that react by changing color when dipped into urine. These reagents react with many different things that could be found in urine such as cells, bacteria, protein and glucose. Looking at the sample under a microscope is also done to see if cells and bacteria are present.

The urine may also be set up for a culture. A culture will grow the bacteria that are present in the urine on a special media. The type of bacteria present can be identified and then tested to see which antibiotics will be successful in fighting the bacteria.

Since cultures take at least two days before results are available, physicians will often treat the infection empirically with one of several antibiotics that generally are effective. If the infection is not responsive to treatment, a culture becomes necessary in order to determine which antibiotic will be effective.

Treatment

- **Antibiotics:**
 - Cystitis: Uncomplicated urinary tract infections are treated with antibiotics. Generally oral antibiotics such as nitrofurantoin, fluoroquinolones (Ciprofloxacin®), cephalosporins, and trimethoprim/sulfamethoxazole are used. Usually a three-day course of treatment is adequate however nitrofurantoin requires a 5 to 7 day course.
 - Pyelonephritis: Pyelonephritis is treated more aggressively than a simple bladder infection using either a longer course of oral antibiotics or intravenous antibiotics.
- **Pyridium® (phenazopyridine) and Uristat®:** These medications numb the bladder and urethra. Pyridium is sometimes prescribed to reduce the burning pain associated with infections. Uristat is an over-the-counter medication. These medications change the color of urine to either blue or orange and interfere with laboratory testing of the urine.
- **Fluids:** It is often recommended to drink extra fluids when a bladder infection is present to help flush bacteria from the bladder. However this can also dilute the antibiotic in the bladder possibly making the medication less effective. No studies have been done to address this issue.
- **Bladder irritants:** Coffee, alcohol, and soft drinks containing citrus juices and caffeine can irritate the bladder and aggravate symptoms.

- **Heating pads:** Warm heating pads applied to the abdomen may minimize bladder pressure and discomfort.

Prevention

Steps can be taken to reduce the risk of urinary tract infections.

- **Drink plenty of liquids, especially water.** Drinking water helps to dilute urine and causes increased frequency of urination which flushes out bacteria.
- **Avoid bladder irritants.** Carbonated beverages (soda), caffeine (coffee, tea, soda), and alcohol are the most common irritants. Tomatoes and tomato based products, sugar, chocolate, and highly spiced foods can also cause irritation in the bladder. Artificial sweeteners, especially aspartame should also be avoided.
- **Wipe from front to back.** After urinating or bowel movements, wiping from the front to the back helps prevent bacteria in the anal region from spreading to the vagina and urethra.
- **Empty bladder regularly.** Flushing the bacteria out of the bladder and urethra is important to prevent infections.
- **Cranberry products:** Cranberry juice or tablets are promoted as a way to help prevent infections. Reviews of literature have found evidence for this in women but not in everyone.
- **Antibiotics:** A prolonged course (six months to a year) or low-dose antibiotics may be prescribed and is effective in reducing the frequency of recurrent urinary tract infections.