The American Urological Association
Pediatric Vesicoureteral Reflux Guidelines Panel

Caring for Children With Primary Vesicoureteral Reflux

A Guide for Parents

Information to discuss with your child's doctor

Pediatric Vesicoureteral Reflux Guidelines Panel

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What is vesicoureteral reflux?

Urine is made by the kidneys and flows down tubes called ureters into the bladder, where it is stored. The connection between the ureter and bladder on each side is a one-way "flap valve" that prevents urine from backing up into the kidney. During urination, the bladder contracts and the urethral sphincter relaxes (the urethral sphincter is a group of muscles that tighten to hold urine in the bladder and loosen to release urine), allowing urine to leave the bladder through a tube called the urethra. This entire system from the kidneys to the urinary opening is called the urinary tract.

Vesicoureteral reflux is a condition in which urine travels backward from the bladder toward the kidney and may affect one or both ureters. Figure 1 shows the urinary tract. In most children, reflux is a birth defect (i.e., congenital) and is caused by an abnormal attachment between the ureter and bladder with a short, ineffective flap valve. Figure 2 shows how urine flows normally and Figure 3 shows the flow in reflux. In some children, an abnormal voiding pattern may cause reflux to occur.

Reflux predisposes a child to a kidney infection (pyelonephritis), which can cause kidney damage. More severe reflux is associated with greater kidney damage. When urine backflow is more severe, the ureters and kidneys become larger and distorted. Although reflux can have these serious medical consequences, it is a "silent" abnormality, that is, reflux does not cause pain, discomfort or problems with urination.

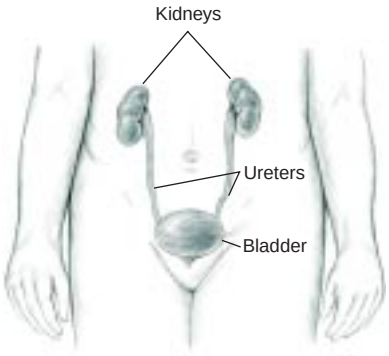

Figure 1. Urinary tract.

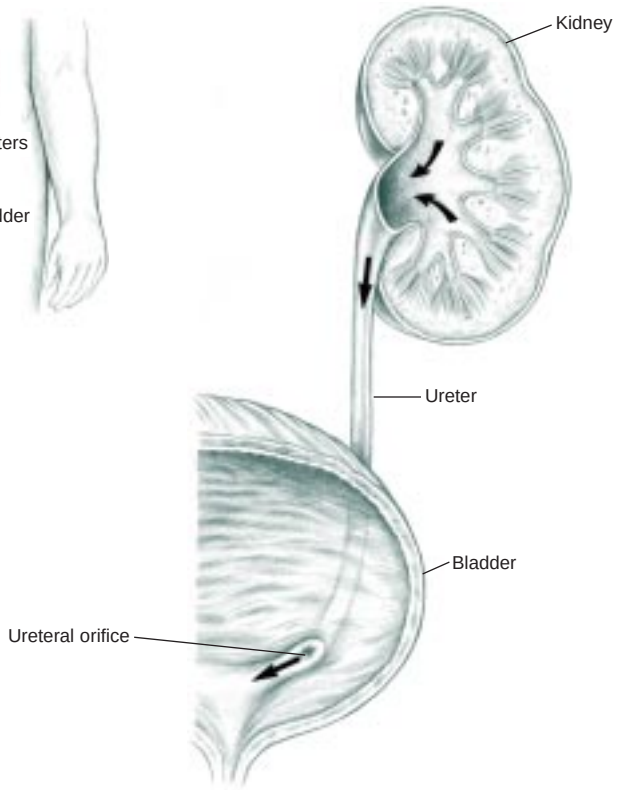

Figure 2. Normal flow of urine.

