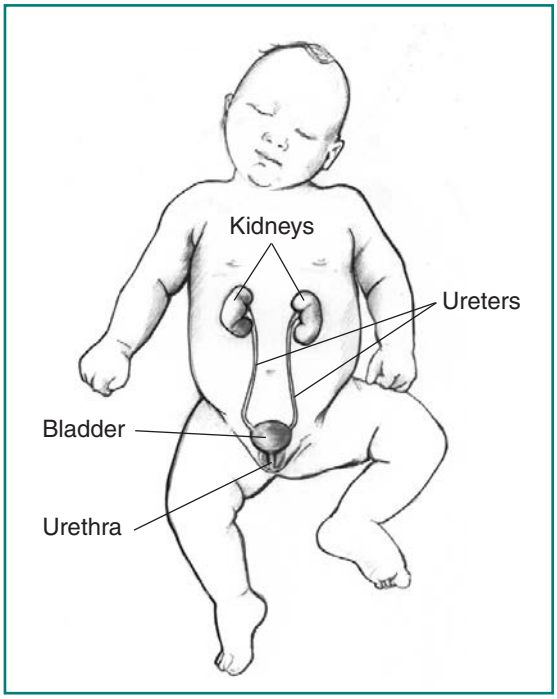
Urine Blockage in Newborns

National Kidney and Urologic Diseases Information Clearinghouse

National Institute of Diabetes and Digestive and Kidney Diseases

What is the urinary tract?

The urinary tract is the body's drainage system for removing wastes and extra fluid. The urinary tract includes two kidneys, two ureters, a bladder, and a urethra. The kidneys are two bean-shaped organs, each about the size of a fist. They are located just below the rib cage, one on each side of the spine. Every day, the kidneys filter about 120 to 150 quarts of blood to produce about 1 to 2 quarts of urine, composed of wastes and extra fluid. Children produce less urine than adults. The amount produced depends on their age. The urine flows from the kidneys to the bladder through tubes called ureters. The bladder stores urine until releasing it through urination. When the bladder empties, urine flows out of the body through a tube called the urethra at the bottom of the bladder.



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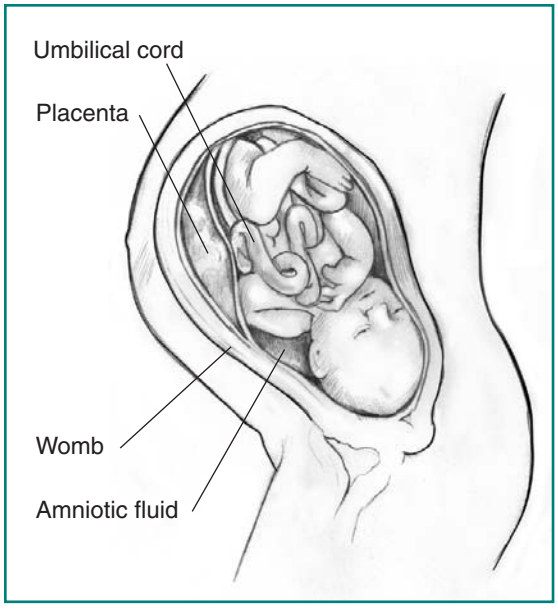
The kidneys and urinary system keep fluids and natural chemicals in the body balanced. While a baby is developing in the mother's womb, called prenatal development, the placenta—a temporary organ joining mother and baby—controls much of that balance. The baby's kidneys begin to produce urine at about 10 to 12 weeks after conception. However, the mother's placenta continues to do most of the work until the last few weeks of the pregnancy. Wastes and extra water are removed from the baby's body through the umbilical cord. The baby's urine is released into the amniotic sac and becomes part of the amniotic fluid. This fluid plays a role in the baby's lung development.

