

About Chronic Kidney Disease

A Guide for Patients and Their Families



National Kidney
Foundation®

www.kidney.org

**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™) develops guidelines that help your doctor and healthcare team make important decisions about your medical treatment? The information in this booklet is based on the NKF-KDOQI recommended guidelines.

Stages of Chronic Kidney Disease

There are five stages of chronic 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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What are the kidneys and how do they help to maintain good health?

Your kidneys are two bean-shaped organs, each about the size of your fist. They are located near the middle of your back, just below the rib cage. Your kidneys are a filtering system.



Each kidney is made up of about one million tiny units called nephrons. The kidneys filter about 200 quarts of blood each day. They remove about two quarts of waste products and excess fluid in the form of urine. The urine flows through two tubes, called ureters, to the bladder. The urine is stored there until you go to the bathroom. The wastes come from the breakdown of food you eat and normal muscle activity.

In addition to removing wastes and fluid from your body, your kidneys perform these other important jobs:

- They regulate your body water and other chemicals in your blood such as sodium, potassium, phosphorus and calcium
- They remove drugs and toxins introduced into your body
- They release hormones into your blood to help your body.

These hormones:

1. regulate blood pressure
2. make red blood cells
3. promote strong bones.



What is chronic kidney disease?

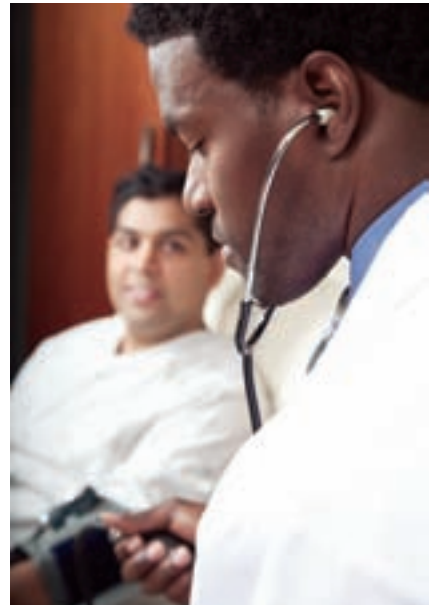
Chronic kidney disease means the kidneys have been damaged by diabetes, high blood pressure and other disorders. Damaged kidneys are not able to keep you healthy by doing the jobs listed on page 5. If kidney disease gets worse, wastes can build to high levels in your blood and make you feel sick. You may develop complications like high blood pressure, anemia (low red blood cell count), weak bones, poor nutrition and nerve damage. Also, kidney disease increases your risk of having heart and blood vessel disease. These problems may happen slowly over a long period of time. Early detection and treatment can often keep chronic kidney disease from getting worse. If kidney disease gets worse, it may lead to kidney failure, which requires dialysis or a kidney transplant to maintain life.

What causes chronic kidney disease?

The two main causes of chronic kidney disease are diabetes and high blood pressure. Diabetes happens when your blood sugar is too high, causing damage to many organs and muscles in your body, including the kidneys and heart, as well as blood vessels, nerves and eyes. High blood pressure, or hypertension, occurs when the pressure of your blood against the walls of your blood vessels increases. If it's not well controlled, high blood pressure can be a leading cause of heart attacks, strokes and chronic kidney disease. Also, chronic kidney disease can cause high blood pressure.

Other conditions that affect the kidneys are:

- Glomerulonephritis, a group of diseases that cause inflammation and damage to the kidney's filtering units. These disorders are the third most common type of kidney disease.
- Inherited diseases, such as polycystic kidney disease, which causes large cysts to form in the kidneys. These cysts damage the tissue around them.
- Malformations that occur as a baby develops in its mother's womb. For example, a narrowing may occur that prevents normal outflow of urine



and causes urine to flow back up to the kidney. This causes infections and may damage the kidneys.

- Lupus and other diseases that affect the body's immune system.
- Obstructions caused by problems like kidney stones, tumors or an enlarged prostate gland in men.
- Repeated urinary infections.

What are the symptoms of chronic kidney disease?