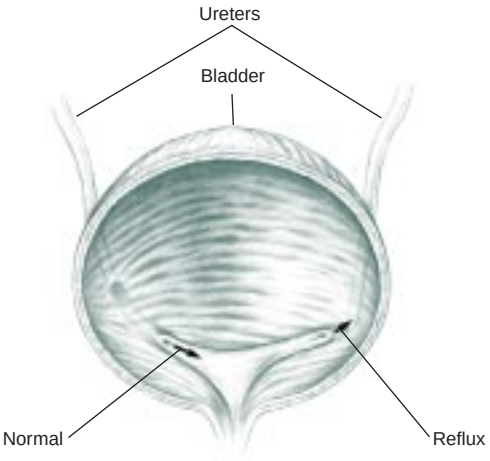

Figure 3. Urine flow, normal and in reflux.

Illustrations prepared by Tim Phelps, Baltimore, MD.

Who gets reflux?

Reflux occurs in about 1 percent of healthy children. It is usually diagnosed after a child has a urinary tract infection. The average age at diagnosis of reflux is 2–3 years, but it may be diagnosed at any age, even in newborn babies or older children. Approximately three-quarters of children being treated for reflux are girls.

In many children, reflux appears to be inherited (i.e., genetic). About one-third of sisters and brothers of children with reflux also have the disorder. In addition, if a mother has been treated for reflux, as many as half of her children also may have reflux. Your doctor may recommend screening your other children to see if any of them also has reflux.

How is urinary tract infection related to reflux? A urinary tract infection, also called UTI, is a bacterial infection of the urinary tract and may involve either the kidney, the bladder or both. A UTI involving the kidney is termed a kidney infection or pyelonephritis. Typical symptoms include fever, pain in the abdomen or lower back, a general ill feeling, and/or nausea and vomiting. A UTI that primarily involves the bladder is termed a bladder infection, or cystitis. Typical symptoms include painful and frequent urination and an urgent need to urinate, and many children experience wetting (lack of daytime urinary control). Newborns with a UTI often do not have such specific symptoms. Typical signs include fever, fussiness, vomiting, diarrhea, poor feeding and poor weight gain.

The bacteria that cause UTIs are typically from bacteria in the child's own stool (feces). Even with excellent hygiene, bacteria may colonize the genital area (with no external sign of infection) and ultimately enter the urethra and bladder. If the child has reflux, the bacteria may be transported to the kidney(s) and result in a kidney infection.

Although reflux usually is diagnosed after a child has been treated for a UTI, it is important to remember that reflux does not cause UTI and UTI does not cause reflux.

How is reflux diagnosed?

Reflux is diagnosed with a test called a voiding cystourethrogram (VCUG), which is an x-ray of the bladder. A thin plastic tube called a catheter is inserted into the urethra, which is the opening where the urine comes out (the tip of the penis in boys and just above the opening of the vagina in girls). Fluid containing x-ray dye is injected through the tube until the bladder is full, and then the child is asked to urinate. Pictures of the bladder are taken to see if the dye goes backward up to one or both kidneys (and so shows reflux). The VCUG usually takes 15–20 minutes. In some instances, the test is performed with fluid containing a tiny amount of radioactive tracer, and the test is monitored with a special camera. Infection related to using a catheter for these tests occurs in a small proportion of children, and antibiotics given before and after the procedure may be recommended.

Ways to ease discomfort and anxiety related to inserting a catheter should be discussed with the doctor. A few children become upset and need to be held during the test. Occasionally, a mild sedative can be prescribed before the procedure is performed. Performing the test using general anesthesia is not recommended, because it is important to observe whether there is reflux when the child is urinating.

What other tests are obtained in children with reflux?

To find out if one or both kidneys have been damaged by the combination of reflux and UTI, pictures are taken of the kidneys with ultrasound (sonogram) or by injection of either a radioactive substance or x-ray dye into a vein. Sometimes it is helpful to have two or even three of these tests done.

All of these tests, except ultrasound, expose the patient to a small amount of radiation. Radiation exposure is lower with some of the tests than with others; ask your doctor. These tests may also cause your child some discomfort and anxiety. You should discuss the procedures with

your child's doctor so you can help your child understand the tests.

Tests to monitor for UTI may include urinalysis (urine dipstick plus microscopic examination of the urine), urine culture, or a combination. The only risk of this test is the possibility of skin reactions to cleansing agents that may be used to prepare the child for the procedure.

