YOUR KIDNEYS:

Master Chemists of the Body

National Kidney Foundation™

www.kidney.org

National Kidney Foundation's Kidney Disease Outcomes Quality Initiative

Did you know that the National Kidney Foundation's Kidney Disease Outcomes Quality Initiative (NKF-KDOQI™) offers guidelines and commentaries that help your doctor and healthcare team make important decisions about your medical treatment? The information in this booklet is based on those recommended guidelines.

Stages of Kidney Disease

There are 5 stages of kidney disease. They are shown in the table below. Your doctor determines your stage of kidney disease based on the presence of kidney damage and your glomerular filtration rate (GFR), which is a measure of your level of kidney function. Your treatment is based on your stage of kidney disease. Speak to your doctor if you have any questions about your stage of kidney disease or your treatment.

STAGES OF KIDNEY DISEASE

Stage	Description	Glomerular Filtration Rate (GFR)*
1	Kidney damage (e.g., protein in the urine) with normal GFR	90 or above
2	Kidney damage with mild decrease in GFR	60 to 89
3	Moderate decrease in GFR	30 to 59
4	Severe reduction in GFR	15 to 29
5	Kidney failure	Less than 15

*Your GFR number tells your doctor how much kidney function you have. As chronic kidney disease progresses, your GFR number decreases.

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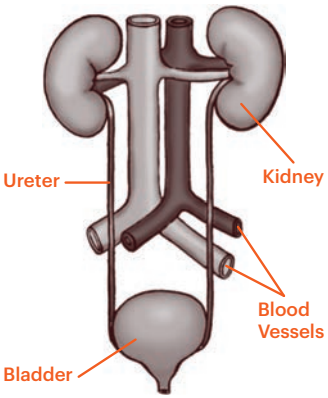
"Bones can break, muscles can atrophy, glands can loaf, even the brain can go to sleep without immediate danger to survival. But should the kidneys fail, neither bones, muscles, glands nor brain could carry on."

—Dr. Homer W. Smith,
From Fish to Philosopher

Your kidneys perform important functions that affect every part of your body. Many other organs depend upon the kidneys to function normally. The kidneys perform complicated jobs that keep the rest of the body in balance. When the kidneys become damaged, your body's other organs are affected as well.

Your kidneys can be affected by a number of problems, including urinary tract infections, kidney stones, and chronic kidney disease. Medical advances have improved our ability to diagnose and treat these problems. Even when the kidneys no longer function, treatments such as dialysis and transplantation have brought new life to hundreds of thousands of people. There is still much to learn, however, and we still need to support kidney research efforts.

Why are the kidneys so important?

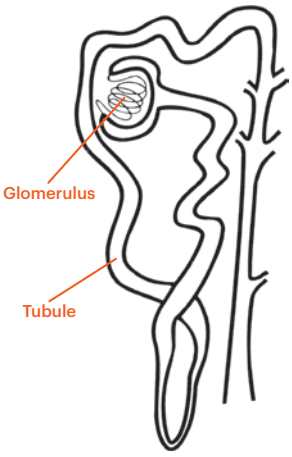


The major job of the kidneys is to remove waste products and extra fluids from the body in the form of urine. The production of urine is a complicated process that maintains a chemical balance in your body.

Your kidneys also regulate your body's salt, potassium and acid content, and make hormones that affect the way your other organs function. One hormone produced by the kidneys is needed to make red blood cells. Others help regulate your blood pressure and help your body use calcium. Your kidneys also:

- Remove waste products from your body
- Balance chemicals in your body, such as potassium, phosphorus, calcium, and sodium
- Balance your body's fluids
- Regulate your blood pressure
- Promote strong, healthy bones

Where are the kidneys and how do they function?



NEPHRON

You have two kidneys, each about the size of a fist, located on either side of your spine at the bottom of your rib cage. Each kidney contains up to a million filtering units called "nephrons." Each nephron has a cluster of tiny blood vessels called a glomerulus. The glomerulus is attached to a tubule. When blood enters the glomerulus, it is filtered and loses some of its fluid, which passes through the tubule. In the tubule, chemicals and water are either added to or removed from this fluid, according to the body's needs. When the fluid leaves the tubule system, it is called urine. Urine moves down to the bladder, where it will spend from 1 to 8 hours before leaving the body.

