

# High Blood Pressure and Kidney Disease

*National Kidney and Urologic Diseases Information Clearinghouse*



National Institute of Diabetes and Digestive and Kidney Diseases

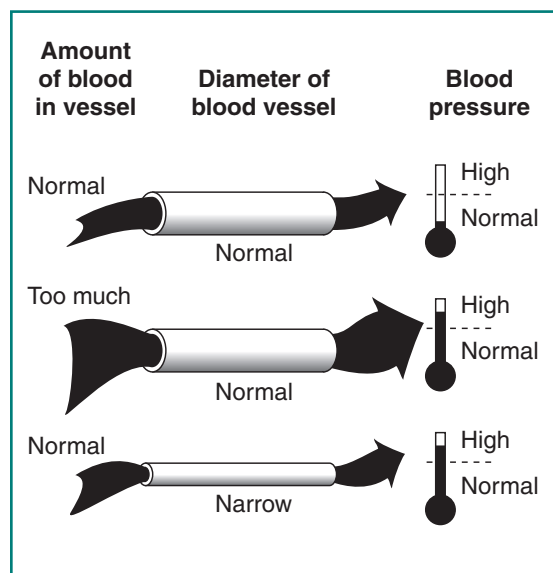
## What is high blood pressure?

Blood pressure is the force of blood pushing against blood vessel walls as the heart pumps out blood, and high blood pressure, also called hypertension, is an increase in the amount of force that blood places on blood vessels as it moves through the body. Factors that can increase this force include higher blood volume due to extra fluid in the blood and blood vessels that are narrow, stiff, or clogged.

Blood pressure test results are written with two numbers separated by a slash. For example, a health care provider will write a blood pressure result as 120/80. A health care provider will say this blood pressure result as “120 over 80.” The top number is called the systolic pressure and represents the pressure as the heart beats and pushes blood through the blood vessels. The bottom number is called the diastolic pressure and represents the pressure as blood vessels relax between heartbeats.

Most people without chronic health conditions have a normal blood pressure if it stays below 120/80. Prehypertension is a systolic pressure of 120 to 139 or a diastolic pressure of 80 to 89. High blood pressure is a systolic pressure of 140 or above or a diastolic pressure of 90 or above.<sup>1</sup>

People should talk with their health care provider about their individual blood pressure goals and how often they should have their blood pressure checked.