In some children with reflux who also have difficulty with daytime urinary control (wetting), other tests may be recommended. For example, the doctor may suggest testing to determine whether the bladder size and function are normal. Such tests may include (1) uroflow, in which the child urinates into a special toilet to evaluate the rate and pattern of flow, (2) postvoid residual, in which the volume of urine remaining in the bladder after urinating is measured, and (3) urodynamics, in which a small tube is inserted into the bladder, the bladder is slowly filled with sterile water and the bladder size and bladder pressures are measured.

How is reflux measured?

Reflux can be measured or graded. The doctor looks at an x-ray of the urinary tract to determine the reflux grade. The reflux grade indicates how much urine is flowing back into the ureters and kidneys and helps the doctor decide what type of care is most appropriate.

The most common system of grading reflux—the International Study Classification—includes five grades. Figure 4 shows the progression of reflux severity in the ureter and kidney as seen on x-ray. Grade V is the most severe.

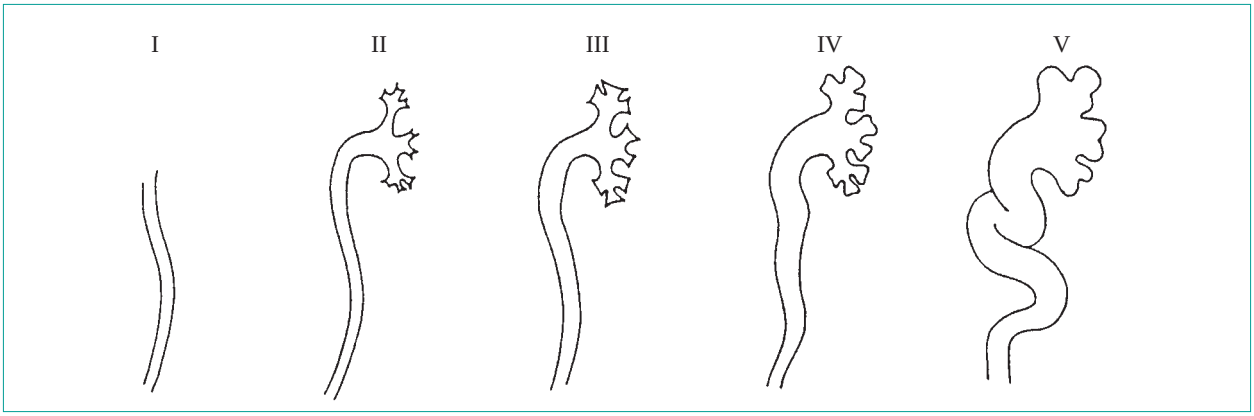

Figure 4. International Study Classification (Williams & Wilkins © 1981. All rights reserved.)

What are the risks of reflux?

Kidney damage. In children with reflux and UTI, kidney damage, also termed "kidney scarring," may occur. Higher grades of reflux are associated with greater risk of kidney damage. Some children who are discovered to have reflux already have kidney damage. In general, reflux without infection does not cause kidney damage. Kidney damage may cause high blood pressure. In addition, if both kidneys are damaged, kidney function may be impaired. If both kidneys are severely damaged, kidney failure can result.

Urinary tract infection. Kidney infection (pyelonephritis) is more common in children with reflux than in those children without reflux. In some children, hospitalization is necessary for treatment of the kidney infection. If the infection is severe, it may result in kidney damage.

Pregnancy complications. Pregnant women with significant kidney damage from UTI have an

increased risk of toxemia, premature delivery, fetal growth retardation, loss of the pregnancy, and worsening of their own kidney function. Some doctors also think that if a woman with reflux becomes pregnant, she has an increased chance of having a kidney infection, premature delivery, and fetal growth retardation. Others think these complications are related to the patient's increased risk of urinary tract infections and previous kidney damage.

How is reflux treated?

The goals of treatment in children with reflux are to prevent kidney damage, kidney infection, and the other complications of reflux previously discussed. The three primary treatment options are (1) medical treatment, (2) surgical treatment, and (3) surveillance (or observation).

