

Urinary Tract Pain

The information below is at the specified websites maintained by the National Kidney and Urologic Diseases Information Clearinghouse (NKUDIC), part of the National Institutes of Health (NIH) of the US Government.

To obtain a free copy of the present document, go to www.masterdocs.com.

The following three NIH articles deal with infections and kidney stones, conditions that can cause urinary pain as well as other symptoms. Sometimes, persistent or repeated infections or kidney stones can cause chronic problems with urinary tract pain:

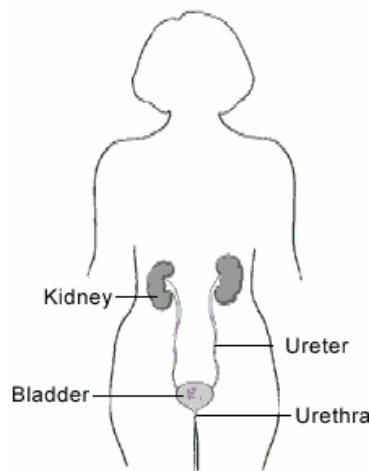
- Urinary tract infection in adults
(<http://kidney.niddk.nih.gov/kudiseases/pubs/utiadult/>)
- Kidney stones (http://kidney.niddk.nih.gov/kudiseases/pubs/stones_ez/index.htm)
- Urinary tract infections in children
(<http://kidney.niddk.nih.gov/kudiseases/pubs/utichildren/>).

Urinary Tract Infections in Adults	2
What are the causes of UTI?	3
Who is at risk?	3
Recurrent Infections	4
Infections in Pregnancy	4
What are the symptoms of UTI?	4
How is UTI diagnosed?	5
How is UTI treated?	5
Recurrent Infections in Women	6
Infections in Pregnancy	7
Complicated Infections	7
Infections in Men	7
Is there a vaccine to prevent recurrent UTIs?	8
For More Information	8
What I need to know about Kidney Stones	9
What do my kidneys do?	9
What is a kidney stone?	10
Are all kidney stones alike?	10
What do kidney stones look like?	11
What can my doctor do about a problem stone?	11
How will my doctor find out what kind of stone I have?	12
Why do I need to know the kind of stone?	12
What can I do to avoid more stones?	13
Points to Remember	13
For More Information	13
Urinary Tract Infections in Children	15
How does the urinary tract normally function?	15
How does the urinary tract become infected?	16
What are the signs of urinary tract infection?	17

How do you find out whether your child has a urinary tract infection?	17
How are urinary tract infections treated?	18
What tests may be needed after the infection is gone?	18
What abnormalities lead to urinary problems?	19
Do urinary tract infections have long-term effects?.....	19
Points to Remember.....	20
For More Information	20
Information about NKUDIC.....	20

Urinary Tract Infections in Adults

Urinary tract infections are a serious health problem affecting millions of people each year. Infections of the urinary tract are common—only respiratory infections occur more often. In 1997, urinary tract infections (UTIs) accounted for about 8.3 million doctor visits. Women are especially prone to UTIs for reasons that are poorly understood. One woman in five develops a UTI during her lifetime. UTIs in men are not so common, but they can be very serious when they do occur.



The urinary system consists of the kidneys, ureters, bladder, and urethra. The key elements in the system are the kidneys, a pair of purplish-brown organs located below the ribs toward the middle of the back. The kidneys remove excess liquid and wastes from the blood in the form of urine, keep a stable balance of salts and other substances in the blood, and produce a hormone that aids the formation of red blood cells. Narrow tubes called ureters carry urine from the kidneys to the bladder, a triangle-shaped chamber in the lower abdomen. Urine is stored in the bladder and emptied through the urethra.

The average adult passes about a quart and a half of urine each day. The amount of urine varies, depending on the fluids and foods a person consumes. The volume formed at night is about half that formed in the daytime.

What are the causes of UTI?

Normal urine is sterile. It contains fluids, salts, and waste products, but it is free of bacteria, viruses, and fungi. An infection occurs when microorganisms, usually bacteria from the digestive tract, cling to the opening of the urethra and begin to multiply. Most infections arise from one type of bacteria, *Escherichia coli* (*E. coli*), which normally lives in the colon.

In most cases, bacteria first begin growing in the urethra. An infection limited to the urethra is called urethritis. From there bacteria often move on to the bladder, causing a bladder infection (cystitis). If the infection is not treated promptly, bacteria may then go up the ureters to infect the kidneys (pyelonephritis).

