Kidney Stones

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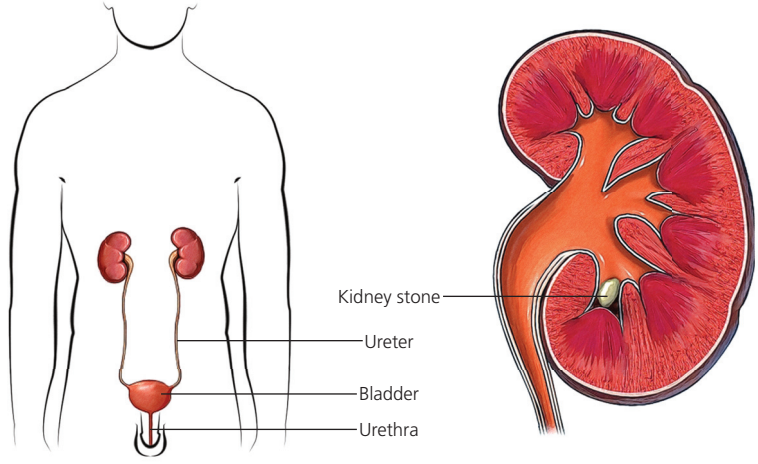
What are kidney stones? Why are they formed?

A kidney stone is a solid mass made up of tiny crystals. These are formed in the kidneys or anywhere in the urinary tract.

The stones form when there is a decrease in urine volume and/or an excess of stone-forming substances in the urine. Dehydration is one of the major risk factors for stone formation.

People with certain medical conditions, such as gout, and those who take certain medications or supplements are at risk for kidney stones. Kidney stones are a common cause for blood in the urine (hematuria) and often severe pain in the abdomen, flank or groin. Kidney stones are sometimes called renal calculi.

Kidney stones can also result from infections in the urinary tract; these are known as struvite or infection stones. Metabolic abnormalities, including inherited disorders of metabolism, can alter the composition of the urine and increase an individual's risk of stone formation.



What are the signs and symptoms of kidney stones?

Some kidney stones may be symptomless and are known as "silent" stones.

- **Pain** – People who have kidney stones complain of the sudden onset of excruciating, cramping pain in their lower back and/or side, groin or abdomen.

Pain cannot be relieved by changing your posture also the abdominal, groin and/or back pain typically waxes and wanes in severity, characteristic of colicky pain and is referred to as renal colic. The pain has been described by many, as the worst pain of their lives, even worse than the pain of childbirth or broken bones

- **Nausea and vomiting -** It may be so severe that it is often accompanied by nausea and vomiting
- **Hematuria -** Kidney stones also characteristically cause blood in the urine
- **Fever and chills -** If infection is present in the urinary tract along with the stones, fever and chills may also develop
- Sometimes, symptoms such as difficulty in urinating, urinary urgency, penile pain or testicular pain may occur due to kidney stones

Risk factors for kidney stones

Risk factors are aspects that make you more likely to develop kidney stones. For instance, people who do not drink enough water are at a higher risk of getting kidney stones, than people who do. Assess your risk factors by answering "yes" or "no" to the questions below. The more times you answer "yes," the higher are your chances of forming kidney stones.

	Yes	No
Do you drink fewer than eight glasses of water a day?	☐	☐
Have you had a kidney stone before?	☐	☐
Has anyone in your family had kidney stones?	☐	☐
Are you between the ages of 30 and 50?	☐	☐
Do you live in a hot climate?	☐	☐
Do you have frequent urinary tract infections?	☐	☐
Do you have a history of gout or bowel disease?	☐	☐
Is your diet high in sodium (salt) or animal protein?	☐	☐
Do you often have cola, black tea, chocolate, spinach or nuts?	☐	☐
Are you overweight?	☐	☐

What you can do?

The first step is to see your doctor. Together you can create a treatment plan, to manage pain and treat your kidney stones. Be sure to show the doctor your answers to the questions above. They can help him or her suggest ways, to keep you from getting kidney stones in the future.