The basis for **medical treatment** is that reflux often will gradually disappear. The average age for this to occur is 5–6 years. The goal of medical treatment is to prevent UTI and kidney damage, while growth and development allow reflux to disappear with time. Reflux improves or disappears in many children because the junction between the bladder and the ureter matures and becomes more normal. The lower the grade of reflux, the more likely it is to disappear. Reflux on one side only is often more likely to resolve than reflux on both sides.

Medical treatment includes antibiotic prophylaxis (use of antibiotics to prevent infection), bladder training and, on occasion, other medications. The child is seen in the office periodically for a physical examination and the urine is examined for infection. From time to time, the child undergoes radiologic studies of the bladder and/or kidneys to monitor the status of the reflux and growth of the kidneys.

Antibiotic prophylaxis: UTI often can be prevented by giving your child an antibiotic in a low dose every night at bedtime (so it stays in the bladder for a long time). The typical dosage prescribed is one-quarter to one-third of the full-strength dose. When used in this way, antibiotic drugs are generally safe, even when used for several years, and have little or no effect on overall immunity. Antibiotic prophylaxis or "maintenance" does not correct the reflux but is intended to prevent UTI from occurring; reflux without UTI usually does not damage the kidneys. Antibiotic prophylaxis is usually continued until the reflux disappears or the risk of reflux is considered low.

Bladder training consists of (1) teaching the child to urinate on a regular schedule and (2) teaching the child and parent other techniques to improve bladder function. The goal is to learn normal urinating patterns and to reduce the chance of developing UTI. Bladder training is often used along with antibiotic prophylaxis. The doctor may also teach the parent and child about proper wiping and general cleaning of the genitals and bottom. Learning how to avoid constipation is also important.

Other medications (called anticholinergic drugs) may also be prescribed to improve bladder function, particularly if the child does not have good bladder control. These medicines are usually effective and are quite safe, even when used for several years.

The goal of **surgical treatment** is to cure reflux with an operation and thus avoid the potential risks of continued reflux. The usual type of surgical therapy is performed under general anesthesia, through an incision in the lower abdomen. The operation consists of correcting the flap-valve attachment of the ureter to the bladder to prevent reflux from occurring. No artificial material is used in this procedure. Numerous techniques have been proven to be effective. Usually a catheter is used to drain the bladder for a few days after the operation. The patient is generally in the hospital for 2–5 days. After the operation, a follow-up radiologic evaluation is performed several months later to be certain that the operation was successful. Once the reflux is successfully corrected, it is unlikely to recur. Antibiotic prophylaxis may be stopped.

Another type of surgical correction is called ***endoscopic surgery***. The surgeon inserts an instrument called a cystoscope into the urethral opening to see inside the bladder. A substance is then injected into the area where the ureter enters the bladder to try to repair the reflux. This technique requires general anesthesia and usually can

be performed as an outpatient (same-day) procedure, but is not as successful as standard surgical techniques. Nearly all of the materials used for this procedure are experimental, and for this reason the technique is not yet approved for general use in the United States.

The third option, **surveillance (or observation)**, means that *antibiotic therapy is given only when a UTI occurs.* The philosophy of this approach is that prompt diagnosis and treatment of a UTI will prevent the risk of kidney infection linked with reflux. However, a UTI can develop quickly, and the child can become very sick quite rapidly. Time lost in providing a urine sample for testing and getting medical care could delay proper antibiotic treatment and increase the risk of kidney damage from the infection. Occasionally surveillance is used in older children who have persistent reflux and who have not been experiencing urinary tract infections. Few medical studies have analyzed the effectiveness of this approach because daily antibiotic prophylaxis is generally considered to be quite safe and effective.

Additional care for children with reflux. In any child with reflux, periodic surveillance and follow-up are used to monitor for a UTI. Regular tests for infection may include a urinalysis (urine dipstick and microscopic analysis) or a urine culture, especially if the child is ill, to rule out a UTI as the cause of illness. The doctor may also want to check your child's blood pressure. This is particularly important if renal scarring is found.

Bladder x-rays are performed to check whether the reflux is improved, the same, or worse. Also, tests (as described on pages 3–4) to see if there is any new damage to the kidneys may be recommended. In some cases, based on the test results, another type of therapy may be recommended.

What are the benefits and risks of each treatment?