Microorganisms called *Chlamydia* and *Mycoplasma* may also cause UTIs in both men and women, but these infections tend to remain limited to the urethra and reproductive system. Unlike *E. coli*, *Chlamydia* and *Mycoplasma* may be sexually transmitted, and infections require treatment of both partners.

The urinary system is structured in a way that helps ward off infection. The ureters and bladder normally prevent urine from backing up toward the kidneys, and the flow of urine from the bladder helps wash bacteria out of the body. In men, the prostate gland produces secretions that slow bacterial growth. In both sexes, immune defenses also prevent infection. But despite these safeguards, infections still occur.

Who is at risk?

Some people are more prone to getting a UTI than others. Any abnormality of the urinary tract that obstructs the flow of urine (a kidney stone, for example) sets the stage for an infection. An enlarged prostate gland also can slow the flow of urine, thus raising the risk of infection.

A common source of infection is catheters, or tubes, placed in the bladder. A person who cannot void or who is unconscious or critically ill often needs a catheter that stays in place for a long time. Some people, especially the elderly or those with nervous system disorders who lose bladder control, may need a catheter for life. Bacteria on the catheter can infect the bladder, so hospital staff take special care to keep the catheter sterile and remove it as soon as possible.

People with diabetes have a higher risk of a UTI because of changes in the immune system. Any disorder that suppresses the immune system raises the risk of a urinary infection.

UTIs may occur in infants who are born with abnormalities of the urinary tract, which sometimes need to be corrected with surgery. UTIs are rarely seen in boys and young men. In women, though, the rate of UTIs gradually increases with age. Scientists are not sure why women have more urinary infections than men. One factor may be that a woman's urethra is short, allowing bacteria quick access to the bladder. Also, a woman's

urethral opening is near sources of bacteria from the anus and vagina. For many women, sexual intercourse seems to trigger an infection, although the reasons for this linkage are unclear.

According to several studies, women who use a diaphragm are more likely to develop a UTI than women who use other forms of birth control. Recently, researchers found that women whose partners use a condom with spermicidal foam also tend to have growth of *E. coli* bacteria in the vagina.

Recurrent Infections

Many women suffer from frequent UTIs. Nearly 20 percent of women who have a UTI will have another, and 30 percent of those will have yet another. Of the last group, 80 percent will have recurrences.

Usually, the latest infection stems from a strain or type of bacteria that is different from the infection before it, indicating a separate infection. (Even when several UTIs in a row are due to *E. coli*, slight differences in the bacteria indicate distinct infections.)

Research funded by the National Institutes of Health (NIH) suggests that one factor behind recurrent UTIs may be the ability of bacteria to attach to cells lining the urinary tract. A recent NIH-funded study found that bacteria formed a protective film on the inner lining of the bladder in mice. If a similar process can be demonstrated in humans, the discovery may lead to new treatments to prevent recurrent UTIs. Another line of research has indicated that women who are "non-secretors" of certain blood group antigens may be more prone to recurrent UTIs because the cells lining the vagina and urethra may allow bacteria to attach more easily. Further research will show whether this association is sound and proves useful in identifying women at high risk for UTIs.

Infections in Pregnancy

Pregnant women seem no more prone to UTIs than other women. However, when a UTI does occur, it is more likely to travel to the kidneys. According to some reports, about 2 to 4 percent of pregnant women develop a urinary infection. Scientists think that hormonal changes and shifts in the position of the urinary tract during pregnancy make it easier for bacteria to travel up the ureters to the kidneys. For this reason, many doctors recommend periodic testing of urine.

What are the symptoms of UTI?

Not everyone with a UTI has symptoms, but most people get at least some. These may include a frequent urge to urinate and a painful, burning feeling in the area of the bladder or urethra during urination. It is not unusual to feel bad all over--tired, shaky, washed out--and to feel pain even when not urinating. Often women feel an uncomfortable pressure above the pubic bone, and some men experience a fullness in the rectum. It is common for a person with a urinary infection to complain that, despite the urge to urinate, only a

small amount of urine is passed. The urine itself may look milky or cloudy, even reddish if blood is present. A fever may mean that the infection has reached the kidneys. Other symptoms of a kidney infection include pain in the back or side below the ribs, nausea, or vomiting.

In children, symptoms of a urinary infection may be overlooked or attributed to another disorder. A UTI should be considered when a child or infant seems irritable, is not eating normally, has an unexplained fever that does not go away, has incontinence or loose bowels, or is not thriving. The child should be seen by a doctor if there are any questions about these symptoms, especially a change in the child's urinary pattern.