Most people do not have any severe symptoms until their kidney disease is advanced. However, you may notice that you:



- Feel more tired and have less energy
- Have trouble concentrating
- Have a poor appetite
- Have trouble sleeping
- Have cramping at night
- Have swollen feet and ankles
- Have puffiness around your eyes, especially in the morning
- Have dry, itchy skin
- Need to urinate more often, especially at night.

Can anyone get chronic kidney disease?

Yes. Anyone can get chronic kidney disease at any age. However, some people are more likely than others to develop kidney disease. You may have an increased risk for kidney disease if you:

- Have diabetes
- Have high blood pressure
- Have a family history of chronic kidney disease
- Are older
- Belong to a population group that has a high rate of diabetes or high blood pressure, such as African Americans, Hispanic Americans, Asian Americans or American Indians.

What should I do if I am at increased risk for kidney disease?

If you are at increased risk for kidney disease, visit your doctor or clinic and get checked. The following tests should be included:

- Blood pressure measurement
- A simple test for protein in the urine. Protein is not normally found in urine. Protein is an important building block in the body, and your kidneys normally hold onto any filtered protein. When your kidneys are damaged, protein leaks into the urine. There are different tests to check protein in the urine. Persistent protein in the urine

(two positive tests over several weeks) may be an early sign of kidney damage.

- A simple blood test to measure your level of creatinine, a waste that comes from normal muscle activity. When your kidneys are damaged, creatinine can build to high levels in your blood. The results of your creatinine blood test should be used to estimate your glomerular filtration rate, or GFR. Your GFR tells how much kidney function you have.

Free screening for kidney disease may be available in your community through the National Kidney Foundation's Kidney Early Evaluation Program (KEEP®). Check with the National Kidney Foundation affiliate in your area to find out if this screening is available. You may also get more information about KEEP by calling the national toll-free number 800.622.9010.

Are any other tests done to help detect chronic kidney disease?

Other tests may be done to help detect chronic kidney disease.

- **Urinalysis** can detect many abnormalities in the urine, such as blood, protein, pus, sugar and bacteria
- **Microalbuminuria** is a sensitive test to detect a small amount of protein in the urine
- **Urine creatinine** estimates the concentration of your urine and helps to give an accurate protein result

- **Protein-to-creatinine ratio** estimates the amount of protein you excrete in your urine in a day. This can replace the 24-hour urine sample.

Can I prevent chronic kidney disease even if I am at increased risk?

Yes. You should speak to your doctor about how to reduce your chances of developing kidney disease. You may be told to:



- Have regular checkups by your doctor or clinic
- Follow your prescribed treatment for diabetes and/or high blood pressure
- Lose excess weight by following a healthy diet and regular exercise program
- Stop smoking, if you are a smoker
- Avoid using large amounts of over-the-counter pain-relieving medications
- Make some changes in your diet, such as eating less salt and less protein
- Limit your intake of alcoholic drinks.

What if my test results show I already have chronic kidney disease?

Your doctor will need to pinpoint your diagnosis and assess your kidney function to help plan your treatment. Your doctor may ask you to see a specialist to consult on your case and help manage your disease. The following may be done:

- Glomerular filtration rate (GFR), which tells how much kidney function you have. You do not need another test to estimate your GFR. Your doctor can calculate it from the results of your blood creatinine test, your age, race, gender and other factors. Your GFR helps your doctor determine your stage of kidney disease. (See the chart “What is your stage of kidney disease?” on page 13.) GFR is the best way to evaluate your kidney function.
- An ultrasound or CT scan takes a picture of your kidneys and urinary tract. This shows whether your kidneys are too large or too small, whether you have any blockages such as kidney stones or tumors and whether there are any problems in the structure of your kidneys and urinary tract.
- A kidney biopsy involves looking at small pieces of your kidney tissue under a microscope. This is done in some cases to help:
 - identify a specific type of kidney disease
 - determine how much damage has occurred
 - plan treatment.

What is your stage of kidney disease?

Stages of Kidney Disease		
Stage	Description	Glomerular Filtration Rate (GFR)*
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* Your GFR number tells your doctor how much kidney function you have. As chronic kidney disease progresses, your GFR number decreases.

If I have chronic kidney disease, what will my treatment include?