Benefits

Cure. Under medical therapy, the chance of reflux disappearing varies according to reflux grade and the child's age. Higher grades of reflux are less likely to disappear. In addition, older children are not as likely to have their reflux resolve as are younger children. Antibiotic prophylaxis prevents UTI and possible kidney damage from infection while waiting to see if reflux disappears with time. Children who have reflux along with abnormal urination patterns (such as wetting) may have a better chance of reflux disappearing if they receive bladder training and/or other medications with antibiotic treatment.

Standard surgery corrects reflux in almost all patients. The chance of success is highest for Grades I and II and only slightly lower for Grades III and IV. For Grade V, it is the lowest, but still fairly high with approximately 85 percent of surgery successful. Following successful surgery, antibiotic prophylaxis may be stopped.

Endoscopic surgery has not yet been approved for general use in the United States. The chance of success is highest for mild reflux and lowest for severe reflux. If the procedure is unsuccessful, it may be repeated. Questions remain about how permanent the correction of reflux is after endoscopic therapy. Testing of the long-term benefit and safety of this procedure is ongoing.

Risks

Urinary tract infection. As many as one-third of all children treated for reflux will continue to have UTIs after treatment, regardless of treatment method (medical or surgical). However, because successful surgery cures reflux, bacteria that get into the bladder usually will not be able to reach the kidney. Kidney infection is about 2.5 times more likely to occur in children receiving medical treatment than in those who have had successful surgical therapy.

Kidney damage. Preventing new or additional kidney damage, which can result from kidney infections, is a major goal of treatment for reflux. The presence of kidney damage is detected on radiologic tests (see page 2). The risk of developing kidney damage appears to be higher in children who have a UTI.

Short-term studies have shown that patients receiving medical therapy and those treated surgically have a similar chance of developing new kidney damage, approximately 15–20 percent. Many clinicians believe that if reflux does not

disappear, there is continued risk for additional kidney damage, particularly if the child continues to get UTIs.

Kidney damage increases the child's chance of developing hypertension (high blood pressure), which would require treatment with medication. In those who have badly damaged kidneys, kidney failure can occur. These patients require kidney dialysis or transplantation. In addition, pregnant women with kidney damage may be at greater risk for having premature delivery, high blood pressure, a small baby, and worsening kidney function.

Medication-related problems. Possible reactions to antibiotic therapy for reflux include minor effects such as rash or prickly skin, nausea and vomiting, abdominal pain, cavities, and bad taste in the mouth. Rash or prickly skin is the most common side effect of antibiotics, usually from medications containing sulfa. The chance of developing other minor effects is low, occurring in less than 10 percent of patients. Cavities are linked with taking liquid forms of the drugs and can be avoided if the child brushes his or her teeth after taking the medicine. More serious side effects are extremely rare.

A related problem in children is getting them to take the recommended dose of the medication every night. The doctor can advise parents on this. In addition, parents should ask the doctor how long the child will need to take antibiotics and about any problems that may occur while they are taking the medicine. An important issue to discuss is the possibility that bacteria occasionally develop resistance to one or more antibiotics—this means that the antibiotic will no longer be effective against certain infections.

Reactions to other medications such as anticholinergic drugs also may occur in children. Possible effects include redness of the face, dry mouth, dry eyes, decreased sweating, increased heart rate, blurry vision, drowsiness, and constipation. Parents should discuss any new symptoms such as these with the doctor.

Surgical complications. The most common problems related to surgery to correct reflux are persistent reflux, ureteral obstruction, and contralateral reflux. The chance of complications varies and depends on the individual child's condition.

The chance of persistent reflux after standard surgery is approximately 2– 4 percent, except in Grade V (the most severe grade), in which the risk is slightly higher. If reflux persists, often it will disappear with time, but it is possible it will need to be corrected.

The chance of ureteral obstruction, (blockage in the ureter) is about 2 percent. In most cases this problem will require corrective surgery.

About 5 percent of patients who have surgery on one ureter subsequently develop reflux on the other side, termed "contralateral reflux." The chance of having this complication does not seem to be related to reflux severity or surgical method used. Contralateral reflux usually disappears on its own with time.