How is UTI diagnosed?

To find out whether you have a UTI, your doctor will test a sample of urine for pus and bacteria. You will be asked to give a "clean catch" urine sample by washing the genital area and collecting a "midstream" sample of urine in a sterile container. (This method of collecting urine helps prevent bacteria around the genital area from getting into the sample and confusing the test results.) Usually, the sample is sent to a laboratory, although some doctors' offices are equipped to do the testing.

In the urinalysis test, the urine is examined for white and red blood cells and bacteria. Then the bacteria are grown in a culture and tested against different antibiotics to see which drug best destroys the bacteria. This last step is called a sensitivity test.

Some microbes, like Chlamydia and Mycoplasma, can be detected only with special bacterial cultures. A doctor suspects one of these infections when a person has symptoms of a UTI and pus in the urine, but a standard culture fails to grow any bacteria.

When an infection does not clear up with treatment and is traced to the same strain of bacteria, the doctor will order a test that makes images of the urinary tract. One of these tests is an intravenous pyelogram (IVP), which gives x-ray images of the bladder, kidneys, and ureters. An opaque dye visible on x-ray film is injected into a vein, and a series of x rays is taken. The film shows an outline of the urinary tract, revealing even small changes in the structure of the tract.

If you have recurrent infections, your doctor also may recommend an ultrasound exam, which gives pictures from the echo patterns of sound waves bounced back from internal organs. Another useful test is cystoscopy. A cystoscope is an instrument made of a hollow tube with several lenses and a light source, which allows the doctor to see inside the bladder from the urethra.

How is UTI treated?

UTIs are treated with antibacterial drugs. The choice of drug and length of treatment depend on the patient's history and the urine tests that identify the offending bacteria. The sensitivity test is especially useful in helping the doctor select the most effective drug. The drugs most often used to treat routine, uncomplicated UTIs are trimethoprim

(Trimplex), trimethoprim/sulfamethoxazole (Bactrim, Septra, Cotrim), amoxicillin (Amoxil, Trimox, Wymox), nitrofurantoin (Macrochantin, Furadantin), and ampicillin. A class of drugs called quinolones includes four drugs approved in recent years for treating UTI. These drugs include ofloxacin (Floxin), norfloxacin (Noroxin), ciprofloxacin (Cipro), and trovafloxin (Trovan).

Often, a UTI can be cured with 1 or 2 days of treatment if the infection is not complicated by an obstruction or nervous system disorder. Still, many doctors ask their patients to take antibiotics for a week or two to ensure that the infection has been cured. Single-dose treatment is not recommended for some groups of patients, for example, those who have delayed treatment or have signs of a kidney infection, patients with diabetes or structural abnormalities, or men who have prostate infections. Longer treatment is also needed by patients with infections caused by Mycoplasma or Chlamydia, which are usually treated with tetracycline, trimethoprim/sulfamethoxazole (TMP/SMZ), or doxycycline. A follow-up urinalysis helps to confirm that the urinary tract is infection-free. It is important to take the full course of treatment because symptoms may disappear before the infection is fully cleared.

Severely ill patients with kidney infections may be hospitalized until they can take fluids and needed drugs on their own. Kidney infections generally require several weeks of antibiotic treatment. Researchers at the University of Washington found that 2-week therapy with TMP/SMZ was as effective as 6 weeks of treatment with the same drug in women with kidney infections that did not involve an obstruction or nervous system disorder. In such cases, kidney infections rarely lead to kidney damage or kidney failure unless they go untreated.

Various drugs are available to relieve the pain of a UTI. A heating pad may also help. Most doctors suggest that drinking plenty of water helps cleanse the urinary tract of bacteria. During treatment, it is best to avoid coffee, alcohol, and spicy foods. And one of the best things a smoker can do for his or her bladder is to quit smoking. Smoking is the major known cause of bladder cancer.

Recurrent Infections in Women

Women who have had three UTIs are likely to continue having them. Four out of five such women get another within 18 months of the last UTI. Many women have them even more often. A woman who has frequent recurrences (three or more a year) should ask her doctor about one of the following treatment options:

Take low doses of an antibiotic such as TMP/SMZ or nitrofurantoin daily for 6 months or longer. (If taken at bedtime, the drug remains in the bladder longer and may be more effective.) NIH-supported research at the University of Washington has shown this therapy to be effective without causing serious side effects.