Your treatment plan will depend on your stage of kidney disease and other health problems you may have. Your treatment may include the following:

- Controlling other health problems. You may have other disorders, such as diabetes and high blood pressure, which can damage your kidneys. One of the goals of your treatment is to make sure these are well-controlled. Your doctor may prescribe medications called angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs) as part of your therapy. Studies have shown that these medications help to protect your kidney function. You may also need other blood pressure medications to control your high blood pressure.

Your doctor may ask you to lose weight if you are overweight and cut down on salt in your diet to help lower your blood pressure. If you have diabetes, you will also need to monitor your blood sugar, follow your diet and take your medications as ordered by your doctor.

- **Preventing heart problems**

People who have kidney disease also have an increased chance of developing heart problems. Controlling diabetes and high blood pressure is also very important to help prevent heart problems. In addition, anemia (low red blood cell count) should be treated because it can cause heart damage. To treat anemia, you may need to take a hormone called erythropoietin (EPO) and iron supplements. If your cholesterol level is too high, your doctor may recommend changes in your diet, regular exercise and, possibly, special medications, to help lower cholesterol. Smoking makes heart and kidney disease worse and, if you are a smoker, you will need to quit. Depending on your symptoms, your doctor may order additional tests to check your heart.

- **Treating complications of kidney disease**

Kidney disease may cause complications, such as anemia and bone disease. In addition to treating your anemia with EPO and iron supplements, you may need to follow some guidelines to maintain healthy bones. This may include limiting the amount of high-phosphorus foods in your diet, taking a type of medication called a phosphate binder with your meals and snacks and taking a form of vitamin D.



- **Tracking your progress**
 - Your glomerular filtration rate (GFR) will be checked regularly to find out whether your kidney disease is getting worse. This usually is done with blood tests.
 - The amount of protein in your urine will be checked from time to time.
 - Nutritional tests will be done to make sure you are getting enough protein and calories to maintain your overall health. You may be asked to follow a diet that is restricted in protein, so you will need to get extra calories from other food sources. Your doctor can refer you to a registered dietitian who will help you plan your meals to get the right foods in the right amounts.

See “Understanding your lab values” on page 24. And see pages 9 – 11 for a list of tests that may be done.

Can I keep my kidney disease from getting worse?

Most likely. The goal of your treatment is to slow or prevent your kidney disease from getting worse. Your doctor may consult with a specialist to develop a treatment plan specific to your kidney disease. How well your treatment can achieve this goal depends on:

- Your stage of kidney disease (see chart on page 13) at the time you are diagnosed and begin your treatment. Your glomerular filtration rate (GFR) is the best test to measure your kidney function and determine your stage of kidney disease. The earlier kidney disease is detected and treated, the better the chance of slowing or stopping its progression.
- How carefully you follow your treatment plan. You are a key member of the healthcare team.

Learn all you can about chronic kidney disease and its treatment, and make sure to follow all the steps of your treatment faithfully. Ask your doctor about your test results. Keep track of your glomerular filtration rate, so you know your stage of kidney disease.

- The cause of your kidney disease. Some diseases are more difficult to control.



What happens if my kidney disease gets worse?

If your kidney disease gets worse, and your glomerular filtration rate (GFR) falls below 30, you will need to discuss treatment options for kidney failure. You will need to be seen by a specialist in kidney disease (called a nephrologist). This doctor may have seen you before and worked with your primary care doctor to develop your treatment plan. The kidney doctor will help manage your disease and will provide you with information about kidney failure to make the best treatment choice for you and your family based on:

- Your medical condition
- Your lifestyle and personal preference.

If your GFR falls below 15, you will need to start treatment for kidney failure. Two successful treatments are available for kidney failure—dialysis and kidney transplantation. Dialysis is a treatment that removes wastes and excess fluid from your blood. Two types of dialysis are available: hemodialysis and peritoneal dialysis. In hemodialysis, your blood is cleaned outside your body as it passes through a special filter called an artificial kidney, or dialyzer. In peritoneal dialysis, your blood is cleaned inside your body with the help of a dialysis solution that is placed into and drained from your abdominal cavity (your belly).

Kidney transplantation involves an operation to place a donated kidney inside your body to take over the work of your failed kidneys. The kidney may come from

someone who has died (nonliving donor) or from a living donor who may be a close relative, friend or possibly a stranger who wished to donate a kidney to anyone in need of a transplant (nondirected donor). With a transplant, you need to take medications every day to prevent your body from recognizing the donated kidney as “foreign” and rejecting it.

