

# Kidney Beginnings



**A Patient's Guide to Living with  
Reduced Kidney Function**





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# Introduction

Chronic kidney disease (CKD) is very uncommon in young adults and much more common in older adults (depending on how it is defined and the country of residence). Kidney disease frequently can be present without any symptoms in its early stages. Recognition of CKD is important as steps can often be taken to protect the kidneys from further damage. If your doctor has diagnosed you as having CKD, this book was written specifically for you and your family. Take the time to read through all the information and write down any questions you have in the spaces provided. At your next doctor's appointment, take this book with you and discuss your concerns with your doctor. You are the most important member of your healthcare team, and it's up to you to take a leadership role in your case.

At this point, you most likely have a lot of questions, the largest one being, "What is CKD and why have I been given this book?" CKD means that an event has occurred causing damage to the kidneys and altered their normal function or anatomy. In some cases, over time, the condition might progress and your kidneys may fail, but this is not a common outcome of CKD. As of 2014, about 2 per 1,000 Americans had kidney failure and were receiving treatment with dialysis or transplantation. The purpose of this book is not to frighten you by describing unlikely outcomes. Its purpose is to provide you with the information you need to take control of your healthcare and do what is necessary to preserve and protect your kidney function. There are many health conditions that can lead to CKD. If you have been diagnosed with one of these health conditions, there are many things you should know about your health that will impact your kidney function.

First of all, you can have CKD, according to its current definition, even though the ability to eliminate toxins via the kidney is normal. For example persisting leakage of protein in the urine is a form of CKD. If the anatomy of the kidneys is abnormal but they are functioning properly, this is also CKD

So CKD is a term that can apply to many situations, but some of them can progress to kidney failure and some do not.

If you do have a form of CKD that can lead to loss of kidney function there are many things you can do to stall or prevent the progression of disease. Also, many elderly people may have reduced kidney function as they age. This is perfectly normal and is not CKD. An elderly person who simply has a reduced level of kidney function (see below) and

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everything else is normal (including an analysis of urine) should not be unduly alarmed.

**A Friendly Note:** My name is Sam and I'll be your guide through this book. I'm like you. I have CKD. I used education to make myself more aware of my condition. I learned what I needed to do to protect my kidney function. CKD may mean you might be at greater risk for kidney failure. Take it from me, becoming involved in your healthcare, learning and doing what is needed makes a difference in your overall health, well-being and quality of life.



# Kidneys 101



*A Friendly Note: Before we can begin explaining CKD, you need to understand the role of your kidneys. The information below may have some medical terms with which you aren't familiar. We'll explain everything, but sometimes it's difficult when we're dealing with medical terms. If you find something you're unclear about, jot down a note in the margin and ask your doctor about it on your next visit. Taking an active role means knowing what questions to ask. Our doctors, nurses and healthcare team are here to help us and they don't mind when we ask questions. After I first found out about CKD, I kept a notebook with me at all times. Every time a question arose, I wrote it down and asked the doctor at my next visit. It really helps.*

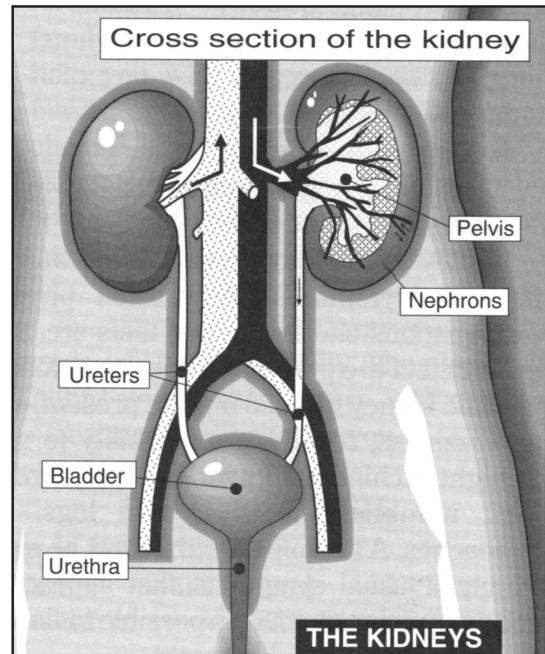
## What are the kidneys and what do they do?