Take a single dose of an antibiotic after sexual intercourse.

Take a short course (1 or 2 days) of antibiotics when symptoms appear.

Dipsticks that change color when an infection is present are now available without a prescription. The strips detect nitrite, which is formed when bacteria change nitrate in the urine to nitrite. The test can detect about 90 percent of UTIs when used with the first morning urine specimen and may be useful for women who have recurrent infections.

Doctors suggest some additional steps that a woman can take on her own to avoid an infection:

Drink plenty of water every day.

Urinate when you feel the need; don't resist the urge to urinate.

Wipe from front to back to prevent bacteria around the anus from entering the vagina or urethra.

Take showers instead of tub baths.

Cleanse the genital area before sexual intercourse.

Avoid using feminine hygiene sprays and scented douches, which may irritate the urethra.

Some doctors suggest drinking cranberry juice.

Infections in Pregnancy

A pregnant woman who develops a UTI should be treated promptly to avoid premature delivery of her baby and other risks such as high blood pressure. Some antibiotics are not safe to take during pregnancy. In selecting the best treatments, doctors consider various factors such as the drug's effectiveness, the stage of pregnancy, the mother's health, and potential effects on the fetus.

Complicated Infections

Curing infections that stem from a urinary obstruction or nervous system disorder depends on finding and correcting the underlying problem, sometimes with surgery. If the root cause goes untreated, this group of patients is at risk of kidney damage. Also, such infections tend to arise from a wider range of bacteria, and sometimes from more than one type of bacteria at a time.

Infections in Men

UTIs in men usually stem from an obstruction--for example, a urinary stone or enlarged prostate--or from a medical procedure involving a catheter. The first step is to identify the infecting organism and the drugs to which it is sensitive. Usually, doctors recommend

lengthier therapy in men than in women, in part to prevent infections of the prostate gland.

Prostate infections (chronic bacterial prostatitis) are harder to cure because antibiotics are unable to penetrate infected prostate tissue effectively. For this reason, men with prostatitis often need long-term treatment with a carefully selected antibiotic. UTIs in older men are frequently associated with acute bacterial prostatitis, which can be fatal if not treated immediately.

Is there a vaccine to prevent recurrent UTIs?

In the future, scientists may develop a vaccine that can prevent UTIs from coming back. Researchers in different studies have found that children and women who tend to get UTIs repeatedly are likely to lack proteins called immunoglobulins, which fight infection. Children and women who do not get UTIs are more likely to have normal levels of immunoglobulins in their genital and urinary tracts.

Early tests indicate that a vaccine helps patients build up their own natural infection-fighting powers. The dead bacteria in the vaccine do not spread like an infection; instead, they prompt the body to produce antibodies that can later fight against live organisms. Researchers are testing injected and oral vaccines to see which works best. Another method being considered for women is to apply the vaccine directly as a suppository in the vagina.

For More Information

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What I need to know about Kidney Stones



Pain in the shaded areas (see diagram above) may be caused by kidney stones.

If you have a kidney stone, you may already know how painful it can be. Most kidney stones pass out of the body without help from a doctor. But sometimes a stone will not just go away. It may even get larger. Your doctor can help.

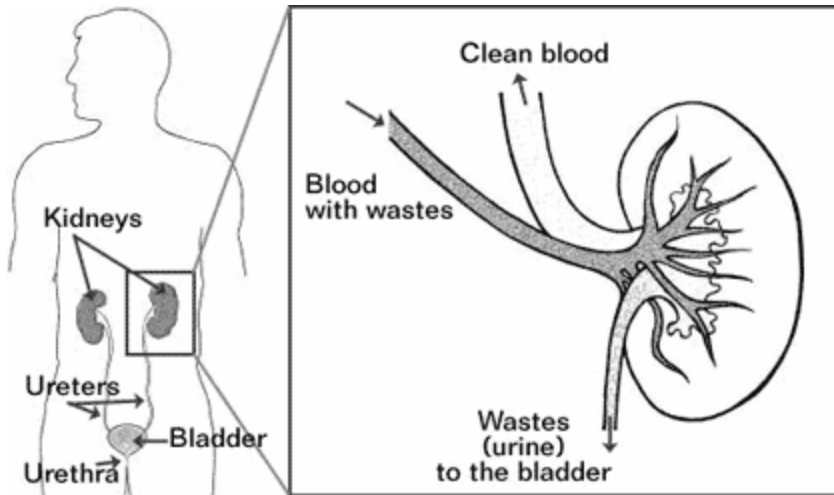
You should call a doctor when you have

- extreme pain in your back or side that will not go away
- blood in your urine
- fever and chills
- vomiting
- urine that smells bad or looks cloudy
- a burning feeling when you urinate

These may be signs of a kidney stone that needs a doctor's care.

