

# Urinary Tract Infections in Children

*National Kidney and Urologic Diseases Information Clearinghouse*



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Urinary tract infections (UTIs) affect about 3 percent of children in the United States every year. Throughout childhood, the risk of a UTI is 2 percent for boys and 8 percent for girls. UTIs account for more than 1 million visits to pediatricians' offices every year. 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 1½ 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 1½ 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, a muscle called the sphincter relaxes and 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).

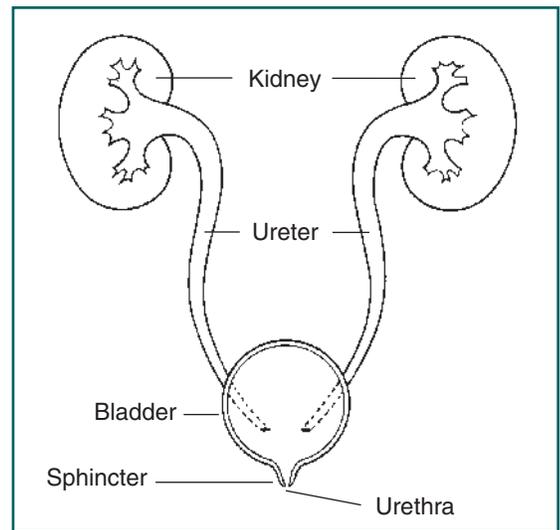


Figure 1. Front view of urinary tract.

## 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 cause swelling and pain in the lower abdomen and side. This bladder infection is called cystitis.

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.



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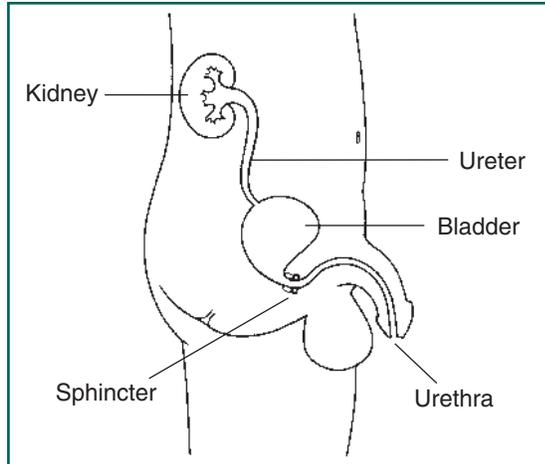


Figure 2. Side view of male urinary tract.

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?** on page 4.) 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?** on page 4.)

Children who frequently delay a trip to the bathroom are more likely to develop UTIs. Regular urination helps keep the urinary tract sterile by flushing away bacteria. Holding in urine allows bacteria to grow. Keeping the sphincter muscle tight for a long time also makes it more difficult to relax that muscle when it is time to urinate. As a result, the child's bladder may not empty completely. This dysfunctional voiding can set the stage for a urinary infection.

## 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 only a few years

old, the signs of a urinary tract infection may not be clear, since children that young cannot tell you exactly 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, called 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 or red.

## 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 your child's age. 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

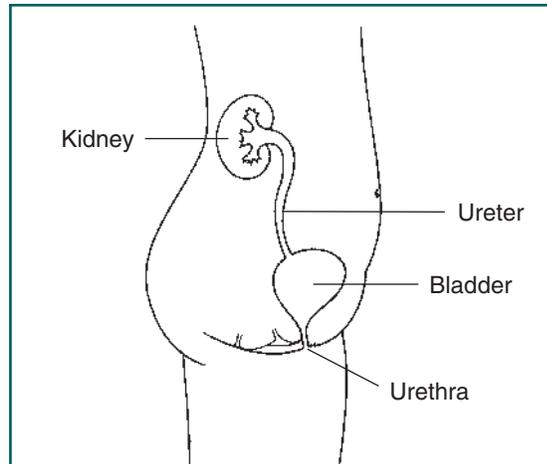


Figure 3. Side view of female urinary tract.

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, 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 cul-

ture 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 bacteria-fighting drugs called antibiotics. 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 recommends. 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.** These tests use 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.
- **Computed tomography (CT) scans and magnetic resonance imaging (MRI).** These tests provide 3-D images and cross-sections of the bladder and kidneys. With a typical CT scan or MRI machine, the child lies on a table that slides inside a tunnel where the images are taken. If the child's infection is complicated or difficult to see in other image tests, a CT scan or MRI can provide clearer, more detailed images to help the doctor understand the problem.

### 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 to protect the kidneys against damage. Abnormalities that could occur include the following:

- **Vesicoureteral reflux (VUR).** Urine normally flows from the kidneys down the ureters to the bladder in one direction. With VUR, 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.
- **Dysfunctional voiding.** Some children develop a habit of delaying a trip to the bathroom because they don't want to leave their play. They may work so hard at keeping the sphincter muscle tight that they forget how to relax it at the right time. These children may be unable to empty the bladder completely. Some children may strain during urination, causing pressure in the bladder that sends urine flowing back up the ureters. Dysfunctional voiding can lead to vesicoureteral reflux, accidental leaking, and UTIs.

### Points to Remember

- Urinary tract infections affect about 3 percent of children in the United States every year.
- 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.

## 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.

## How can urinary tract infections be prevented?

If your child has a normal urinary tract, you can help him or her avoid UTIs by encouraging regular trips to the bathroom. Make sure your child gets enough to drink if infrequent voiding is a problem. Teach your child proper cleaning techniques after using the bathroom to keep bacteria from entering the urinary tract.

Some abnormalities in the urinary tract correct themselves as the child grows, but some defects may require surgical correction. A common procedure to correct VUR is the reimplantation of the ureters. During this surgery, the doctor repositions the connection between the ureter and the bladder so that urine will not back up into the ureters and kidneys. In recent years, doctors have treated some cases of VUR by injecting collagen, or a similar substance, into the bladder wall, just below the opening where the ureter joins the bladder. This injection creates a kind of valve that keeps urine from flowing back into the ureter. The injection is delivered to the inside of the bladder through a catheter passed through the urethra, so there is no need for a surgical incision.

## For More Information

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