The kidneys filter about 200 quarts of blood each day. Two quarts of fluid with wastes are removed from the blood in the form of urine.

What is chronic kidney disease?

Chronic kidney disease (CKD) means the kidneys are damaged. When the kidneys are damaged, they cannot filter blood and do their other jobs well enough. Protein in the urine for three months or longer is a warning sign of kidney damage. Your level of kidney function is measured by the test for glomerular filtration rate (GFR). A GFR of less than 60 for three months or more indicates CKD.

What are some of the causes of kidney disease?

There are many causes of kidney disease. In the United States, diabetes and high blood pressure are the two leading causes. Some conditions are inherited (run in families); people may be born with abnormal kidneys. The following are some of the most common causes of kidney damage.

Diabetes is a disease in which your body does not make enough insulin—the hormone that processes sugar—or cannot properly use normal amounts of insulin. The result is a high blood sugar level, which can cause problems in many parts of your body. (See National Kidney Foundation publication *Diabetes and Your Eyes, Heart, Nerves, Feet and Kidneys* Order# 11-10-0216.)

High blood pressure (also known as hypertension) is another common cause of kidney disease and other illnesses, such as heart attacks and strokes. When high blood pressure is controlled, the risk of kidney disease is decreased. (See National Kidney Foundation publication *High Blood Pressure and Your Kidneys* Order# 11-10-0204.)

Glomerulonephritis (glo-mer-yoo-low-nef-rite-iss) is a disease that causes inflammation of the kidney's tiny filtering units—the glomeruli. Glomerulonephritis may happen suddenly, for example after a bout of strep throat, and the individual may get well again. However, the disease can also develop slowly over several years and it may cause loss of kidney function. (See National Kidney Foundation's online *A to Z Health Guide:* "Glomerulonephritis" at **www.kidney.org/atoz**)

Polycystic kidney disease is the most common inherited kidney disease. It is characterized by the formation of cysts in the kidneys. These cysts enlarge over time and can seriously damage the kidneys or even cause kidney failure. (See National Kidney Foundation's online *A to Z Health Guide:* "Polycystic Kidney Disease" at **www.kidney.org/atoz**)

Kidney stones are a common problem. Having kidney stones may or may not lead to long-term kidney problems. Stones result from a build-up of extra wastes in the blood. The most common wastes are oxalate and uric acid. Sometimes extra fluid, diet, and medications can help prevent stones

from forming. Kidney stones may cause severe pain in your back and side. Stones are sometimes too large to pass out of your body in urine. In these cases, the stones can be removed surgically or broken down into smaller pieces that can pass out of the body in urine. (See National Kidney Foundation's online *A to Z Health Guide:* "Kidney Stones" at **www.kidney.org/atoz**)

Urinary tract infections (UTIs) happen when germs enter the urinary tract and multiply. Symptoms include feeling an increased need to urinate, pain and/or burning during urination, cloudy or blood-stained urine, and a strong odor to the urine. These infections happen most often in the bladder, but they sometimes spread upwards to the kidneys. This causes fever and back pain. Kidney infections are serious and must be treated right away to avoid scarring kidney tissue. (See National Kidney Foundation publication *Urinary Tract Infections* Order# 11-10-0205)

Congenital diseases, ones that people are born with, may also affect the kidneys. These diseases usually begin with a problem that happens in a baby's urinary tract when it is growing in the womb. One of the most

common congenital diseases happens when a valve in the bladder fails to work and allows urine to back up to the kidneys, causing infections and possible kidney damage over time.

Drugs and toxins can also cause kidney problems. Using large amounts of over-the-counter pain relievers (non-steroidal anti-inflammatory drugs (NSAIDs)) for a long time can be harmful to the kidneys. Certain other medications, toxins, pesticides, and street drugs such as heroin and crack can also cause kidney damage.

How is kidney disease detected?

Early detection and treatment can slow or prevent the progression of kidney disease. Some simple tests can be done to detect early kidney disease. They are:

- *Blood pressure monitoring.* High blood pressure is a cause of kidney disease. It may also be a sign of kidney trouble.
- *A test for protein in the urine.* Too much protein in your urine may mean that your kidneys' filtering units have been damaged. A single positive result could be due to a fever or heavy exercise, so your doctor will want to confirm your urine protein test results over several weeks.
- *An estimate of your GFR to show how much kidney function you have.* Your doctor uses the results of a blood test, along with your age, gender, and race, to estimate your GFR number. The chart on page 2 shows the stages of kidney disease by GFR number.