Nearly all children experience some pain after surgery. Parents should ask the doctor how their child's pain will be managed. There have been recent advances in managing pain in children after surgery that will make the child as comfortable as possible.

A few children get a UTI right after surgery. This problem is treated with antibiotics. Many children have burning with urination and difficulty with bladder control as the bladder is healing. These problems generally resolve within 1–2 weeks. Passing blood in the urine for as long as 1 week is also common. In most instances, it is extremely unlikely that a blood transfusion will be necessary.

Difficulty with urinating after surgery has been reported in up to 2–3 percent of cases. This problem is most likely following surgery on both sides and usually resolves after a short period of time. However, the need to use a catheter during this time may cause the child some pain.

Hospitalization. If the child develops a severe kidney infection, he or she might need to be hospitalized for 2–4 days to receive intravenous antibiotic treatment and fluid therapy. The hospital stay after surgery for reflux correction is usually about 2–5 days and varies with the surgical method used. Hospital stays have become shorter for many procedures in recent years. Average lengths of stay for children undergoing surgery to correct reflux are likely to continue to decrease.

Observation. Care of reflux in children, particularly those receiving antibiotic treatment, involves regular tests to check for a UTI as well as periodically determining the status of the reflux problem. Children experience discomfort with some of these tests related to catheter insertion and/or injection of a radiologic agent into a small vein on the arm or hand.

What should be considered in choosing a treatment?

Many factors should be considered when deciding about what treatment is best for your child: reflux severity, whether reflux is on one or both sides, the child's age and gender, presence of kidney damage, presence of urination problems (such as wetting), and the family's views on these considerations, as well as the effects of continued testing to monitor the reflux status and everyday antibiotic therapy.

Generally, the lower the reflux grade the better the results are likely to be from any form of treatment. Children with low-grade reflux (Grades I or II) have a high chance of reflux disappearing and of effective treatment with either antibiotics or surgery. However, in patients with the more severe forms of reflux, the chance of reflux going away over time while the child is receiving medical therapy to prevent a UTI is lower. Standard surgery is effective in about 96 percent of patients.

In general, scientific information suggests that reflux disappears on its own in the majority of patients with Grades I–III reflux after several years of daily antibiotic therapy. For Grades I–IV reflux, antibiotic therapy may be favored over surgery as a first option because it is associated with fewer risks in the short term. In children with more severe reflux, the decision to choose surgical therapy is based on information that kidney infection is 2.5 times more likely in children treated with antibiotic therapy as with successful surgery. Infections that occur during antibiotic prophylaxis are called "breakthrough" infections and may pose a risk for kidney damage. In certain cases, these infections may be difficult to prevent, and therefore, surgical treatment may be recommended.

Surgery is most often recommended for Grade V reflux because it is believed that this severe condition is unlikely to disappear on its own in patients receiving antibiotic therapy.

Surgical treatment may also be recommended more often for girls than for boys because evidence shows that girls have a greater risk of developing UTIs. Other factors to consider include whether the child is a good candidate for surgery, has other health conditions, is able to tolerate and reliably take the antibiotics, as well as other social and cost factors.

Family's views

Because parents (and, at older ages, children) differ in what they consider important, the treatment choice for one family may not be right for another. In deciding between medical and surgical therapy, the family needs to think about the frequency, inconveniences, and costs related to doctor visits and tests to monitor the status of the child's reflux. The tests may also cause some discomfort and anxiety.

Some families choose daily antibiotic therapy to prevent infection because they feel it has fewer immediate risks than surgery, and they recognize the possibility that the reflux may disappear on its own as the child matures.

Other families, no matter what the affected child's age or severity of reflux, may choose surgery to treat reflux. They will risk the chance of complications from the operation to avoid daily antibiotics and regular monitoring tests.

Still others may choose management of reflux by surveillance or regular examinations with antibiotic treatment only when an infection occurs. They choose to avoid daily antibiotics and the risk of complications from an operation. However, they risk their child getting an infection that is not detected and treated immediately.

The family's personal feelings are often the most important factor in choosing the treatment.