Your doctor will help you decide which of these options is best for you.

How can I cope with chronic kidney disease?

A diagnosis of chronic kidney disease can be difficult to face. You and your family may need to make some lifestyle changes to adjust to your condition and new treatment. It’s important to realize that you don’t have to face things alone. A skilled team of medical professionals is available to help you. You may also find it helpful to speak to other people who have chronic kidney disease. Call your local National Kidney Foundation Affiliate and ask if a support group is available. Learn all you can about kidney disease and its treatment. Knowing what to expect and what you can do to help yourself gives you more of a feeling of control over your disease. The National Kidney Foundation can provide you with many resources to help you learn more.



Where can I get more information?

If you have questions, speak with your healthcare team. They know you and can answer questions about you.

If you want to read more about kidney disease, the National Kidney Foundation has more than 50 other publications that cover many subjects, such as:

- CKD risk factors like hypertension and diabetes
- Complications of chronic kidney disease, such as cardiovascular disease, anemia or bone problems
- Nutrition for CKD patients, with information about carbohydrates, protein, sodium, phosphorus and potassium
- Treating kidney disease early
- Treating kidney failure with transplantation or dialysis.

There are two ways to learn about the many free resources available to you:

- Call the National Kidney Foundation at 800.622.9010.
- Visit the National Kidney Foundation website (www.kidney.org/store).

(All publications are free, but there is a limit of five per person.)

Becoming an educated patient is very important to being healthy!



Key points to remember

- ❑ Your kidneys perform many important jobs to keep you healthy. They are: getting rid of wastes and excess fluid, balancing fluids and certain chemicals in your body, removing drugs and toxins from your body and releasing important hormones that help regulate blood pressure, make red blood cells and keep your bones healthy.
- ❑ In chronic kidney disease, your kidneys gradually lose the ability to do these important jobs. The leading causes of chronic kidney disease are diabetes and high blood pressure.
- ❑ If you are at increased risk for kidney disease (see “Can anyone get chronic kidney disease?” on page 9), visit your doctor or clinic and get tested. You should have three simple tests: a blood pressure reading; a test for protein in your urine; and a blood test for creatinine to estimate your glomerular filtration rate (GFR), which tells your doctor how much kidney function you have.
- ❑ Check with your local National Kidney Foundation Affiliate to find out if the Kidney Early Evaluation Program (KEEP®) screening program is available in your community.
- ❑ Persistent protein in the urine is an early sign of chronic kidney disease. Two positive tests over several weeks indicate persistent protein in the urine.

- ❑ If you have persistent protein in your urine, your doctor will need to find out why and assess your kidney function. You may need to have your GFR estimated to find your stage of kidney disease; an ultrasound or CT scan; and, in some cases, a kidney biopsy.
- ❑ Your glomerular filtration rate (GFR) also helps your doctor determine your stage of kidney disease. Your GFR should be calculated from the results of your blood creatinine test, your age, race, gender and other factors.
- ❑ If you are diagnosed with chronic kidney disease, it's important to learn all you can about the disease and its treatment. You are an important member of your healthcare team. How carefully you follow your treatment plan may affect how well you do.
- ❑ Know your numbers. Ask your doctor about important test results like your GFR, and keep track of them.
- ❑ Your treatment depends on your stage of chronic kidney disease and other health problems you may have. (See “If I have chronic kidney disease, what will my treatment include?” on page 13 for more details.)
- ❑ In many cases, early detection and treatment may slow or stop the progression of chronic kidney disease. However, if kidney disease gets worse and kidney failure occurs eventually, two successful treatments are available—dialysis and kidney transplantation.

Test your knowledge: Take this True or False quiz.

1. Your kidneys' only job is to remove wastes and excess fluid from your body. True ____ False ____
2. People with diabetes or high blood pressure have an increased risk of developing chronic kidney disease. True ____ False ____
3. People with chronic kidney disease always have a lot of symptoms. True ____ False ____
4. African Americans have a low risk of developing chronic kidney disease. True ____ False ____
5. Chronic kidney disease can be detected using simple blood and urine tests. True ____ False ____
6. Early detection and treatment can often keep chronic kidney disease from getting worse. True ____ False ____
7. Persistent protein in the urine is an early sign of chronic kidney disease. True ____ False ____
8. The best way to know how your kidneys are working is to know your glomerular filtration rate (GFR). True ____ False ____
9. Anemia and bone disease are common complications of chronic kidney disease. True ____ False ____
10. People with chronic kidney disease have a low risk of developing heart disease. True ____ False ____

See answers on page 31.