Kidneys are like a 24-hour cleaning machine for your blood. Kidneys are twin organs shaped like kidney beans. They're located below the rib cage in the middle of your back. In adults, each kidney is about the size of a closed fist. The kidneys are joined to your bladder by tubes called ureters. These tubes carry urine from the kidney to the bladder.

The kidneys filter your blood and make urine. The bladder holds the urine until your body gets rid of it when you urinate. Each day, the kidneys receive about 1668 quarts of blood through 140 miles of tubes and millions of filters called glomeruli, through which about 150 quarts per day of fluid are filtered. Though most people are born with two kidneys, some are born with one kidney and lead normal lives. People can live a near normal life often without symptoms with as little as 30 percent of their normal kidney function.

Most people don't know all of the things kidneys do to keep them alive and healthy until something goes wrong. The kidneys:

- **Remove waste products from the blood.** As your body works, it builds up waste products that need to be removed. The kidneys are the



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“garbage collectors” that remove the waste from your body in the form of urine. They do this on a 24 hour, 7 days a week basis. If it were not for the adequate removal of toxic substances in the urine, as well as in the stool, we would become ill.

● **Remove extra fluid.** Kidneys get rid of the extra water and salt that may accumulate in your body.

● **Adjust levels of minerals and other chemicals.** The kidneys balance important minerals and chemicals in your body like sodium, potassium, calcium, magnesium and phosphorus. For example, if you eat a lot of salt, the kidneys will get rid of the extra salt you do not need. It's important that these chemicals remain balanced in order for the cells in our body to function correctly.

● **Produce hormones.** Kidneys make hormones (chemical substances that enter the blood stream and act on other organs or cells) to help control your blood pressure, balance minerals and produce the hormone important to the production of red blood cells that carries oxygen to your whole body. This hormone, called erythropoietin (EPO) stimulates red blood cell production by the bone marrow. Without EPO, red blood cell production declines. This results in a condition known as anemia. Anemia causes extreme fatigue and overall weakness. Kidneys activate vitamin D, a hormone needed for strong bones and proper handling of calcium and phosphorus.

# Chronic Kidney Disease



**A Friendly Note:** The phrase “chronic kidney disease” may sound foreign to you. This section will answer some of the most commonly asked chronic kidney disease (CKD) questions. However, this section doesn’t answer everything. You’ll find other valuable information throughout this book. Be sure to read through it thoroughly and ask your doctor any questions you may have.

## Will I know if I start to have kidney problems?

Not necessarily. The early signs of CKD can be subtle and therefore many people do not realize they have symptoms of the condition. The symptoms can include high blood pressure, blood in the urine and swelling in the legs, feet or hands (This is known as edema). The only way to know for sure if you’re starting to have kidney problems is a simple urine test which detects protein in the urine and a simple blood test that can determine how well your kidneys are functioning. Do not wait for signs of kidney damage to have your urine tested; symptoms may not occur until it is too late to do anything. Talk to your doctor and ask what type of tests you should have performed. Knowing that you have two kidneys that are of normal size, shape and position and that urine drains properly into the bladder is also important. This can be evaluated by a test called a renal ultrasound.



**A Friendly Note:** You play an important role in your healthcare. Actually, you ARE the most important player. And, as the most important player, you need to be informed and involved. Not only do you need to have an understanding of the tests being performed and the measures you should take to preserve your kidney function, but you need to realize it’s OK to ask questions, share insight and keep track of your own health.

## What's the best way to be an active member in my healthcare?

The answer is simple. Get involved with your healthcare. No one knows your body better than you. By understanding the various tests performed to measure kidney function, you can become active in monitoring your health. By doing this, you will also become more aware of the activities that can slow down the progression of kidney disease. If you take an active role in your healthcare and understand your condition, whatever challenges you face will be less complicated to adjust to.

## What should I do when my doctor recommends a new test?

When your doctor prescribes a test to gauge your kidney function, there

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are several questions you should ask. When you ask the questions, make sure you write the answers on a piece of paper. Some people like to keep a journal in which all of their important information is kept. This will help you later when you're trying to digest everything the doctor has told you. Whenever you deal with a subject that's new or unfamiliar to you, it's easy to become overwhelmed and confused. It's important to remember that the healthcare team is there to help you. Don't become frightened because you don't understand something. Instead, ask questions.