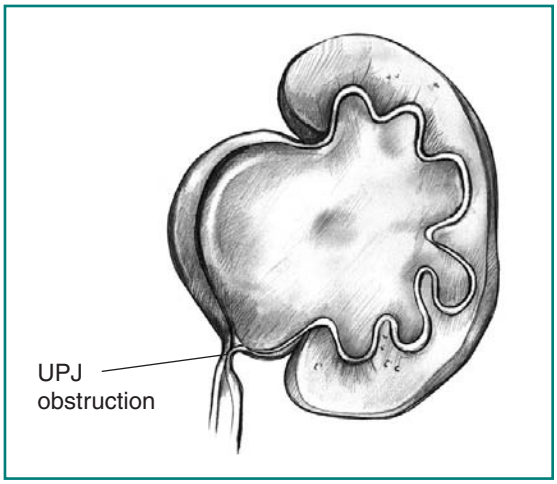


Baby in the mother's womb

What causes urine blockage in newborns?

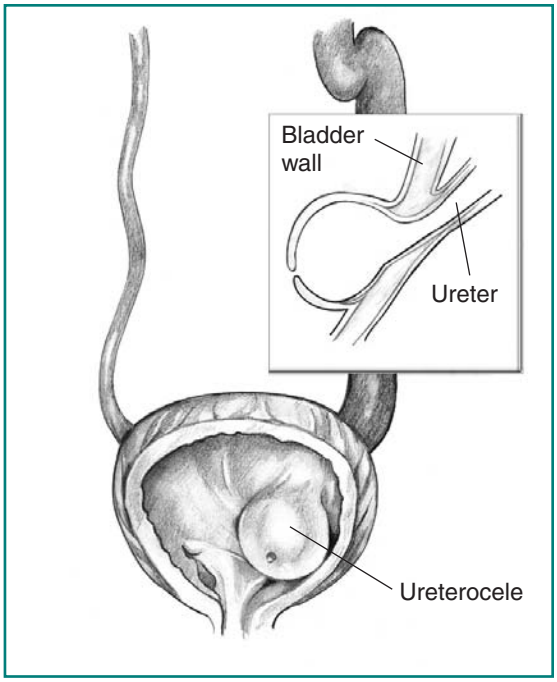
Many types of defects in the urinary tract can cause urine blockage:

- **Vesicoureteral reflux (VUR).** Most children with VUR are born with a ureter that did not grow long enough during development in the womb. The valve formed by the ureter pressing against the bladder wall does not close properly, so urine backs up—refluxes—from the bladder to the ureter and eventually to the kidney. Severe reflux may prevent a kidney from developing normally and may increase the risk for damage from infections after birth. VUR usually affects only one ureter and kidney, though it can affect both ureters and kidneys.
- **Ureteropelvic junction (UPJ) obstruction.** If urine is blocked where the ureter joins the kidney, only the kidney swells. The ureter remains a normal size. UPJ obstruction usually occurs in only one kidney.



UPJ obstruction occurs when urine is blocked where the ureter joins the kidney.

- **Bladder outlet obstruction (BOO).** BOO describes any blockage in the urethra or at the opening of the bladder. **Posterior urethral valves (PUV),** the most common form of BOO seen in newborns and during prenatal ultrasound exams, is a birth defect in boys in which an abnormal fold of tissue in the urethra keeps urine from flowing freely out of the bladder. This defect may cause swelling in the entire urinary tract, including the urethra, bladder, ureters, and kidneys.
- **Ureterocele.** If the end of the ureter does not develop normally, it can bulge, creating a ureterocele. The ureterocele may obstruct part of the ureter or the bladder.



Ureterocele

Some babies are born with genetic conditions that affect several different systems in the body, including the urinary tract:

- **Prune belly syndrome (PBS).** PBS is a group of birth defects involving poor development of the abdominal muscles, enlargement of the ureters and bladder, and both testicles remaining inside the body instead of descending into the scrotum. The skin over the abdomen is wrinkled, giving the appearance of a prune. PBS usually occurs in boys, and most children with PBS have hydronephrosis—swelling in the kidney—and VUR.
- **Esophageal atresia (EA).** EA is a birth defect in which the esophagus—the muscular tube that carries food and liquids from the mouth to the stomach—lacks the opening for food to pass into the stomach. Babies born with EA may also have problems with their spinal columns, digestive systems, hearts, and urinary tracts.
- **Congenital heart defects.** Heart defects range from mild to life threatening. Children born with heart defects also have a higher rate of problems in the urinary tract than children in the general population, suggesting that some types of heart and urinary defects may have a common genetic cause.