Where to find more information

American Foundation for Urologic Disease
1128 N. Charles St.
Baltimore, MD 21201
410-727-2908

National Kidney and Urologic Diseases
Information Clearinghouse
3 Information Way
Bethesda, MD 20892-3580
301-654-4415

Questions to ask the doctor

- ❑ How severe is my child's reflux? What problems will it cause?
- ❑ What are the chances that the reflux will disappear on its own as my child grows?
- ❑ What tests will my child need? Will they be painful? What are the dangers of the tests? How much will each test cost?
- ❑ What are the treatment options? What are the advantages and disadvantages of each? What are the chances of cure for each treatment?
- ❑ What are the risks of each treatment? What kinds of complications are linked with each? How are the complications treated?
- ❑ If we choose medical therapy, how long will my child need to continue taking medications? How much will daily drug treatment cost?
- ❑ If we choose surgery, how long will my child be in the hospital? How long will it take my child to recover fully from surgery? How much will the operation and hospital stay cost? What are the chances my child will require further treatment after surgery?
- ❑ How often will my child need tests to monitor the effect of treatment (medical or surgical)? How much will monitoring tests cost?

Additional questions to ask the doctor:

- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____

Glossary

Anesthesia, general: Patient unconscious, with muscle relaxation and no pain sensation over entire body.

Antibiotic prophylaxis: Daily treatment with antibiotics to prevent infection.

Behavioral techniques: Methods of changing a person's symptoms or behavior for the treatment of abnormal urination patterns. Includes modifying bladder habits by methods such as bladder training or timed urination.

Bladder: A sac made of muscle and membranes that holds the urine, which it receives through the ureters and releases out of the body through the urethra *(see Figure 1)*.

Bladder infection: Urinary tract infection involving the bladder. Typical symptoms include burning with urination, frequency, urgency, and wetting. Also called cystitis.

Bladder training: A behavioral technique that teaches the patient to urinate on a regular schedule and to empty the bladder completely.

Bladder x-ray: The use of an x-ray picture to examine the bladder and urethra. An x-ray is taken during urination while a radiative substance is in the bladder.

Catheter: A thin tube inserted through the urethra into the bladder to allow urine to drain or for performance of a procedure or test, such as insertion of the substance during a bladder x-ray.

Cystitis: *See* Bladder infection.

High blood pressure: Medical term is hypertension.

Kidney: One of two organs that excrete urine.

Kidney infection: Urinary tract infection involving the kidney. Typical symptoms include abdominal or back pain, fever, malaise, and nausea or vomiting. Also called pyelonephritis.

Pyelonephritis: *See* Kidney infection.

Reflux: *See* Vesicoureteral reflux.

Reflux grade: Severity of the reflux *(see Figure 4)*.

Sphincter: A band of muscle fibers that can relax or tighten to open or close a body opening or passage.

Ureter(s): The tube(s) through which the urine passes from the kidneys to the bladder *(see Figure 1)*.

Urethra: The tube through which urine passes from the bladder out of the body.

Urge/urgency: A strong desire to urinate.

Urge incontinence: The involuntary loss of urine with an abrupt and strong desire to urinate (urgency); wetting.

Urinary problems or dysfunction: Abnormal urination patterns or bladder habits, including wetting, dribbling, and other urination control problems.

Urinary tract: Passageway from the kidney to the ureters, bladder, and urethra.

Urinary tract infection (UTI): An infection of the urinary tract, including the bladder (cystitis; bladder infection) or the kidney (pyelonephritis; kidney infection).

Vesicoureteral reflux: Backflow of urine from the bladder into one or both ureters, during rest or especially during urination *(see Figure 3)*.

Voiding cystourethrogram (VCUG): X-ray test of bladder to see whether reflux is present.

Voiding dysfunction: *See* Urinary problems or dysfunction.

This publication is intended for patients and their families. The information is summarized from the *Report on the Management of Primary Vesicoureteral Reflux in Children*, developed by the American Urological Association, Inc., and its Pediatric Vesicoureteral Reflux Guidelines Panel, with assistance from Technical Resources International, Inc.

This *Guide for Parents* is intended to stimulate and facilitate discussion between the patient's family and the doctor regarding the types of treatment described in a summary fashion in this booklet. The full *Report* of the guidelines panel provides the physician with a more detailed discussion of treatment guidelines and options to be considered.

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