What do my kidneys do?

Your kidneys are bean-shaped organs, each about the size of your fist. They are located near the middle of your back, just below the rib cage. The kidneys are sophisticated trash collectors. Every day, your kidneys process about 200 quarts of blood to sift out about 2 quarts of waste products and extra water. The waste and extra water become urine, which flows to your bladder through tubes called ureters (YOOR-uh-turs). Your bladder (BLAD-ur) stores urine until you go to the bathroom.



Wastes removed from the blood go to the bladder (see diagram above).

The wastes in your blood come from the normal breakdown of active muscle and from the food you eat. Your body uses the food for energy and self-repair. After your body has taken what it needs from the food, waste is sent to the blood. If your kidneys did not remove these wastes, the wastes would build up in the blood and damage your body.

In addition to removing wastes, your kidneys help control blood pressure. They also help to make red blood cells and keep your bones strong.

What is a kidney stone?

A kidney stone is a solid piece of material that forms in the kidney out of substances in the urine.

A stone may stay in the kidney or break loose and travel down the urinary tract. A small stone may pass all the way out of the body without causing too much pain.

A larger stone may get stuck in a ureter, the bladder, or the urethra. A problem stone can block the flow of urine and cause great pain.

Are all kidney stones alike?

No. There are four major types of kidney stones.

The most common type of stone contains calcium (KAL-see-um). Calcium is a normal part of a healthy diet. Calcium that is not used by the bones and muscles goes to the kidneys. In most people, the kidneys flush out the extra calcium with the rest of the urine. People who have calcium stones keep the calcium in their kidneys. The calcium that stays behind joins with other waste products to form a stone.

A struvite (STROO-vite) stone may form after an infection in the urinary system. These stones contain the mineral magnesium (mag-NEE-zee-um) and the waste product ammonia (uh-MOH-nyuh).

A uric (YOOR-ik) acid stone may form when there is too much acid in the urine. If you tend to form uric acid stones, you may need to cut back on the amount of meat you eat.

Cystine (SIS-teen) stones are rare. Cystine is one of the building blocks that make up muscles, nerves, and other parts of the body. Cystine can build up in the urine to form a stone. The disease that causes cystine stones runs in families.

What do kidney stones look like?

Kidney stones may be as small as a grain of sand or as large as a pearl. Some stones are even as big as golf balls. Stones may be smooth or jagged. They are usually yellow or brown.



Golf-ball-sized and brown



Small and smooth



Jagged and yellow

Kidney stones vary in size and shape. These are not actual size.

What can my doctor do about a problem stone?

If you have a stone that will not pass by itself, your doctor may need to take steps to get rid of it. In the past, the only way to remove a problem stone was through surgery.

Now, doctors have new ways to remove problem stones. The following sections describe a few of these methods.

Shock Waves: Your doctor can use a machine to send shock waves directly to the kidney stone. The shock waves break a large stone into small stones that will pass through your urinary system with your urine. Two types of shock wave machines exist. With one machine, you sit in a tub of water. With the other type of machine, you lie on a table. The full name for this method is extracorporeal (EKS-truh-kor-POR-ee-ul) shockwave lithotripsy (LITH-oh-TRIP-see). Doctors often call it ESWL for short. Lithotripsy is a Greek word that means stone crushing.

Tunnel Surgery: In this method, the doctor makes a small cut into the patient's back and makes a narrow tunnel through the skin to the stone inside the kidney. With a special instrument that goes through the tunnel, the doctor can find the stone and remove it. The technical name for this method is percutaneous (PER-kyoo-TAY-nee-us) nephrolithotomy (NEF-roh-lih-THAH-tuh-mee).

Ureteroscope: A ureteroscope (yoo-REE-ter-uh-scope) looks like a long wire. The doctor inserts it into the patient's urethra, passes it up through the bladder, and directs it to the ureter where the stone is located. The ureteroscope has a camera that allows the doctor to see the stone. A cage is used to catch the stone and pull it out, or the doctor may destroy it with a device inserted through the ureteroscope.

How will my doctor find out what kind of stone I have?



Try to catch a stone in a strainer.