Urine blockage can also be caused by spina bifida and other birth defects that affect the spinal cord. These defects may interrupt nerve signals between the bladder, spinal cord, and brain, which are needed for urination, and lead to urinary retention—the inability to empty the bladder completely—in newborns. Urine that remains in the bladder can reflux into the ureters and kidneys, causing swelling.

What are the symptoms of urine blockage in newborns?

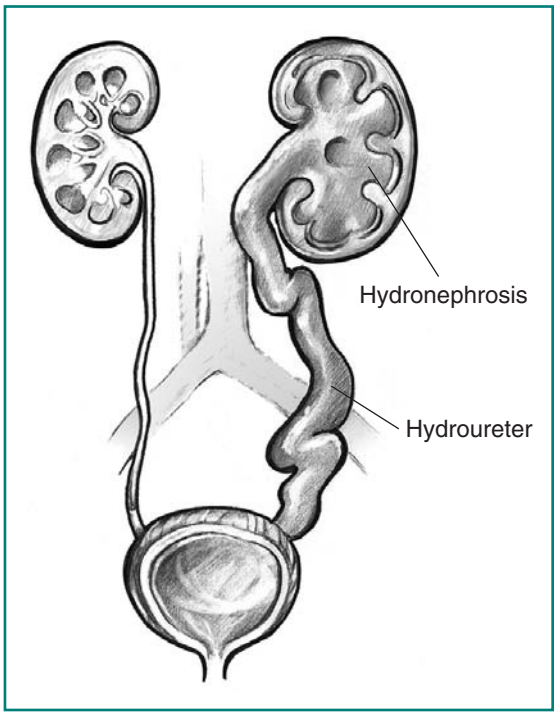
Before leaving the hospital, a baby with urine blockage may urinate only small amounts or may not urinate at all. As part of the routine newborn exam, the health care provider may feel an enlarged kidney or find a closed urethra, which may indicate urine blockage. Sometimes urine blockage is not apparent until a child develops symptoms of a urinary tract infection (UTI), including

- fever
- irritability
- not eating
- nausea
- diarrhea
- vomiting
- cloudy, dark, bloody, or foul-smelling urine
- urinating often

If these symptoms persist, the child should see a health care provider. A child 2 months of age or younger with a fever should see a health care provider immediately. The health care provider will ask for a urine sample to test for bacteria.

What are the complications of urine blockage before and after birth?

When a defect in the urinary tract blocks the flow of urine, the urine backs up and causes the ureters to swell, called hydroureter, and hydronephrosis.



Swelling in the kidney is called hydronephrosis. Swelling in the ureter is called hydroureter.

Hydronephrosis is the most common problem found during prenatal ultrasound of a baby in the womb. The swelling may be easy to see or barely detectable. The results of hydronephrosis may be mild or severe, yet the long-term outcome for the child's health cannot always be predicted by the severity of swelling. Urine blockage may damage the developing kidneys and reduce their ability to filter. In the most severe cases of urine blockage, where little or no urine leaves the baby's bladder, the amount of amniotic fluid is reduced to the point that the baby's lung development is threatened.

After birth, urine blockage may raise a child's risk of developing a UTI. Recurring UTIs can lead to more permanent kidney damage.

How is urine blockage in newborns diagnosed?

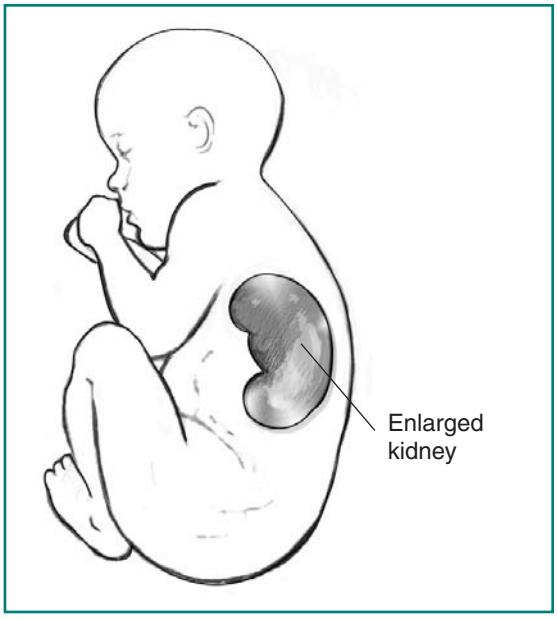
Defects of the urinary tract may be diagnosed before or after the baby is born.