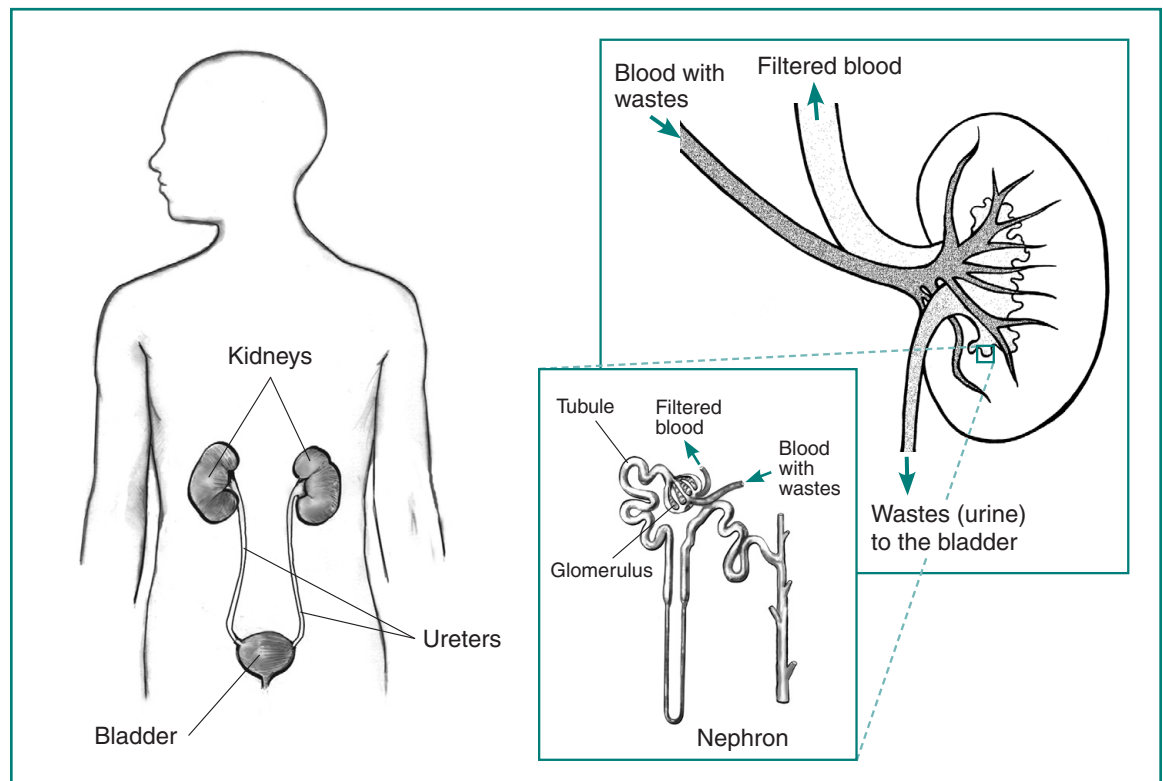


Blood pressure is the force of blood pushing against the blood vessel walls as the heart pumps out blood.

## What are the kidneys and what do they do?

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 two kidneys filter about 120 to 150 quarts of blood to produce about 1 to 2 quarts of urine, composed of wastes and extra fluid. The urine flows from the kidneys to the bladder through tubes called ureters. The bladder stores urine. When the bladder empties, urine flows out of the body through a tube called the urethra, located at the bottom of the bladder. In men the urethra is long, while in women it is short.

Kidneys work at the microscopic level. The kidney is not one large filter. Each kidney is made up of about a million filtering units called nephrons. Each nephron filters a small amount of blood. The nephron includes a filter, called the glomerulus, and a tubule. The nephrons work through a two-step process. The glomerulus lets fluid and waste products pass through it; however, it prevents blood cells and large molecules, mostly proteins, from passing. The filtered fluid then passes through the tubule, which sends needed minerals back to the bloodstream and removes wastes. The final product becomes urine.



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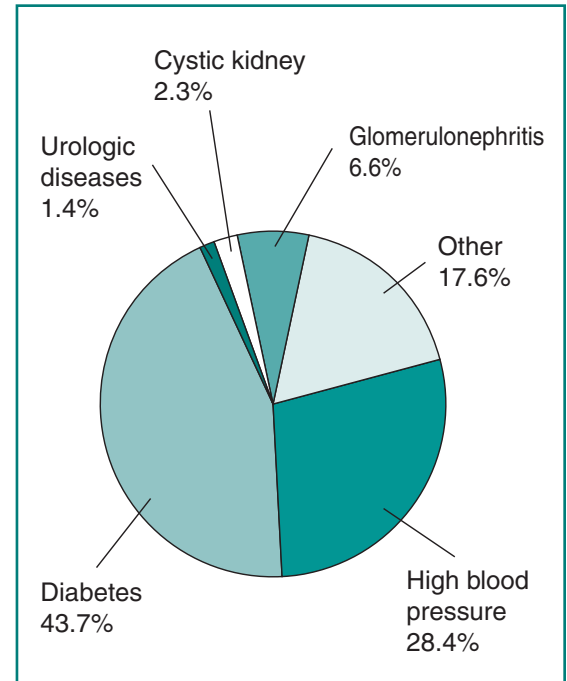
## How does high blood pressure affect the kidneys?

High blood pressure can damage blood vessels in the kidneys, reducing their ability to work properly. When the force of blood flow is high, blood vessels stretch so blood flows more easily. Eventually, this stretching scars and weakens blood vessels throughout the body, including those in the kidneys.

If the kidneys' blood vessels are damaged, they may stop removing wastes and extra fluid from the body. Extra fluid in the blood vessels may then raise blood pressure even more, creating a dangerous cycle.

High blood pressure is the second leading cause of kidney failure in the United States after diabetes, as illustrated in Figure 1.<sup>2</sup> In addition, the rate of kidney failure due to high blood pressure increased 7.7 percent from 2000 to 2010.<sup>3</sup>

**Figure 1. Causes of kidney failure in the United States**



Source: Health, United States, 2011: table 51. End-stage renal disease patients, by selected characteristics: United States, selected years 1980–2010. Centers for Disease Control and Prevention website. [www.cdc.gov/nchs/data/hus/2011/051.pdf](http://www.cdc.gov/nchs/data/hus/2011/051.pdf). Updated 2011. Accessed December 20, 2013.

## What are the symptoms of high blood pressure and kidney disease?

Most people with high blood pressure do not have symptoms. In rare cases, high blood pressure can cause headaches.

