Kidney stones are deposits of minerals and salts that form in the kidneys.

Most commonly, kidney stones are composed primarily of calcium. Less frequently, they are made up of uric acid (a normal by-product in the urine) or cystine (an amino acid) or are associated with urinary tract infections (struvite kidney stones).

What Are Symptomatic Kidney Stones?
While small kidney stones may pass freely through the urinary system, larger kidney stones can become lodged within a ureter, which is the tube that carries urine from the kidney to the bladder. Symptomatic kidney stones typically cause sudden onset of severe flank or back pain on one side of the body that can radiate to the groin (renal colic) and may result in blood in the urine, pain with urination, increased frequency of urination, fever and chills, and nausea and vomiting.

How Are Symptomatic Kidney Stones Diagnosed?
The preferred imaging study to confirm the diagnosis of kidney stones is a noncontrast abdominal computed tomography (CT) scan, which provides information about the size and location of the stones. Ultrasonography may be an alternative option for individuals who are pregnant (to avoid radiation exposure to the fetus) or for patients who need frequent imaging due to recurrent kidney stones.

Initial Treatment for Symptomatic Kidney Stones
Initial treatment for symptomatic kidney stones involves pain control. Nonopioid analgesics, including nonsteroidal anti-inflammatory medications such as intravenous ketorolac, are often used to treat renal colic in patients without kidney disease. Opioids may be prescribed for pain control in individuals with severe renal colic. Patients with symptomatic kidney stones who are dehydrated should be treated with intravenous fluids.

For patients with a kidney stone that is 10 mm in diameter or smaller, typical outpatient management involves a 4- to 6-week trial of straining the urine to capture a passed kidney stone. Patients who are not at risk of developing low blood pressure may be treated with an alpha-adrenergic blocker medication (such as tamsulosin) to help expel ureteral stones.

Which Patients Should Undergo Surgical Treatment for Kidney Stones?
Surgical treatment is recommended for patients with symptomatic kidney stones larger than 10 mm in diameter. Surgery may also be considered for patients with smaller symptomatic kidney stones who have fever, uncontrolled nausea or pain, or only 1 functioning kidney and for those who prefer early intervention or who have not spontaneously passed the kidney stone after 4 to 6 weeks.

Risk Factors for Recurrent Symptomatic Kidney Stones
Risk factors for symptomatic recurrent kidney stones include history of asymptomatic or symptomatic kidney stones, larger stones, and a higher number of kidney stones detected by imaging. Other risk factors include male sex, younger age, obesity, pregnancy, and having a family history of kidney stones.

Recommended Treatments to Decrease Recurrent Kidney Stones
All patients with symptomatic kidney stones should increase their fluid intake and eat a low-sodium, normal-calcium, moderate-protein diet. Patients at high risk of recurrent symptomatic kidney stones may also benefit from treatment with a thiazide diuretic medication and potassium citrate. The composition of kidney stones and urine collected over 24 hours may be analyzed to help guide preventive therapy for some patients.

FOR MORE INFORMATION
National Library of Medicine
medlineplus.gov/kidneystones.html

Author: Kristin Walter, MD, MS
Author Affiliation: Senior Editor, JAMA.
Conflict of Interest Disclosures: None reported.

The JAMA Patient Page is a public service of JAMA. The information and recommendations appearing on this page are appropriate in most instances, but they are not a substitute for medical diagnosis. For specific information concerning your personal medical condition, JAMA suggests that you consult your physician. This page may be downloaded or photocopied noncommercially by physicians and other health care professionals to share with patients. To purchase bulk reprints, email reprints@jamanetwork.com.