#### **Sample Questions to Ask:**

- What is the name of the test?
- Why do I need this test?
- Could the test results change the treatment of my condition? If so, how?
- How accurate is the test? Is there a chance for a false-positive or a false-negative result?
- Is there anything I should do to improve the accuracy of the test?
- Is there anything special I need to do before the test, such as limiting food intake, fasting, not taking medications, exercising, etc.?
- Is this test covered by my insurance?
- Are there any consequences if I delay or avoid having this test done?
- Are there any health risks associated with this test? If so, what are they?
- When and how will I receive the test results? What will the results mean?
- What is the next step if the results are normal or abnormal?

*A Friendly Note: After you have a test performed, when the doctor calls or when you meet with the doctor to discuss the results, you should be prepared with a pen and paper. Try to write down as much as you can. Some people keep this information on their tablet or smart phone. Others, keep their tests securely online in a personal health record website.*



*Whatever you do, it will help you remember what your doctor has told you. You may also want to take someone to the doctor appointment with you. With another person there, you have the advantage of hearing with two sets of ears. This will help you if you have questions later on about what your doctor said.*

#### **When I have tests done, what should I do with the results?**

Keeping track of your own results puts you in control of your healthcare. The more you know about CKD, your percentage of kidney function, your

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hemoglobin and other important results, the better you can take care of yourself. In the Appendix, there are three sample tracking charts to help you keep a history of important test results. You should also take an active role in monitoring your own health. Purchase a blood pressure cuff and learn to take your own blood pressure and track the results. By keeping track of your test results, you'll know what questions to ask your doctor during the next visit.

### **What tests may be performed to gauge my kidney function?**

Kidney disease is diagnosed and monitored by measuring various substances in your blood and urine. There are several tests that may be performed to monitor your kidney function. It's just as important to know the purpose of these tests as it is to keep track of your own test results. By doing this you are taking an active role in your healthcare and becoming more aware of your personal health.

The tests your doctor may order will help him/her evaluate several factors related to your kidney function and overall health. The tests will answer questions such as, what is your current kidney function, what is causing your kidney function to decrease, what treatment options are available to slow the progression of kidney failure, etc.

When kidney function is reduced, certain substances begin to build up in the bloodstream. The following blood and urine tests measure changing levels of these substances in the bloodstream and their effect on organ function. This will help your doctor determine how well your kidneys are working.

● **Complete blood count (CBC).** A complete blood count is a very common test and can tell your doctor a lot about what's happening with your kidneys. Your blood is made up of three basic types of cells: red cells, white cells and platelets. Red cells carry oxygen to body tissues and remove carbon dioxide. White cells fight infections and harmful substances that invade the body. Platelets help stop bleeding by plugging leaks in blood vessels. It takes all three types, working together properly, to perform vital bodily functions. In order to know if your blood cells are functioning properly, a CBC is commonly performed to measure the levels of the different types of cells in your blood circulation.

A CBC is a relatively fast and painless procedure. A healthcare professional will take blood from your vein. The blood sample is then sent to a laboratory for analysis (see CBC chart on page 52). This chart will help you learn how to read your own CBC results.

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● **Serum Creatinine Level.** A blood test used to evaluate kidney function. Creatinine is a byproduct of muscle breakdown. Muscle cells undergo wear and tear and their replacement is a normal process, (See below) The serum concentration of creatinine (in milligrams per 100 milliliters, mg/dL) of blood plasma or serum It is used as a marker of kidney function.

● **Creatinine clearance and glomerular filtration rate (GFR).** An estimate of the glomerular filtration rate (GFR) of blood plasma in the kidneys can be determined from the values of serum or plasma creatinine and use of estimating equations (called eGFR formulas). These formulas give reasonably accurate results for true GFR and do not require timed collections of urine, but they are subject to a variety of errors. These eGFR values can be electronically calculated by inserting a serum creatinine value into a mathematical formula. The website for this is <http://mdrd.com>.

Simultaneous measurement of creatinine in the urine, in a timed sample (such as a 24-hour urine collection), can also allow calculation of the creatinine clearance. These tests show how well the two kidneys are functioning. Direct measurement of GFR is more difficult, but can be performed by special tests. This type of measurement gives a more precise value to GFR. If the kidneys are damaged and not functioning normally, the amount of creatinine in the serum or plasma increases. Creatinine levels can vary, and each laboratory has its own normal range. In many labs the normal range is 0.6 to 1.3 mg/dL with values somewhat lower for women than men..