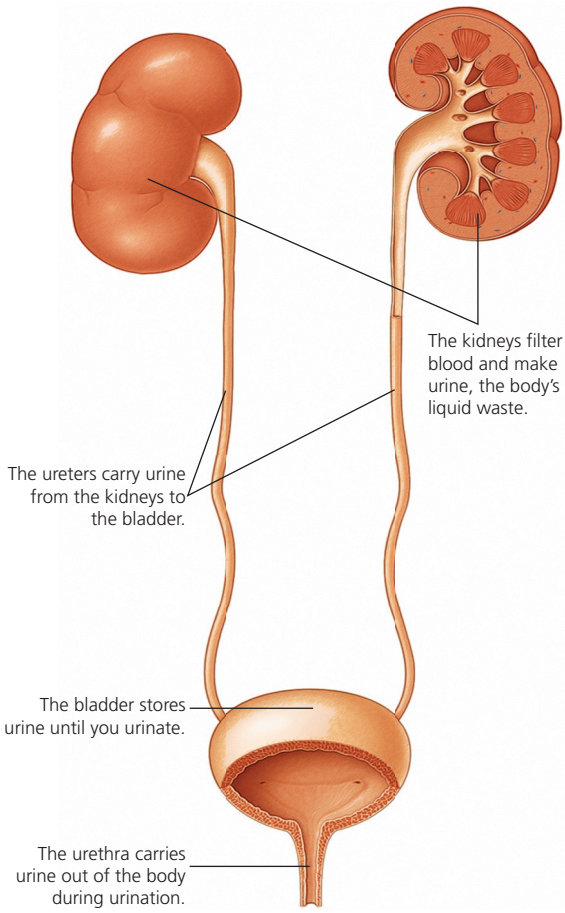
Understanding kidney stones

The urinary tract, or urinary system, includes the kidneys, ureters, bladder, and urethra. The kidneys filter the blood. They remove waste, and excess water and minerals. These materials are carried out of the body as urine. If an imbalance of minerals in the urine occurs, it can result in the formation of kidney stones.

What causes kidney stones?

Some of the minerals in urine, such as calcium, promote the growth of crystals, while others prevent it. Normally, a balance is kept in the levels of these minerals. An imbalance can cause crystals to form. The crystals can then bind together, into kidney stones. This mineral imbalance is often caused by dehydration (too little water in the body). It can also be caused by eating too much of certain foods.

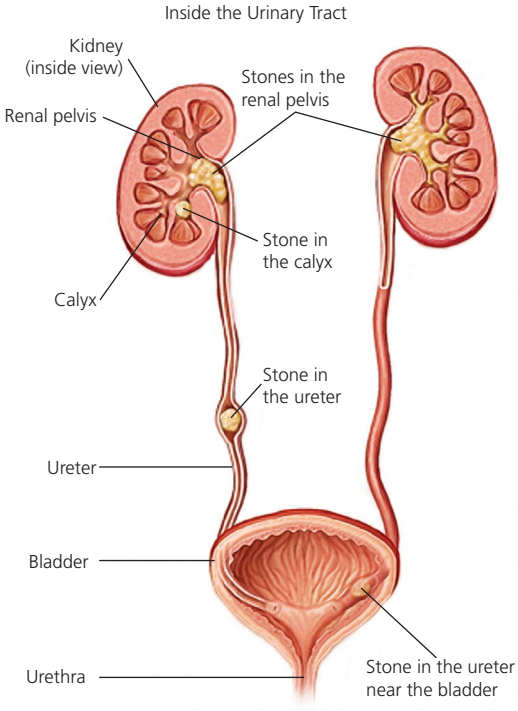
The Urinary Tract



Types of kidney stones

Kidney stones vary in size, shape, and color. There are four main types of stones, each made up of different minerals. Most people develop just one type. These are the main types:

- **Calcium stones** are the most common type. They consist of calcium, combined with other minerals such as; oxalate or phosphate
- **Uric acid stones** are the second most common type. They may occur in people with a history of gout
- **Struvite stones** (also called infection stones) are caused by infection in the urinary tract. They are made of magnesium and phosphate
- **Cystine stones** are caused by cystinuria, which is a rare genetic disorder



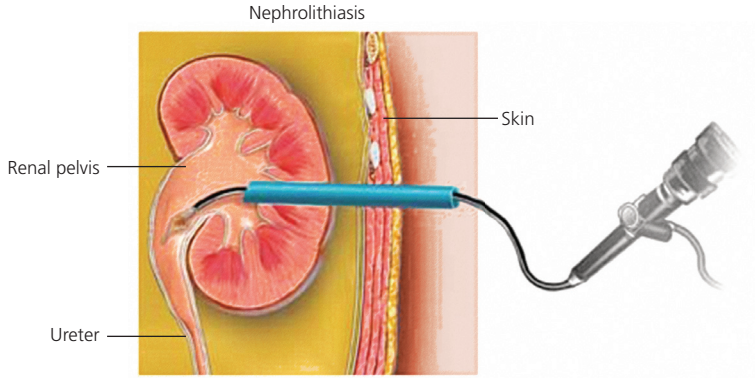
Note: Renal calculus is a medical term your doctor may use. It means kidney stone.