The best way for your doctor to find out what kind of stone you have is to test the stone itself. If you know that you are passing a stone, try to catch it in a strainer.

Your doctor may ask for a urine sample or take blood to find out what is causing your stones. You may need to collect your urine for a 24-hour period. These tests will help your doctor find ways for you to avoid stones in the future.

Why do I need to know the kind of stone?

The therapy your doctor gives you depends on the type of stone you have. For example, a medicine that helps prevent calcium stones will not work if you have a struvite stone. The diet changes that help prevent uric acid stones may have no effect on calcium stones. Therefore, careful analysis of the stone will help guide your treatment.

What can I do to avoid more stones?

Drink more water. Try to drink 12 full glasses of water a day. Drinking lots of water helps to flush away the substances that form stones in the kidneys.

You can also drink ginger ale, lemon-lime sodas, and fruit juices. But water is best. Limit your coffee, tea, and cola to one or two cups a day because the caffeine may cause you to lose fluid too quickly.

Your doctor may ask you to eat more of some foods and to cut back on other foods. For example, if you have a uric acid stone, your doctor may ask you to eat less meat, because meat breaks down to make uric acid.

The doctor may give you medicines to prevent calcium and uric acid stones.



Try to drink 12 full glasses of water every day.

Points to Remember

- Most stones will pass out of the body without a doctor's help.
- See your doctor if you have severe pain in your back or side that will not go away.
- See your doctor if you have blood in your urine (urine will appear pink).
- Drink lots of water to prevent more kidney stones from forming.
- When you pass a stone, try to catch it in a strainer to show to your doctor.
- Talk to your doctor about how to avoid more stones.

For More Information

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Urinary Tract Infections in Children

After unexpected wetting, the most common urinary problem among children is infections. An estimated 3 percent of girls and 1 percent of boys have had a urinary tract infection (UTI) by the age of 11. Some researchers believe these estimates are low because many cases of UTI go undetected. The symptoms are not always obvious to parents, and younger children are usually unable to describe how they feel. Recognizing and treating urinary tract infections is important. Untreated UTIs can lead to serious kidney problems that could threaten the life of your child.

How does the urinary tract normally function?

The kidneys filter and remove waste and water from the blood to produce urine. They get rid of about 1-1/2 to 2 quarts of urine per day in an adult and less in a child, depending on the child's age. The urine travels from the kidneys down two narrow tubes called the ureters. The urine is then stored in a balloon-like organ called the bladder (see figure 1). In a child, the bladder can hold about 1 to 1-1/2 ounces of urine for each year of the child's age. So, the bladder of a 4-year-old child may hold about 4 to 6 ounces (less than 1 cup); an 8-year-old can hold 8 to 12 ounces. When the bladder empties, urine flows out of the body through the urethra, a tube at the bottom of the bladder. The opening of the urethra is at the end of the penis in boys (see figure 2) and in front of the vagina in girls (see figure 3).

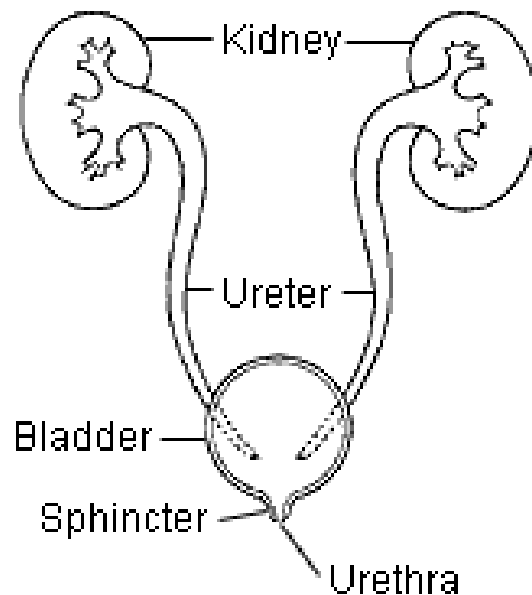


Figure 1. Front view of urinary tract

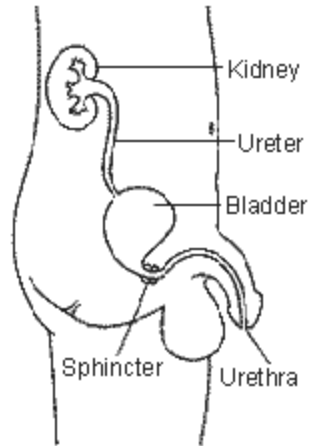


Figure 2. Side view of male urinary tract

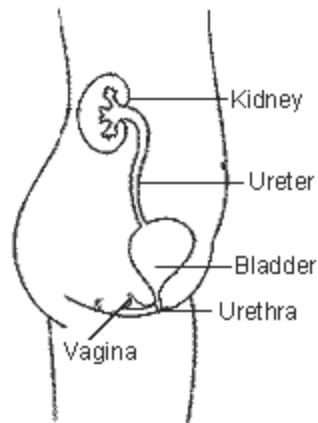


Figure 3. Side view of female urinary tract

How does the urinary tract become infected?