Cystatin C is a protein chain that is also sometimes used as a marker of kidney function. In some patients, muscle breakdown may be excessive. Other patients, especially the elderly, may have a very low muscle mass. In these persons, the serum creatinine may not be able to accurately reflect how the kidneys function, Cystatin C is not affected by muscle breakdown and therefore useful in these circumstances. Formulas using serum/plasma Cystatin C to estimate GFR have been developed and can be used in special circumstances.

● **24-hour urine collection for protein in the urine.** In this test, all of the urine produced in 24 hours is collected and the amount of protein in the urine is measured in the laboratory. Normally there are only small amounts of protein in the urine (less than 150mg/d). Increased amounts of protein indicate possible kidney damage. More recently we are able to look at the ratio between the urine protein and creatinine levels. The urine protein:creatinine ratio or UPCR from a simple urine sample (usually the first or second morning voided specimen) and do not need a 24 hour

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collection.

- **Blood urea nitrogen (BUN) level.** Along with an increase in serum creatinine level, the urea nitrogen level (blood urea nitrogen, or BUN) in serum also increases and can help estimate how well the kidneys are removing wastes from the bloodstream. Urea is a waste product formed when protein is broken down in the body. Urea is produced in the liver and eliminated from the body in urine. A BUN test measures the amount of nitrogen in the blood that comes from urea. If the kidneys aren't able to remove urea from the blood normally, the BUN level increases. The test is done from a blood sample. A normal BUN level is between 7 and 20 mg/dL.

- **Blood electrolyte tests.** Electrolytes are also filtered out of the body by the kidneys. If there are altered levels of the following electrolytes in the blood, it may mean the kidneys are not functioning adequately:

- Potassium > 3.5 – 5.0 mEq/L
- Sodium > 135 – 145 mEq/L
- Phosphate > 2.4 – 4.5 mg/dL
- Calcium > 8.5 – 10.5 mEq/L
- Magnesium > 1.5 – 2.0 mEq/L

- **Kidney Biopsy.** A diagnostic test where a small piece of kidney tissue is removed by a needle. The tissue is looked at under a microscope to determine the cause of kidney disease.

- **Hemoglobin A1C.** A blood test that gives an estimate of blood glucose control over several months.



*A Friendly Note: These may be a lot of strange sounding tests. Don't be alarmed by the name of the test. When your doctor recommends a test, ask questions to find out more about the test and what the results of the test will tell your doctor.*

### Classification of GFR

The formula to estimate a value for GFR (eGFR) from serum creatinine levels in adults was derived from a large study that looked at how the modification of dietary protein would affect renal disease - hence Modification of Diet in Renal Disease (MDRD). The formula has since been updated, and replaced by the newer CKD-EPI creatinine formula. The classification of kidney disease by eGFR is based upon the newer formula.

### Stages of CKD based on GFR:

After 2002, chronic kidney disease was classified into five disease stages by the National Kidney Foundation. In 2013 the classification was changed by the Kidney Disease Improving Global Outcomes Workgroup (KDIGO), subdividing stage 3 and adding albuminuria.

STAGE	*VALUE of GFR or eGFR	EXPLANATION
G1	Greater than or equal to 90	Normal or high in the absence of kidney damage
G2	60 - 89	Mildly decreased function relative to young adult level
G3a	45 - 89	Mild to moderate decrease in function
G3b	30-44	Moderate to severe decreased function
4	15-29	Severe decreased function
5	Less than 15	Kidney failure – Dialysis, transplantation or palliative care (no treatment) is necessary

\*In ml/min/1.73m<sup>2</sup> of body surface area; persisting for 3 months or more.