Where do stones form and lodge?

A kidney stone forms in a calyx (a section of the kidney, where urine drains before flowing to the center of the kidney or renal pelvis). The stone can stay in the calyx or it can move and lodge in another area of the kidney or ureter. If lodged, a stone can irritate tissue and block urine flow. Kidney stones cause fewer problems in the urethra. This is because the urethra is wide enough for stones to easily pass out of the body.

How are kidney stones diagnosed?

Medical evaluation helps your doctor to reach the conclusion of your suffering from 'nephrolithiasis' or 'kidney stones'. This includes health history, physical exam and diagnostic tests. This can be done in the outpatient department or in the emergency setup, in the event of excruciating pain. Once evaluated you will be referred to an urologist.



History of illness – Your symptoms will be evaluated. Pain will be analysed for its site, intensity, duration, any reference to other sites and its association with micturition. You will be asked if you had any fever, chills, or rigour. Any bloody urine or presence of nausea and vomiting should be told by you, to the doctor. The healthcare provider will also inquire about the risk factors like low water intake, any history of dehydration, any medications that can cause stones or any familial tendency.

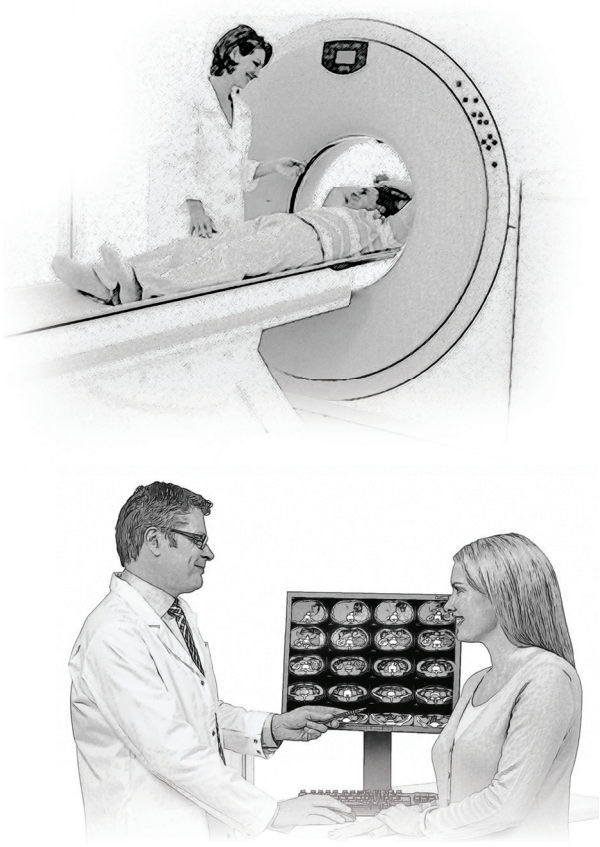
Physical exam – This will include palpitation of the site of pain. Your temperature will be recorded along with other vital signs being checked.

Diagnostic tests – Certain tests should be done. These may include:

- Blood tests to check calcium, phosphorus, uric acid and electrolyte levels
- Kidney function tests
- Urinalysis to see crystals and look for red blood cells in the urine
- Examination of the stone to determine the type

Stones or a blockage can be seen on:

- Abdominal CT scan
- Abdominal/kidney MRI
- Abdominal X-rays
- Intravenous pyelogram (IVP)
- Kidney ultrasound
- Retrograde pyelogram



Your treatment plan

Based on your evaluation results, your doctor will work with you to create a plan to treat your kidney stone. Treatment will depend on factors such as the type, size and location of your stone.

Treatment options

There are two main ways to treat kidney stones: passing stones on your own and procedures to help stones pass. Open surgery is rarely performed to treat kidney stones.

Passing kidney stones on your own

Many kidney stones can be passed in the urine. This may be done with or without the aid of medication.

Procedures for kidney stones removal

Procedures to break up or remove kidney stones may be used if stones won't pass, are large, or are associated with infection.