Kidney disease also does not have symptoms in the early stages. A person may have swelling called edema, which happens when the kidneys cannot get rid of extra fluid and salt. Edema can occur in the legs, feet, or ankles and less often in the hands or face. Once kidney function decreases further, symptoms can include

- appetite loss
- nausea
- vomiting
- drowsiness or feeling tired
- trouble concentrating
- sleep problems
- increased or decreased urination
- generalized itching or numbness
- dry skin
- headaches
- weight loss
- darkened skin
- muscle cramps
- shortness of breath
- chest pain

## How are high blood pressure and kidney disease diagnosed?

A health care provider diagnoses high blood pressure when multiple blood pressure tests—often repeated over several visits to a health care provider’s office—show that a systolic blood pressure is consistently above 140 or a diastolic blood pressure is consistently above 90. Health care providers measure blood pressure with a blood pressure cuff. People can also buy blood pressure cuffs at discount chain stores and drugstores to monitor their blood pressure at home.

Kidney disease is diagnosed with urine and blood tests.



Health care providers measure blood pressure with a blood pressure cuff.

## Urine Tests

**Dipstick test for albumin.** A dipstick test performed on a urine sample can detect the presence of albumin in the urine. Albumin is a protein in the blood that can pass into the urine when the kidneys are damaged. A patient collects the urine sample in a special container in a health care provider's office or a commercial facility. The office or facility tests the sample onsite or sends it to a lab for analysis. For the test, a nurse or technician places a strip of chemically treated paper, called a dipstick, into the urine. Patches on the dipstick change color when blood or protein is present in urine.

**Urine albumin-to-creatinine ratio.** A health care provider uses the albumin and creatinine measurement to determine the ratio between the albumin and creatinine in the urine. Creatinine is a waste product in the blood that is filtered in the kidneys and excreted in the urine. A urine albumin-to-creatinine ratio above 30 mg/g may be a sign of kidney disease.

## Blood Test

A blood test involves having blood drawn at a health care provider's office or a commercial facility and sending the sample to a lab for analysis. A health care provider may order a blood test to estimate how much blood the kidneys filter each minute, called the estimated glomerular filtration rate (eGFR). The results of the test indicate the following:

- eGFR of 60 or above is in the normal range
- eGFR below 60 may indicate kidney damage
- eGFR of 15 or below may indicate kidney failure

## Get Screened for Kidney Disease

Kidney disease, when found early, can be treated to prevent more serious disease and other complications. The National Kidney Foundation recommends people with high blood pressure receive the following regular screenings:

- blood pressure tests
- urine albumin
- eGFR

Health care providers will help determine how often people with high blood pressure should be screened.

## How can people prevent or slow the progression of kidney disease from high blood pressure?

The best way to slow or prevent kidney disease from high blood pressure is to take steps to lower blood pressure. These steps include a combination of medication and lifestyle changes, such as

- healthy eating
- physical activity
- maintaining a healthy weight
- quitting smoking
- managing stress

No matter what the cause of the kidney disease, high blood pressure can increase damage to the kidneys. People with kidney disease should keep their blood pressure below 140/90.<sup>4</sup>

### Medication

Medications that lower blood pressure can also significantly slow the progression of kidney disease. Two types of blood pressure-lowering medications, angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs), have been shown effective in slowing the

progression of kidney disease. Many people require two or more medications to control their blood pressure. In addition to an ACE inhibitor or an ARB, a health care provider may prescribe a diuretic—a medication that helps the kidneys remove fluid from the blood. A person may also need beta blockers, calcium channel blockers, and other blood pressure medications.

### Eating, Diet, and Nutrition

Following a healthy eating plan can help lower blood pressure. A health care provider may recommend the Dietary Approaches to Stop Hypertension (DASH) eating plan. DASH focuses on fruits, vegetables, whole grains, and other foods that are heart healthy and lower in sodium, which often comes from salt. The DASH eating plan

- is low in fat and cholesterol
- features fat-free or low-fat milk and dairy products, fish, poultry, and nuts
- suggests less red meat, sweets, added sugars, and sugar-containing beverages
- is rich in nutrients, protein, and fiber

Read more about DASH at [www.nhlbi.nih.gov/health/resources/heart/hbp-dash-index.htm](http://www.nhlbi.nih.gov/health/resources/heart/hbp-dash-index.htm).