Understanding your lab values

Some or all of the following tests may be used to check your nutrition and general health. Ask your doctor and dialysis care team which tests you will have and how often they will be done. If your numbers are not in the normal range, ask how to improve them.

Serum Albumin: Albumin is a type of protein made from the protein you eat each day. A low level of albumin in your blood may be caused by not getting enough protein and calories from your diet. A low level of albumin may lead to health problems, such as difficulty fighting off infections. Ask your dietitian how to get the right amount of protein and calories from your diet.

Blood Pressure: Ask your doctor what your blood pressure should be. If your blood pressure is high, make sure to follow all the steps in your prescribed treatment. These steps may include taking high blood pressure medications, cutting down on the amount of salt in your diet, losing weight if you are overweight and following a regular exercise program.

Blood Urea Nitrogen (BUN):

Urea nitrogen is a normal waste product in your blood that comes from the breakdown of protein from foods you eat. Healthy kidneys remove BUN from your blood, but when kidney failure occurs, your BUN rises. BUN is also removed from your blood by your dialysis. Your BUN rises from not getting enough dialysis or from eating too much protein. It can fall from getting more dialysis or from eating the right amount of protein recommended by your doctor and dietitian.

Body Weight:

Maintaining a healthy weight is important to your overall health. If you are losing weight without even trying, you may not be getting the right nutrition to stay healthy. Your dietitian can suggest how to safely add extra calories to your diet. On the other hand, if you are slowly gaining unwanted weight, you may need to reduce calories and increase your activity level. A sudden weight gain may also be a problem. If it is accompanied by swelling, shortness of breath and a rise in blood pressure, it may be a sign of too much fluid in your body. You should check your

weight at home every morning. Speak to your doctor if your weight changes suddenly.

Calcium:

Calcium is a mineral that is important for strong bones. Ask your doctor what your calcium level should be. To help balance the amount of calcium in your blood, your doctor may ask you to take calcium supplements or a special prescription form of vitamin D. Take only the medications recommended by your doctor.

Cholesterol:

Total

Cholesterol is a fat-like substance found in your blood. A high cholesterol level may increase your risk of having heart and circulation problems. However, a cholesterol level that is too low may mean you are not eating well enough to stay healthy. Ask your doctor if your cholesterol level is in the right range.

HDL

HDL cholesterol is a type of “good” cholesterol that protects your heart. For many dialysis patients, the target level for HDL cholesterol is above 35.

LDL

LDL cholesterol is a type of “bad” cholesterol. A high LDL level may increase your chance of having heart and circulation problems. For many dialysis patients, the target level for LDL cholesterol is below 100. If your LDL level is too high, your doctor may recommend changing your diet and increasing your activity level.

Serum Creatinine:

Creatinine is a waste product in your blood that comes from the normal function of your muscles. Healthy kidneys remove creatinine from your blood, but when the kidneys are not working, your creatinine level rises. Your dialysis also removes creatinine from your blood. Not getting enough dialysis can cause your creatinine level to rise, while getting more dialysis causes it to fall. Your creatinine level can also fall from not eating well over a long period of time.

Creatinine Clearance:

Creatinine clearance is another measure of how well your dialysis clears wastes from your blood. Your dialysis care team will check your weekly creatinine clearance about once every four months to make sure you are getting the right amount of dialysis.

Hematocrit: Your hematocrit is a measure of the red blood cells your body is making. A low hematocrit can mean you have anemia and need treatment with EPO and extra iron. You will feel less tired and have more energy when your hematocrit is at least 33 to 36 percent.

Hemoglobin: Hemoglobin is the part of red blood cells that carries oxygen from your lungs to all the tissues in your body. Measuring your hemoglobin level tells your doctor if you have anemia, which makes you feel tired and have little energy. To treat your anemia, you may need to take a hormone called EPO along with iron. The goal of anemia treatment is to reach and maintain a hemoglobin level of at least 11 to 12.