*A Friendly Note: You should always know your eGFR number. This helps you understand where things are with your kidney function. When your doctor tells you your GFR stage, keep track of it in the notebook where you're writing down all your questions.*



### What role does the GFR play in measuring my kidney function?

A GFR tells your doctor how well your kidneys are working. As explained above, GFR can be estimated (eGFR) from your serum creatinine level, age, ancestry (race) and gender by any of the several estimating formulas. Some of these formulas are more accurate in older compared to younger individuals. Normal values for GFR or eGFR have been established for the age and gender of an individual. An eGFR or GFR <60ml/min/1.73m<sup>2</sup> of body surface area, if persisting for 3 months or longer is generally considered to indicate CKD in a younger person, but such values in older adults may not always indicate CKD, especially if urinalyses are normal and abnormal proteinuria is not present. An eGFR or GFR below 45ml/min/1.73m<sup>2</sup>, if persisting for 3 months or longer is generally regarded as indicating CKD in an older adult (over 65 years of age) even if abnormal proteinuria or other signs of kidney damage are not present.

### **My doctor is watching for protein in my urine. Why is this?**

Protein in the urine is called proteinuria. It is often the first sign of kidney disease. A very small amount of protein (up to about 150mg/d) in the urine is normal, but when elevated above a normal range can indicate kidney damage. If you are a person with diabetes, one of the first signals that you may be experiencing diabetic nephropathy (decreased kidney function) is a slight to moderate increase in urine albumin (albumin is a protein normally present in serum or plasma), usually above 300mg/d to 300mg/d. Consequently, testing urine for the presence of protein or albumin should always be a part of a routine medical exam. A dipstick test (a special strip of paper that's quickly dipped into a sample of urine to test its chemical makeup) may be done. The dipstick test only becomes positive when the amount of proteins, mainly albumin, reaches two to four times the levels normally found in urine. In people with diabetes, the first sign of kidney problems is an even lower level of proteinuria, called moderate albuminuria that is too low to be detected by a dipstick test. There are also new sensitive dipsticks that detect such low to moderate, but abnormally increased albumin excretion.

If the leakage or protein is found, usually over 3,000mg/d the protein and albumin lost may be enough to cause a fall in the level of albumin in the blood. This can cause swelling of the ankles or face and an increase in blood cholesterol levels. This condition is called the nephrotic syndrome.

The presence of protein in the urine is abnormal. The measurement of albumin excretion in the urine is commonly used to assess proteinuria and is known as the albumin excretion rate. KDIGO has classified albuminuria in three categories.

Albumin Category	Albumin* excretion rate	What this means: The urine albumin along with the GFR can help predict disease prognosis
A1	Under 30	Normal to mild increase – good prognosis when associated with Stages G1 and G2
A2	30-299	Moderate increase means the prognosis may be worse, especially if Stage G3b, G4 or G5
A3	Greater than or equal to 300	Severe increase means a worse prognosis, even when associated with Stage G3a.

### **Proteinuria or albuminuria and diagnosis of CKD**

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Increased excretion of protein, including albumin, that persists for 3 months or longer is a sign of CKD, regardless of the value for eGFR or GFR. Excretion of more than 30 mg of albumin per day is considered to be abnormal. When the doctor finds proteinuria, further tests are needed to sort out the cause. Is it due to kidney disease? If so, what is the disease? Is it caused by diabetes or some other generalized disease that involves the kidneys? In many cases, it may require a kidney biopsy to determine the cause of the proteinuria.

After a diagnosis of abnormal abnormal proteinuria or albuminuria is made, treatment may be aimed at reducing the amount of leaked protein. Various drugs can be used, depending on the diagnosis. These may include ACE (angiotensin converting enzyme) inhibitors, angiotensin receptor blockers (ARBs), steroids, cytotoxic agents and other drugs. In addition, other treatments may be required when the cause of the proteinuria is a more generalized disease such as diabetes. Much research is taking place at this time to find out what are the best treatments for the various diseases that can affect the kidneys and cause proteinuria.

### **How often should I see my doctor when it's related to CKD?**

Your doctor will work with you to determine a schedule for follow up visits. However, you should see your doctor right away if you get a bladder or kidney infection. Signs of a bladder or kidney infection include cloudy or bloody urine, pain or burning when you urinate and frequent urination. Back pain, chills and fever are also signs of a kidney infection.

### **What can I do to protect the function of my kidneys?**

You can do things to slow the progression of CKD. The sooner you change your habits, the better!

