

## Urinary System Pathologies

### Urinary Tract Infections

Urinary tract infections (UTI) are commonly seen in clinical practice. Bacteria from the gut can invade the urinary epithelium to cause inflammation and infection anywhere along the urinary tract such as the urethra, bladder, ureter, or kidney. Some individuals are predisposed to developing a UTI. It is more common for women to develop a UTI especially when pregnant, sexually active, during post-menopause with estrogen-deficiency and when being treated with antibiotics where the normal bacteria flora is diminished. Although less common, men may develop a lower UTI. An upper UTI is less common in men due to the longer urethra and ureter structures that make it more difficult for bacteria to reach the kidney. An indwelling urinary catheter can also contribute the development of a UTI. Finally, individuals who experience urinary obstruction, diabetes or neurogenic bladder are also at risk for developing a UTI.

A UTI can be discussed in terms of its severity. It can be complicated or uncomplicated. It can also be discussed according to its location, where it can occur anywhere along the urinary tract (upper vs. lower tract disorders). It is under these categories that UTI will be discussed. Finally, common organisms that cause UTI are covered. This information is essential as the NP is responsible for identifying the organism so that appropriate treatment can be initiated.

The diagram below compares the male and female urinary tracts. Note that the female has a shorter urethra which predisposes her to an increased risk of infection than the male.

### UTI Risk Factors

There are several risk factors that predispose individuals to the development of a UTI. For women, pregnancy is a risk factor. During pregnancy, progesterone relaxes smooth muscle that causes stasis of urine, allowing the bacteria to colonize. Also, the female ureter is shorter and allows for the entrance of bacteria into the urethra.

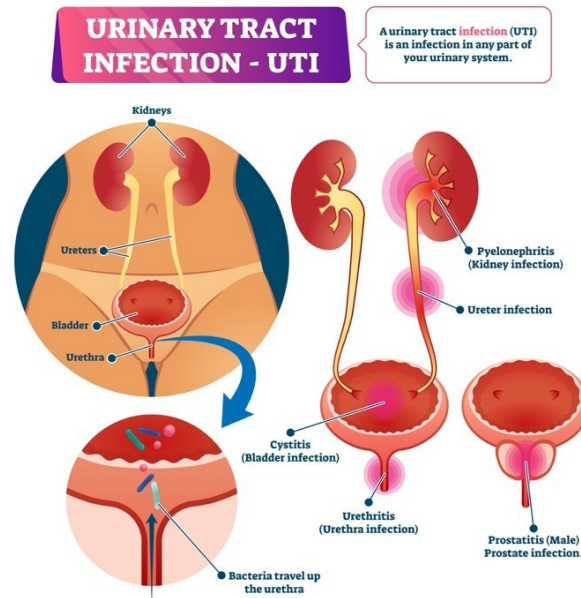
Post-menopausal women are also at risk for developing a UTI. The lack of estrogen results in vaginal and urethral dryness that promotes an environment for bacteria to grow. Sexual intercourse also contributes to the development of a UTI where bacteria can be easily introduced into the urethra. If spermicides are used during sexual intercourse, this also puts the woman at risk for a UTI.

Indwelling urinary catheterization is also a major cause of a UTI, especially in females. The catheter itself can introduce infections directly into the bladder. The bacteria will colonize in the bladder and initiate an immune response. The neutrophils enter the area to further promote inflammation. Fibrinogen accumulates on the catheter which provides an ideal environment for the attachment of uropathogens that express fibrinogen-binding proteins. After the initial attachment to the fibrinogen-binding proteins on the catheter, the bacteria multiply to form biofilms. This results in epithelial damage to the urinary tract that leads to a kidney infection.

### Lower vs. Upper Tract Disorders

A UTI can be discussed in terms of its location. Note that a UTI can occur anywhere along the urinary tract and can be associated with another issue in the area. For example, if the infection

occurs at the opening of the urethra, then the condition is termed urethritis. Overall, cystitis is a condition of the lower urinary tract that denotes a bladder infection. Cystitis can occur in both females and males. In males, the cystitis may be associated with prostatitis.



A UTI is an infection in any part of your urinary system

Recognizing the signs and symptoms of the UTI is important in categorizing it as either a lower or upper urinary tract disorder. In a lower urinary tract disorder, the individual experiences urgency associated with burning on urination. Other common symptoms of a lower UTI is frequency, dysuria, and suprapubic pain. The urine may also appear cloudy and have an odor.

An infection of the lower urinary tract can progress to an upper urinary tract infection if the bacteria ascends from the bladder to the kidney. The condition is pyelonephritis. Because the infection involves the kidney, it is a more serious condition as it can cause acute renal failure if it is not treated. The signs and symptoms of pyelonephritis include all the symptoms associated with cystitis plus fever, flank pain, costovertebral angle (CVA) tenderness, nausea, and vomiting. Malaise is also a common complaint for the patient with pyelonephritis. There can also be signs of shock if the infection has entered the circulation from the kidney via the renal vein. Think of the symptoms of pyelonephritis in a classic triad: vomiting, flank pain and fever.

The NP can also collect a urine sample to determine the presence of a lower vs. upper UTI. A urine dipstick can be observed for the presence of leukocyte esterase and nitrites. These should be considered together when diagnosing a UTI. Leukocyte esterase is an enzyme that is released by the WBCs (leukocytes). It is a qualitative measure of WBCs in the urinary tract. On the actual dipstick test, you may just note leukocytes. But note that the dipstick does not measure the