Diagnosis before Birth

Tests during pregnancy can help determine if the baby is developing normally in the womb.

- **Ultrasound.** Ultrasound uses a device, called a transducer, that bounces safe, painless sound waves off organs to create an image of their structure. A prenatal ultrasound can show internal organs within the baby. The procedure is performed in a health care provider's office, outpatient center, or hospital by a specially trained technician, and the images are interpreted by
  - a radiologist—a doctor who specializes in medical imaging, or
  - an obstetrician—a doctor who delivers babies

The images can show enlarged kidneys, ureters, or bladders in babies.



A prenatal ultrasound can show enlarged kidneys, ureters, or bladders in babies.

- **Amniocentesis.** Amniocentesis is a procedure in which amniotic fluid is removed from the mother's womb for testing. The procedure can be performed in the health care provider's office, and local anesthetic may be used. The health care provider inserts a thin needle through the abdomen into the uterus to obtain a small amount of amniotic fluid. Cells from the fluid are grown in a lab and then analyzed. The health care provider usually uses ultrasound to find the exact location of the baby. The test can show whether the baby has certain birth defects and how well the baby's lungs are developing.
- **Chorionic villus sampling (CVS).** CVS is the removal of a small piece of tissue from the placenta for testing. The procedure can be performed in the health care provider's office; anesthesia is not needed. The health care provider uses ultrasound to guide a thin tube or needle through the vagina or abdomen into the placenta. Cells are removed from the placenta and then analyzed. The test can show whether the baby has certain genetic defects.

Most healthy women do not need all of these tests. Ultrasound exams during pregnancy are routine. Amniocentesis and CVS are recommended only when a risk of genetic problems exists because of family history or a problem is detected during an ultrasound. Amniocentesis and CVS carry a slight risk of harming the baby and mother or ending the pregnancy in miscarriage, so the risks should be carefully considered.

Diagnosis after Birth

Different imaging techniques can be used in infants and children to determine the cause of urine blockage.

- **Ultrasound.** Ultrasound can be used to view the child's urinary tract. For infants, the image is clearer than could be achieved while the baby was in the womb.
- **Voiding cystourethrogram (VCUG).** VCUG is an x-ray image of the bladder and urethra taken while the bladder is full and during urination, also called voiding. The procedure is performed in an outpatient center or hospital by an x-ray technician supervised by a radiologist, who then interprets the images. While anesthesia is not needed, sedation may be used for some children. The bladder and urethra are filled with a special dye, called contrast medium, to make the structures clearly visible on the x-ray images. The x-ray machine captures images of the contrast medium while the bladder is full and when the child urinates. The test can show reflux or blockage of the bladder due to an obstruction, such as PUV.

- **Radionuclide scan.** A radionuclide scan is an imaging technique that detects small amounts of radiation after a person is injected with radioactive chemicals. The dose of the radioactive chemicals is small; therefore, the risk of causing damage to cells is low. Radionuclide scans are performed in an outpatient center or hospital by a specially trained technician, and the images are interpreted by a radiologist. Anesthesia is not needed. Special cameras and computers are used to create images of the radioactive chemicals as they pass through the kidneys. Radioactive chemicals injected into the blood can provide information about kidney function.

How is urine blockage in newborns treated?

Treatment for urine blockage depends on the cause and severity of the blockage. Hydronephrosis discovered before the baby is born rarely requires immediate action, especially if it is only on one side. The condition often goes away without any treatment before or after birth. The health care provider should keep track of the condition with frequent ultrasounds.