Iron:

TSAT and Serum Ferritin Your TSAT (pronounced "tee sat") and serum ferritin (pronounced "ferry tin") are measures of iron in your body. Your TSAT should be above 20 percent, and your serum ferritin should be above 100. This will help you build red blood cells. Your doctor will recommend iron when needed to reach your target levels.

Kt/V

Kt/V (pronounced "kay tee over vee") is a measure of the amount of dialysis you receive. Getting the right amount of dialysis is important to your overall health and can also affect how well you eat. Your target weekly Kt/V should be at least 2.0 for CAPD, 2.1 for CCPD and 2.2 for NIPD.

nPNA

Your nPNA (normalized Protein Nitrogen Appearance) is a test that may tell if you are eating enough protein. This measurement comes from lab studies that include urine collection and blood work. Your dietitian may ask for an accurate food record to go with this test.

Parathyroid Hormone (PTH):

High levels of parathyroid hormone (PTH) may result from a poor balance of calcium and phosphorus in your blood. This can cause bone disease. Ask your doctor if your PTH level is in the right range. Your doctor may order a special form of vitamin D to help lower your PTH. Caution: Do not take over-the-counter vitamin D unless ordered by your kidney doctor.

Phosphorus:

A high phosphorus level in your blood can lead to weak bones, itching, bone pain and hardening of blood vessels. Ask your doctor what your phosphorus level should be. If your level is too high, your doctor may ask you to reduce your intake of foods that are high in phosphorus and take a phosphate binder with all your meals and snacks.

Potassium:

Potassium is a mineral that helps your heart and muscles work properly. A potassium level that is too high or too low may weaken muscles and change your heartbeat. Whether you need to change your intake of high-potassium foods varies with each person on peritoneal dialysis. Ask your doctor or dietitian what your potassium level should be. Your dietitian can help you plan your meals to get the right amount of potassium.

Subjective
Global
Assessment
(SGA):

Your dietitian may use SGA to help check for signs of nutrition problems. The dietitian will ask you some questions about your daily diet and check your weight and the fat and muscle stores in your face, hands, arms, shoulders and legs. Ask your dietitian about your score on the SGA. If your score is too low, ask how to improve it.

Triglyceride:

Triglyceride is another type of fat found in your blood. A high triglyceride level, along with high levels of total and LDL cholesterol, may increase your chance of having heart and circulation problems.

Urea Reduction
Ratio (URR):

URR is another measure of how well your dialysis treatments are working to clear wastes from your blood. It uses blood tests but does not include urine collection. Your target URR should be 65 percent or higher.

Answers to Quiz on Page 23

- | | |
|------|-------|
| 1. F | 6. T |
| 2. T | 7. T |
| 3. F | 8. T |
| 4. F | 9. T |
| 5. T | 10. F |

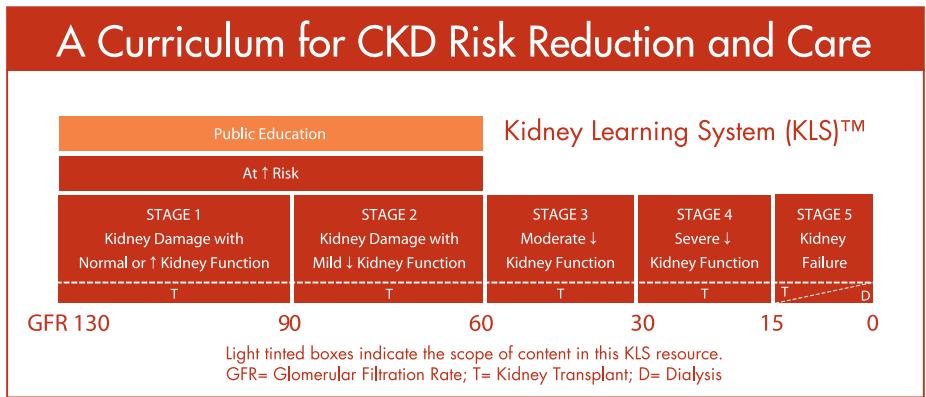
National Kidney Foundation

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 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.



National Kidney Foundation

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