During treatment

With either treatment approach, you may need to do the following:

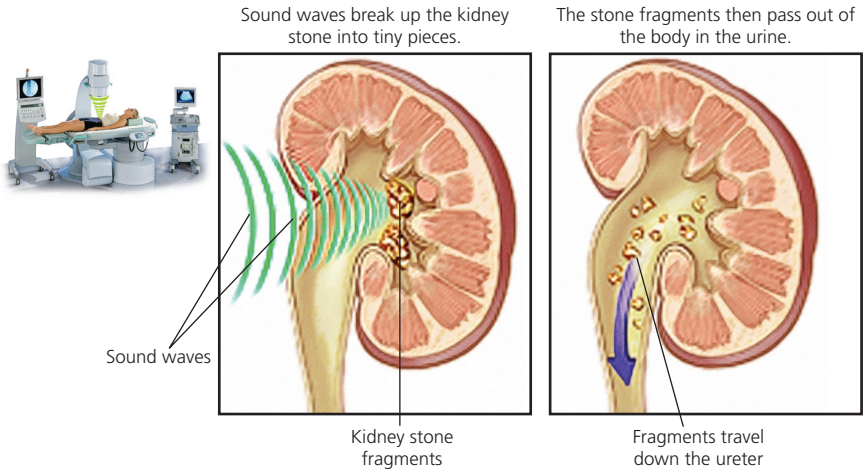
- **Manage pain** – Your doctor will likely recommend pain medications. These help control pain, as you wait to pass your stone or recover from a procedure. Opioids (narcotics) or NSAIDs (nonsteroidal anti-inflammatory drugs) may be prescribed. Be sure to take them as directed
- **Strain your urine** – Your doctor may ask you to do this to help catch stones as you pass them. You'll urinate through a special strainer and then bring any stones you pass to your doctor for analysis
- **Treat infection if needed** – If you have an infection, your doctor will give you antibiotics to treat it

Shock wave lithotripsy

Shock wave lithotripsy (SWL) is the most common procedure used to treat kidney stones. It uses sound waves to break stones into small pieces. This makes stones easier to pass. SWL is typically used for stones in the kidney and upper ureter.

How does SWL work?

During SWL, a machine generates sound waves outside the body. These waves pass through the body into the kidney stone. They break up the stone into small, sandlike pieces. These pieces can then pass easily out of the body in the urine. The sound waves are focused on the kidney stone. So, there is little impact to the skin and nearby tissues. X-rays are taken before and during the procedure to locate the stone and make sure it has broken up.



What to expect?

During SWL, general anaesthesia is most often used (you'll be asleep). You'll likely go home on the same day of the procedure. A few days later, you may have an X-ray done. This will check, that the stone was completely broken up. If a stent was placed, you may have it removed at this visit. Your doctor may suggest a follow-up appointment in a few weeks or months.

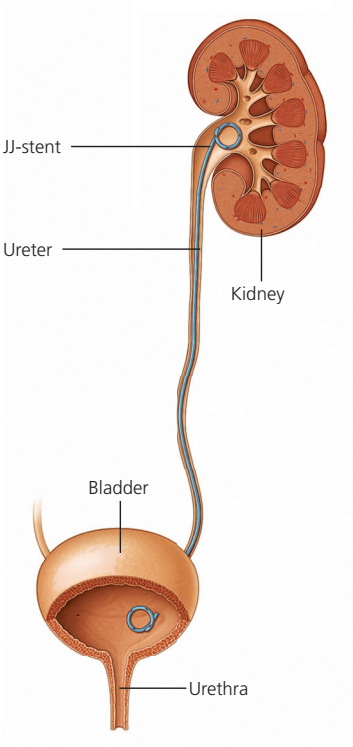
Risks and complications of SWL

SWL has some risks and possible complications. They include:

- Need for a repeat procedure
- Stent side effects
- Infection
- Internal bleeding (very rare)

Ureteral stents

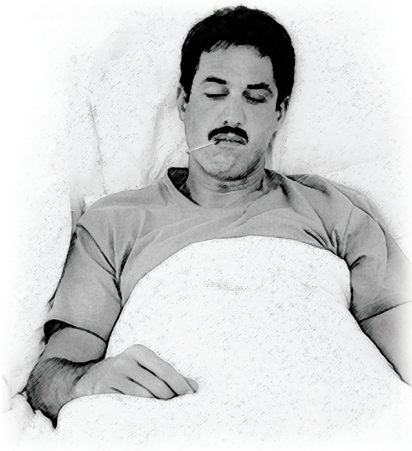
A temporary stent may be placed. This is a flexible plastic tube that helps urine drain and the ureter heal. Stent side effects include more frequent urination, burning during urination and blood in the urine.



