

Your Kidneys: Master Chemists of the Body



National Kidney
Foundation®

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**LOVE YOUR
KIDNEYS™**

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)[™] has guidelines that help your doctor and health care team make important decisions about your medical treatment? The information in this booklet is based on the NKF-KDOQI recommended guidelines.

What is your stage of kidney disease?

There are five 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.

Table of Contents

Why are the kidneys so important?	5
Where are the kidneys and how do they function?	6
What is chronic kidney disease?	7
What are some of the causes of CKD?	8
How is chronic kidney disease detected?	11
What are the warning signs of kidney disease?	12
Can kidney disease be successfully treated? . .	13
Resources	15



“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*

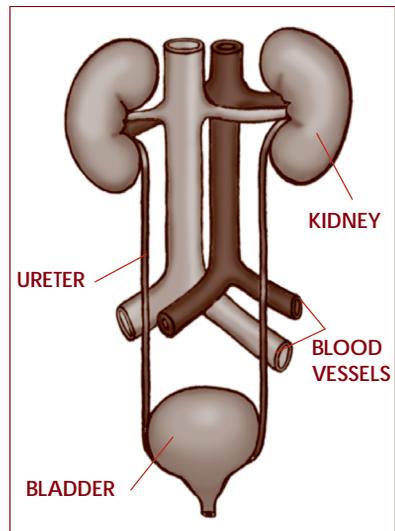
Your kidneys perform crucial functions that affect every part of your body. Many other organs in our bodies depend upon the kidneys to function normally. The kidneys perform complex functions that keep the rest of the body in balance. When the kidneys become damaged by disease, your body's other organs 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 literally 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 function of the kidneys is to remove waste products and excess fluids from the body in the form of urine. The production of urine is a highly complex process that maintains a stable chemical balance in our bodies.

Your kidneys also regulate your body's salt, potassium and acid content and produce hormones that

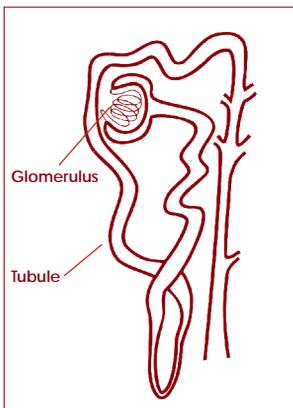


affect the way your other organs function. One hormone produced by the kidneys stimulates the production of red blood cells. Others help regulate your blood pressure and help your body use calcium. Your kidneys also:

- 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?

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



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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 being excreted from the body.

The kidneys filter about 200 quarts of blood each day. Two quarts of fluid with wastes will leave your body in the form of urine. The other 198 quarts of blood are reabsorbed by your body.

What is chronic kidney disease?

Chronic kidney disease (CKD) is kidney damage and decreased kidney function. Protein in the urine that occurs for three months or longer is a warning sign of **kidney damage**. **Kidney function** is estimated by the test for glomerular filtration rate (GFR). A GFR less than 60 for three months or more indicates CKD.

What are some of the causes of CKD?

There are many causes of CKD. 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 & 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 CKD 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 occur 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 over time. (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 on 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 may result from a variety of conditions, including urinary tract infections, obstructions in the urinary system or an inherited disorder that causes too much calcium to be absorbed from foods. Sometimes medications and diet can help to prevent recurrent stone formation. Kidney stones may cause severe pain in your back and side. Stones are sometimes too large to pass out of your body in the urine. In these cases, the stones can be removed surgically or broken down into smaller pieces that can pass out of the body in the urine. (See National Kidney Foundation's online *A to Z Health Guide*: "Kidney Stones" at www.kidney.org/atoz).

Urinary tract infections occur 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 most often affect the bladder, but they sometimes spread upwards to the kidneys. This causes fever and back pain. Infection in the kidney is serious and must be treated promptly 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 the urinary tract when a baby is developing in the womb. One of the most common congenital diseases occurs when a valve-like mechanism in the bladder fails to work properly 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 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 chronic kidney disease detected?

Early detection and treatment of CKD are important in slowing down complications and preventing kidney failure. Some simple tests can be done to detect early kidney disease. They are:

- Blood pressure monitoring. Even though high blood pressure is a cause of CKD, it is also an effect of CKD. Therefore, high blood pressure may 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 by disease. A single positive result could be due to a fever or heavy exercise, so your doctor will want to confirm your urine protein test over several weeks.
- An estimate of your GFR to show how much kidney function you have. Your doctor can use the results of your blood creatinine 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 especially important that people who are at increased risk for CKD have these tests. You are at increased risk for kidney disease if you:

- are older (65 and up)
- have diabetes

- have high blood pressure
- have a family history of diabetes, high blood pressure or CKD
- Are African American, Hispanic American, Asian, Pacific Islander or American Indian.