Normal urine contains no bacteria (germs). Bacteria may, at times, get into the urinary tract and the urine from the skin around the rectum and genitals by traveling up the urethra into the bladder. When this happens, the bacteria can infect and inflame the bladder and causes swelling and pain in the lower abdomen and side. This is called cystitis (bladder infection).

If the bacteria travel up through the ureters to the kidneys, a kidney infection can develop. The infection is usually accompanied by pain and fever. Kidney infections are much more serious than bladder infections.

In some children a urinary tract infection may be a sign of an abnormal urinary tract that may be prone to repeated problems. (See What abnormalities lead to urinary problems?)

For this reason, when a child has a urinary infection, additional tests are often recommended. (See What tests may be needed after the infection is gone?) In other cases, children develop urinary tract infections because they are prone to such infections, just as other children are prone to getting coughs, colds, or ear infections. Or a child may happen to be infected by a type of bacteria with a special ability to cause urinary tract infections.

What are the signs of urinary tract infection?

A urinary tract infection causes irritation of the lining of the bladder, urethra, ureters, and kidneys, just like the inside of the nose or the throat becomes irritated with a cold. If your child is an infant or is only a few years old, the signs of a urinary tract infection may not be clear, since children that young cannot tell you just how they feel. Your child may have a high fever, be irritable, or not eat.

On the other hand, sometimes a child may have only a low-grade fever, experience nausea and vomiting, or just not seem healthy. The diaper urine may have an unusual smell. If your child has a high temperature and appears sick for more than a day without signs of a runny nose or other obvious cause for discomfort, he or she may need to be checked for a bladder infection.

An older child with bladder irritation may complain of pain in the abdomen and pelvic area. Your child may urinate often. If the kidney is infected, your child may complain of pain under the side of the rib cage (the flank) or low back pain. Crying or complaining that it hurts to urinate and producing only a few drops of urine at a time are other signs of urinary tract infection. Your child may have difficulty controlling the urine and may leak urine into clothing or bedsheets. The urine may smell unusual or look cloudy.

How do you find out whether your child has a urinary tract infection?

Only by consulting a health care provider can you find out for certain whether your child has a urinary tract infection.

Some of your child's urine will be collected and examined. The way urine is collected depends on how old your child is. If the child is not yet toilet trained, the health care provider may place a plastic collection bag over your child's genital area. It will be sealed to the skin with an adhesive strip. An older child may be asked to urinate into a container. The sample needs to come as directly into the container as possible to avoid picking up bacteria from the skin or rectal area. A doctor or nurse may need to pass a small tube into the urethra. Urine will drain directly from the bladder into a clean container through this tube (called a catheter). Sometimes the best way to get the urine is by placing a needle directly into the bladder through the skin of the lower abdomen. Getting urine through the tube or needle will ensure that the urine collected is pure.

Some of the urine will be examined under a microscope. If an infection is present, bacteria and sometimes pus will be found in the urine. If the bacteria from the sample are

hard to see at first, the health care provider may place the sample in a tube or dish with a substance that encourages any bacteria present to grow. Once the germs have multiplied, they can then be identified and tested to see which medications will provide the most effective treatment. The process of growing bacteria in the laboratory is known as performing a culture and often takes a day or more to complete.

The reliability of the culture depends on how long the urine stands before the culture is started. If you collect your child's urine at home, refrigerate it as soon as it is collected and carry the container to the health care provider or lab in a plastic bag filled with ice.

How are urinary tract infections treated?

Urinary tract infections are treated with antibiotics (bacteria-fighting drugs). While a urine sample is being examined, the health care provider may begin treatment with a drug that treats the bacteria most likely to be causing the infection. Once culture results are known, the health care provider may decide to switch your child to another antibiotic.