Surgery

If the urine blockage threatens the life of the unborn baby, a fetal surgeon may recommend surgery to insert a shunt or correct the problem causing the blockage. A shunt is a small tube that can be inserted into the baby's bladder to release urine into the amniotic sac. The procedure is similar to amniocentesis, in that a needle is inserted through the mother's abdomen. Ultrasound guides placement of the shunt, which is attached to the end of the needle. Alternatively, an endoscope—a small, flexible tube with a light—can be used to place a shunt or to repair the problem causing the blockage. Fetal surgery carries many risks, so it is performed only in special circumstances, such as when the amniotic fluid is absent and the baby's lungs are not developing or when the kidneys are severely damaged.

If the urinary defect does not correct itself after the child is born, and the child continues to have urine blockage, surgery may be needed to remove the obstruction and restore urine flow. The decision to operate depends on the degree of blockage. After surgery, a small tube, called a stent, may be placed in the ureter or urethra to keep it open temporarily while healing occurs.

Antibiotics

Antibiotics are bacteria-fighting medications. A child with possible urine blockage or VUR may be given antibiotics to prevent UTIs from developing until the urinary defect corrects itself or is corrected with surgery.

Intermittent Catheterization

Intermittent catheterization may be used for a child with urinary retention due to a nerve disease. The parent or guardian, and later the child, is taught to drain the bladder by inserting a thin tube, called a catheter, through the urethra to the bladder. Emptying the bladder in this way helps to decrease kidney damage, urine leakage, and UTIs.

Eating, Diet, and Nutrition

Researchers have not found that a mother's eating, diet, and nutrition play a role in causing or preventing urine blockage in newborns.

Points to Remember

- Many types of defects in the urinary tract can cause urine blockage:
  - vesicoureteral reflux (VUR)
  - ureteropelvic junction (UPJ) obstruction
  - bladder outlet obstruction (BOO), such as posterior urethral valves (PUV)
  - ureterocele
- Some babies are born with genetic conditions that affect several different systems in the body, including the urinary tract:
  - prune belly syndrome (PBS)
  - esophageal atresia (EA)
  - congenital heart defects
- Urine blockage can also be caused by spina bifida and other birth defects that affect the spinal cord.
- Before leaving the hospital, a baby with urine blockage may urinate only small amounts or may not urinate at all. As part of the routine newborn exam, the health care provider may feel an enlarged kidney or find a closed urethra, which may indicate urine blockage. Sometimes urine blockage is not apparent until a child develops symptoms of a urinary tract infection (UTI).
- When a defect in the urinary tract blocks the flow of urine, the urine backs up and causes the ureters to swell, called hydroureter, and hydronephrosis.
- Defects of the urinary tract may be discovered before or after the baby is born.
- Prenatal tests include ultrasound, amniocentesis, and chorionic villus sampling (CVS).
- Different imaging techniques, including ultrasound, voiding cystourethrogram (VCUG), and radionuclide scan, can be used in infants and children to determine the cause of urine blockage.
- Treatment for urine blockage depends on the cause and severity of the blockage. Hydronephrosis discovered before the baby is born rarely requires immediate action, especially if it is only on one side. Treatments for more serious conditions include
  - surgery
  - antibiotics
  - intermittent catheterization

Hope through Research

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) conducts and supports research to help people with urologic diseases, including children. The NIDDK's Division of Kidney, Urologic, and Hematologic Diseases maintains the Pediatric Urology Program, which supports research into the early development of the urinary tract. The Randomized Intervention for Children with Vesicoureteral Reflux (RIVUR) study is investigating whether prophylactic antibiotic treatment prevents UTIs and renal scarring in children with VUR. More information about the RIVUR study, funded under National Institutes of Health clinical trial number NCT00405704, can be found at *www.cscc.unc.edu/rivur.*

Clinical trials are research studies involving people. Clinical trials look at safe and effective new ways to prevent, detect, or treat disease. Researchers also use clinical trials to look at other aspects of care, such as improving the quality of life for people with chronic illnesses. To learn more about clinical trials, why they matter, and how to participate, visit the NIH Clinical Research Trials and You website at *www.nih.gov/health/clinicaltrials.* For information about current studies, visit *www.ClinicalTrials.gov.*

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This publication is available at *www.urologic.niddk.nih.gov.*

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