If you fit one of the above categories, or 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 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:

1. High blood pressure
2. Protein and/or blood in the urine
3. Glomerular filtration rate (GFR) less than 60
4. More frequent urination, particularly at night
5. Puffiness around the eyes, swelling of the hands and feet.



Can kidney disease be successfully treated?

Many kidney diseases can be treated successfully. 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 CKD. Kidney stones and urinary tract infections can usually be treated successfully. Unfortunately, the exact causes of some kidney diseases are still unknown, and specific treatments are not yet available for them. A great deal of research is being done to find more effective treatments for all of the conditions that can cause CKD.

Sometimes, CKD progresses to kidney failure, in which case a person requires dialysis or a kidney transplant to survive.

Kidney transplantation is the optimal 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.

Hemodialysis can be performed either at a dialysis unit or at the patient's home. Treatments are usually performed three times a week. Peritoneal dialysis is generally done each day at home. A doctor who specializes in the diagnosis and treatment of kidney diseases, called a nephrologist, can explain the different approaches and help patients make the best treatment choices.

More information about hemodialysis, peritoneal dialysis, kidney transplantation and organ donation is available from the National Kidney Foundation (800.622.9010).

Resources:

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

The following brochures may also be helpful to you. To order a free copy of any or all of these NKF brochures, call the NKF toll-free at 800.622.9010 or visit the NKF online store at www.kidney.org/store

- *Are You at Increased Risk for Chronic Kidney Disease?* (Order #: 11-10-1814; en español: 11-10-1816)
- *What Everyone Should Know About Kidneys and Kidney Disease* (Order #: 11-10-0101; en español 11-10-0102)
- *About Chronic Kidney Disease: A Guide for Patients and Their Families* (Order #: 11-50-0160; en español 11-50-0166)
- *What You Need to Know About Urinalysis* (Order #: 11-10-1815; en español: 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, Feet & Kidneys* (Order #: 11-10-0216)
- *High Blood Pressure and Your Kidneys* (Order #: 11-10-0204; en español 11-10-0241)
- *Get the Facts on High Blood Pressure and Your Kidneys* (Order #: 11-10-0211)
- *Urinary Tract Infections* (Order #: 11-10-0205)

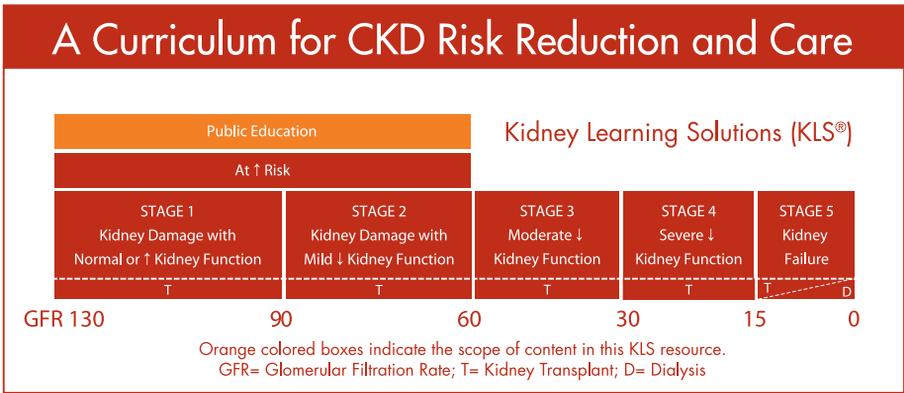
National Kidney Foundation

The National Kidney Foundation (NKF) is dedicated to preventing kidney diseases, improving the health and well-being of individuals and families affected by these diseases and increasing the availability of all organs for transplantation.

With local offices nationwide, the NKF provides early detection screenings and other vital patient and community services. The Foundation conducts extensive public and professional education, advocates for patients through legislative action, promotes organ donation and supports kidney research to identify new treatments.

In 2009 NKF launched a groundbreaking multifaceted collaborative initiative to **“END THE WAIT!”** for a kidney transplant in the United States in 10 years by using proven strategies to eliminate barriers to donation and institute best practices across the country.

The NKF relies on individual and corporate donations, foundation and government grants, membership and special events to support its range of programs, services and initiatives.



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