A dietitian may also recommend this type of diet for people who have already developed kidney disease. A diet low in sodium and liquid intake can help reduce edema and lower blood pressure. Reducing saturated fat and cholesterol can help control high levels of lipids, or fats, in the blood.

Health care providers may recommend that people with kidney disease eat moderate or reduced amounts of protein, though the benefits of reducing protein in a person's diet is still being researched. Proteins break down into waste products that the kidneys filter from the blood. Eating more protein than the body needs may burden the kidneys and cause kidney function to decline faster. However, protein intake that is too low may lead to malnutrition, a condition that occurs when the body does not get enough nutrients. People with kidney disease who are on a restricted protein diet should be monitored with blood tests that can show low nutrient levels.

In addition, consuming too much alcohol raises blood pressure, so people should limit alcoholic drinks—two per day for men and one per day for women.

A health care provider can help people change their diet to meet their individual needs.

## **Physical Activity**

Regular physical activity can lower blood pressure and reduce the chances of other health problems. A health care provider can provide information about how much and what kinds of activity are safe. Most people should try to get at least 30 to 60 minutes of activity most or all days of the week. A person can do all physical activity at once or break up activities into shorter periods of at least 10 minutes each. Moderate activities include brisk walking, dancing, bowling, riding a bike, working in a garden, and cleaning the house.

## **Body Weight**

People who are overweight or obese should aim to reduce their weight by 7 to 10 percent during the first year of treatment for high blood pressure. This amount of weight loss can lower the chance of health problems related to high blood pressure. Overweight is defined as a body mass index (BMI)—a measurement of weight in relation to height—of 25 to 29. A BMI of 30 or higher is considered obese. A BMI lower than 25 is the goal for keeping blood pressure under control.<sup>5</sup>



## Smoking

People who smoke should quit. Smoking can damage blood vessels, raise the chance of high blood pressure, and worsen health problems related to high blood pressure. People with high blood pressure should talk with their health care provider about programs and products they can use to quit smoking.

## Stress

Learning how to manage stress, relax, and cope with problems can improve emotional and physical health. Some activities that may help reduce stress include

- exercising
- practicing yoga or tai chi
- listening to music
- focusing on something calm or peaceful
- meditating

## Points to Remember

- Blood pressure is the force of blood pushing against blood vessel walls as the heart pumps out blood, and high blood pressure, also called hypertension, is an increase in the amount of force that blood places on blood vessels as it moves through the body.
- High blood pressure can damage blood vessels in the kidneys, reducing their ability to work properly. When the force of blood flow is high, blood vessels stretch so blood flows more easily. Eventually, this stretching scars and weakens blood vessels throughout the body, including those in the kidneys.
- High blood pressure is the second leading cause of kidney failure in the United States after diabetes.
- A health care provider diagnoses high blood pressure when multiple blood pressure tests—often repeated over several visits to a health care provider's office—show that a systolic blood pressure is consistently above 140 or a diastolic blood pressure is consistently above 90.



- Kidney disease is diagnosed with urine and blood tests.
- The best way to slow or prevent kidney damage from high blood pressure is to take steps to lower blood pressure. These steps include a combination of medication and lifestyle changes, such as
  - healthy eating
  - physical activity
  - maintaining a healthy weight
  - quitting smoking
  - managing stress
- No matter what the cause of the kidney disease, high blood pressure can increase damage to the kidneys. People with kidney disease should keep their blood pressure below 140/90.

## Hope through Research

In recent years, researchers have learned a great deal about kidney disease. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) sponsors several programs aimed at understanding kidney disease and finding treatments to stop its progression.

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](http://www.nih.gov/health/clinicaltrials). For information about current studies, visit [www.ClinicalTrials.gov](http://www.ClinicalTrials.gov).

## References

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## For More Information

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**Smokefree.gov**  
Phone: 1–877–44U–QUIT (1–877–448–7848) or 1–800–QUIT–NOW (1–800–784–8669)  
TTY: 1–800–332–8615  
Internet: [www.smokefree.gov](http://www.smokefree.gov)

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## National Kidney Disease Education Program

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The National Kidney Disease Education Program (NKDEP) is an initiative of the National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, U.S. Department of Health and Human Services. The NKDEP aims to raise awareness of the seriousness of kidney disease, the importance of testing those at high risk, and the availability of treatment to prevent or slow kidney disease.

## National Kidney and Urologic Diseases Information Clearinghouse

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