The way the antibiotic is given and the number of days that it must be taken depend in part on the type of infection and how severe it is. When a child is sick or not able to drink fluids, the antibiotic may need to be put directly into the bloodstream through a vein in the arm or hand. Otherwise, the medicine (liquid or pills) may be given by mouth or by shots. The medicine is given for at least 3 to 5 days and possibly for as long as several weeks. The daily treatment schedule recommended depends on the specific drug prescribed: The schedule may call for a single dose each day or up to four doses each day. In some cases, your child will need to take the medicine until further tests are finished.

After a few doses of the antibiotic, your child may appear much better, but often several days may pass before all symptoms are gone. In any case, your child should take the medicine for as long as the doctor says. Do not stop medications because the symptoms have gone away. Infections may return, and germs can resist future treatment if the drug is stopped too soon.

Children should drink fluids when they wish. Make sure your child drinks what he or she needs, but do not force your child to drink large amounts of fluid. The health care provider needs to know if the child is not interested in drinking.

What tests may be needed after the infection is gone?

Once the infection has cleared, additional tests may be recommended to check for abnormalities in the urinary tract. Repeated infections in abnormal urinary tracts may cause kidney damage. The kinds of tests ordered will depend on your child and the type of urinary infection. Because no single test can tell everything about the urinary tract that might be important, more than one of the following tests may be needed:

- **Kidney and bladder ultrasound.** An ultrasound test examines the kidney and bladder using sound waves. This test shows shadows of the kidney and bladder that may point out certain abnormalities. However, this test cannot reveal all important urinary abnormalities. It also cannot measure how well a kidney works.
- **Voiding cystourethrogram (VCUG).** This test examines the urethra and bladder while the bladder fills and empties. A liquid that can be seen on x rays is placed into the bladder through a catheter. The bladder is filled until the child urinates. This test can reveal abnormalities of the inside of the urethra and bladder. The test can also determine whether the flow of urine is normal when the bladder empties.
- **Intravenous pyelogram.** This test examines the whole urinary tract. A liquid that can be seen on x rays is injected into a vein. The substance travels into the kidneys and bladder, revealing possible obstructions.
- **Nuclear scans.** Tests using radioactive materials that are usually injected into a vein to show how well the kidneys work, the shape of the kidneys, and whether urine empties from the kidneys in a normal way. Each kind of nuclear scan gives different information about the kidneys and bladder. Nuclear scans expose a child to about the same amount of radiation as a conventional x ray. At times, it can even be less.

What abnormalities lead to urinary problems?

Many children who get urinary tract infections have normal kidneys and bladders. But if a child has an abnormality, it should be detected as early as possible in life to protect the kidneys against damage. Abnormalities that could occur include the following:

- **Vesicoureteral reflux.** Urine normally flows from the kidneys down the ureters to the bladder in one direction. With reflux, when the bladder fills, the urine may also flow backward from the bladder up the ureters to the kidneys. This abnormality is common in children with urinary infections.
- **Urinary obstruction.** Blockages to urinary flow can occur in many places in the urinary tract. The ureter or urethra may be too narrow or a kidney stone at some point stops the urinary flow from leaving the body. Occasionally, the ureter may join the kidney or bladder at the wrong place and prevent urine from leaving the kidney in the normal way.

Do urinary tract infections have long-term effects?

Young children are at the greatest risk for kidney damage from urinary tract infections, especially if they have some unknown urinary tract abnormality. Such damage includes kidney scars, poor kidney growth, poor kidney function, high blood pressure, and other problems. For this reason it is important that children with urinary tract infections receive prompt treatment and careful evaluation.

Points to Remember

- Urinary tract infections occur in about 3 percent of girls and 1 percent of boys by age 11.
- A urinary tract infection in a young child may be a sign of an abnormality in the urinary tract that could lead to repeated problems.
- Symptoms of a urinary infection range from slight burning with urination or unusual smelling urine to severe pain and high fever.
- Untreated urinary infections can lead to serious kidney damage.
- Talk to a doctor if you suspect your child has a urinary tract infection.

For More Information

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Information about NKUDIC

The National Kidney and Urologic Diseases Information Clearinghouse (NKUDIC) is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The NIDDK is part of the National Institutes of Health under the U.S. Department of Health and Human Services. Established in 1987, the clearinghouse provides information about diseases of the kidneys and urologic system to people with kidney and urologic disorders and to their families, health care professionals, and the public. NKUDIC answers inquiries, develops and distributes publications, and works closely with professional and patient organizations and Government agencies to coordinate resources about kidney and urologic diseases.

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