When to call the doctor?

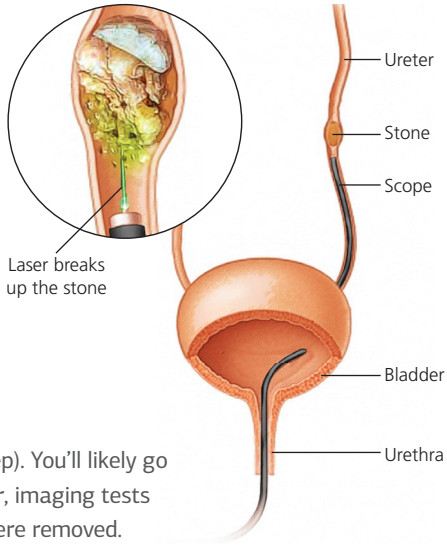
After SWL, call your doctor if you have any of the following:

- 101°F (38.3°C) fever or higher
- Inability to urinate
- Severe vomiting
- Dizziness or extreme fatigue
- Severe pain that doesn't go away
- Heavy bleeding



Ureteroscopy

This procedure is most often used if a stone is lodged in the ureter. A small telescope with a camera is inserted through the urethra and bladder, into the ureter. A laser fiber is sent through the scope to break up the stone. The stone fragments can then pass in the urine. If the stone is small, a tiny basket passed through the scope is used to grasp the stone and remove it from the body.



What to expect?

General anaesthesia is often used (you'll be asleep). You'll likely go home the same day. A few weeks or months later, imaging tests may be done, which checks weather all stones were removed.

Risks and complications of ureteroscopy

Ureteroscopy has some risks and possible complications. They include:

- Bleeding
- Infection
- Scarring in ureter (rare)
- Perforation of ureter (rare)
- Stent side effects

When to call the doctor?

After a ureteroscopy, call your doctor if you have any of the following:

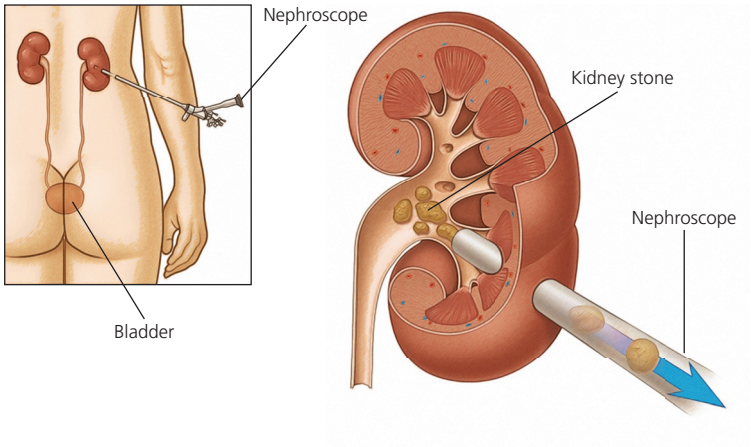
- 101°F (38.3°C) fever or higher
- Inability to urinate
- Severe vomiting
- Dizziness or extreme fatigue
- Severe pain that doesn't go away
- Heavy bleeding

Percutaneous stone removal

This procedure is typically used for larger stones located in the kidney. A small incision is made in the back. A telescope with a camera is inserted through the incision, into the kidney. Lasers or other devices passed through the scope break up the stone. The stone fragments are then removed through the scope.

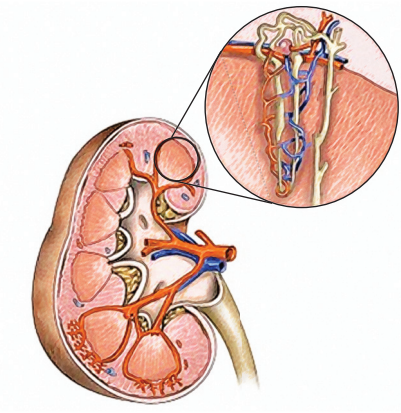
What to expect?

General anaesthesia is used (you'll be asleep). You may have a tube (called a nephrostomy tube) in your kidney for a few days to allow drainage of urine. You'll probably stay in the hospital for one to three days. A few weeks later, you'll likely have a follow-up appointment.