It is very important that people who are at increased risk for kidney disease have these tests.

You are at increased risk for kidney disease if you:

- are age 60 or older
- have diabetes
- have high blood pressure
- have a family history of diabetes, high blood pressure, or kidney failure
- are African American, Hispanic, Asian, Pacific Islander, or American Indian

If you have one of these risks, or if you think you may be at increased risk for kidney disease, ask your doctor about getting tested.

What are the warning signs of kidney disease?

Kidney disease usually affects both kidneys. If the kidneys' ability to filter the blood is seriously damaged by injury or disease, waste products and excess fluid may build up in the body. Although many forms of kidney disease do not cause symptoms until late in the course of the disease, there are a number of warning signs:

- More frequent urination, particularly at night
- Puffiness around the eyes; swelling of the hands and feet
- Weakness and fatigue
- Nausea and vomiting
- Loss of appetite
- Dry and itchy skin
- Trouble sleeping
- Trouble concentrating

Can kidney disease be prevented or successfully treated?

Careful control of diseases like diabetes and conditions like high blood pressure can help prevent kidney disease or keep it from getting worse. Treating high blood pressure with special medications called angiotensin-converting enzyme (ACE) inhibitors or angiotensin-receptor blockers (ARBs) can help slow the progression of kidney disease. Kidney stones and urinary tract infections can usually be treated successfully. Unfortunately, the exact causes of some kidney diseases are still unknown, and treatments are not yet available for them. Research is being done to find treatments for all of the conditions that can cause kidney disease.

Sometimes, kidney disease progresses to kidney failure. When that happens, a person needs treatment with dialysis or a kidney transplant to survive.

Kidney transplantation is the best treatment for kidney failure and has high success rates. A kidney can come from a living donor, such as a family member or a friend. Sometimes the donated kidney comes from someone who has recently died.

There are two types of dialysis—hemodialysis and peritoneal dialysis. Hemodialysis involves treatment with a dialysis machine. It can be performed at a dialysis center or the patient's home. Treatments are usually done three times a week. Peritoneal dialysis is a home-based treatment and is generally done every day or night. A doctor who specializes in kidney disease, called a nephrologist, can explain the different treatments and help patients make the best choices.

More information about hemodialysis, peritoneal dialysis, kidney transplantation, and organ donation is available from the National Kidney Foundation (NKF). Call the NKF Cares Patient Help Line toll-free at **855.NKF.CARES** (855.653.2273) or email **nkfcares@kidney.org**

Learn more at **www.kidney.org**

Resources:

You can find more information about the issues mentioned in this booklet online at the National Kidney Foundation's *A to Z Health Guide:* **www.kidney.org/atoz**

The following brochures from the National Kidney Foundation may also be helpful to you. To order a free copy call the NKF Cares Patient Help Line toll-free at **855.NKF.CARES** (855.653.2273) or email **nkfcares@kidney.org**

Are You at Increased Risk for Chronic Kidney Disease?
Order# 11-10-1814 [Spanish #11-10-1816]

What Everyone Should Know About Kidneys and Kidney Disease
Order# 11-10-0101 [Spanish #11-10-0102]

About Chronic Kidney Disease: A Guide for Patients and Their Families
Order# 11-50-0160

What You Need to Know About Urinalysis
Order# 11-10-1815 [Spanish #11-10-1817]

Glomerular Filtration Rate: A Key to Understanding How Well Your Kidneys Are Working
Order# 11-10-1813

Diabetes and Your Eyes, Heart, Nerves, Feet, and Kidneys
Order# 11-10-0216

High Blood Pressure and Your Kidneys
Order# 11-10-0204
[Spanish #11-10-0241]

Get the Facts on High Blood Pressure and Your Kidneys
Order# 11-10-0211

Urinary Tract Infections
Order# 11-10-0205

Learn more at **www.kidney.org**

Notes

The **National Kidney Foundation** is the leading organization in the U.S. dedicated to the awareness, prevention, and treatment of kidney disease for hundreds of thousands of healthcare professionals, millions of patients and their families, and tens of millions of Americans at risk.

Help fight kidney disease.
Learn more at **www.kidney.org**

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Kidney
Foundation™

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Awareness. Prevention. Treatment.