Risks and complications of percutaneous stone removal

- Bleeding
- Infection
- Minor loss of kidney function
- Need for repeat procedures
- Stent side effects
- Damage to kidney or surrounding tissue (rare)
- Need for blood transfusion (rare)



When to call the doctor?

After percutaneous stone removal, call your doctor if you have any of the following:

- 101°F (38.3°C) fever or higher
- Heavy bleeding (from the incision or in your urine)
- Severe pain
- Fluid leaking from the incision for more than two to three days
- Vomiting that doesn't go away

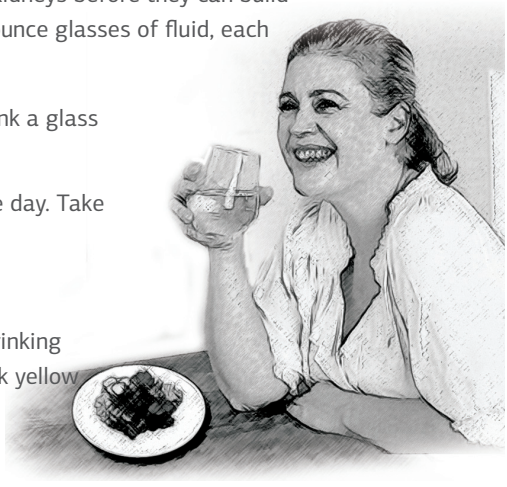
Your treatment will help you get free of the kidney stones. But that is not the end of the story. You will have to make some changes in your lifestyle and keep a tab on the risk factors, to stay stone free for the rest of your life. Follow your doctor's instructions, drink lots of water/ fluids and eat right. These simple steps will help you live a life that is free of kidney stones and pain.

Prevention for lifetime

Since you've had a kidney stone, you are now more likely to have another stone in the future. But you can take steps to prevent kidney stones. Drink plenty of fluids, eat right, and work with your doctor to stay healthy.

Drink lots of fluids

Staying hydrated helps flush minerals out of your kidneys before they can build up and form stones. Aim to drink about eight, 12-ounce glasses of fluid, each day. Water is best. These tips can help:



- Drink a glass of water with each meal. Also drink a glass when you brush your teeth and before bed
- Keep a bottle of water with you throughout the day. Take sips whenever you can
- Limit alcohol and caffeine
- Check the color of your urine to see if you're drinking enough. Clear or light yellow urine is good. Dark yellow urine means that you need to drink more

Follow a healthy diet

Healthy eating helps maintain normal levels of minerals in your urine. Ask your doctor for diet tips based on your type of stone. You may be told to:

- Limit your intake of sodium and animal protein
- Avoid high-oxalate foods and drinks, such as chocolate, nuts, leafy green vegetables, black tea, and colas
- Have the recommended daily amount of calcium in your diet. Too much or too little calcium can lead to kidney stones
- Avoid excessive amounts of vitamin C
- Lose any excess weight. Your doctor can help you create a weight-loss plan

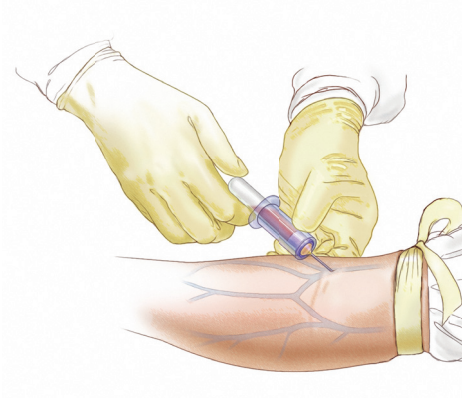
Work with your doctor

The best way to lower your risk of getting future kidney stones is to work with your doctor. This means following your treatment plan and keeping regular appointments. Depending on your risk level, your doctor may want to see you every few months or once a year. He or she may also suggest further testing and preventive medications.

Further testing

These tests can help determine why you developed kidney stones. This information can help you prevent future stones. Tests include:

- Stone analysis – A passed stone is analysed to determine its type
- 24-hour urine sample – Your urine output from a 24-hour period is analysed. This test shows what minerals are in your urine
- Blood tests – These tests check mineral levels in the blood



Preventive medications

Your doctor may prescribe medications to keep you from forming new stones. You may need to take these for life. Preventive medications include:

- Thiazide diuretic – Reduces the amount of calcium in urine
- Allopurinol – Reduces the amount of uric acid in the urine
- Potassium citrate – Helps prevent certain types of stones. Also helps dissolve uric acid stones
- Other medications – Help prevent cystine and other types of stones

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