- **Control of elevated blood pressure (hypertension)**. Even if your doctor has prescribed medication for you, there's still a lot you can do to lower your blood pressure. Changes in your lifestyle and reducing salt in your diet can help control high blood pressure. A blood pressure reading of 120/80 mm HG is considered normal for a young adult, but the optimum blood pressure can vary and this will be determined by your doctor. It is very helpful to check your blood pressure at home at least several times each week, record the results and bring your record with you to the doctor's office. Once your blood pressure is successfully

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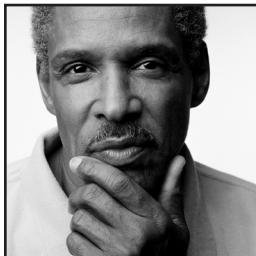
treated with medications, it is important to understand the medications should not be stopped because your blood pressure has normalized. Discuss your target blood pressure with your healthcare team.

- **Keep your blood sugar level in a safe range** if you have diabetes. An Hemoglobin A1C blood test can tell you and your doctor if your blood sugars have been within a normal range for the past two to three months. Although the normal range without diabetes is between 4.5 percent and 5.6 percent, the optimal goal for A1C is less than 6.0, but less than 7.0 is acceptable in advanced CKD in patients with diabetes to minimize the risk of low blood sugar while maximizing slowing the progression of kidney disease or minimizing risks of cardiovascular and eye complications of diabetes. Talk to your doctor or diabetes educator and find out the right target level for you, and what you need to do to maintain your blood sugar level.
- **Reduce the amount of protein you eat.** Your doctor may recommend you meet with a dietitian to reduce the amount of protein in your diet.
- **Maintain healthy levels of fats** (known as lipids), such as cholesterol and triglycerides, in your blood. See the Appendix for normal values of cholesterol, as well as a cholesterol tracking chart.
- **Quit smoking.** If you do not smoke, do not start. If you smoke, discuss ways and techniques to quit with your doctor.
- **Exercise.** Consistent physical activity and/or exercise can have an effect on your blood sugar levels, if you are a diabetic. Additional benefits of regular exercises include: increased energy, weight control and self-esteem. Talk to your doctor before beginning a new exercise routine. We will talk more about exercise later.
- **Medications.** Take all your medications as prescribed. Do not skip or leave out doses.



*A Friendly Note: There's a lot you can do to protect your kidney function. If you're feeling like I first did, you may feel like there's not much you can do. Whatever's going to happen is going to happen and that's it. That thinking couldn't be further from the truth. You have a lot of control over your health. The doctors can guide you, but you're the one who can make the ultimate difference. Don't just skim over this list. Read it carefully, and make the changes you need to make. Ask questions and do not be satisfied until you understand the answers.*

## CKD Risk Factors



There are several conditions and diseases that can eventually lead to CKD. Two of the most common conditions are diabetes and hypertension (high blood pressure). Diabetes is the single leading cause of kidney failure in the United States, accounting for about 50 percent of the people who start treatment for kidney failure each year. Around 28 percent have high blood pressure as causes of kidney disease. The remaining patients lost kidney function due to other, less common conditions. Because diabetes and hypertension are the two main causes of kidney failure, these conditions are explained in further detail in the next section.

*A Friendly Note: If you have one of the below mentioned conditions it doesn't mean you WILL develop kidney failure, however, it does mean you're at greater risk and it's in your best interest to understand your condition and do what's necessary to maintain your health. You're also at greater risk if you are African-American and/or have a first degree relative (mother, father or sibling) with kidney disease. Patients with chronic kidney disease have a greater chance of developing coronary artery disease, heart failure or a stroke even if they never reach a point where they require dialysis therapy.*



**Diabetes** - Diabetes is a disease of high blood glucose (blood sugar) levels caused by either a reduction or lack of insulin or resistance to its action in the body. Type 1 diabetes patients require insulin from the start of their disease because their disease affects the cells (islet cells in the pancreas) that make insulin. Most people with type 2 diabetes do not have a reduction in insulin production but the body does not react to insulin in a normal fashion (insulin resistance). This latter situation is often associated with obesity and most frequently develops after the age of 30. Some people with type 2 diabetes may ultimately develop a true insulin deficiency. Insulin is a hormone necessary for the metabolism of the carbohydrates you eat. With diabetes, over time, the small vessels of the kidneys are affected, damaging the filters of the kidneys and cardiovascular, eye and nerve complications can also occur.

Diabetes has become the most common single cause of end-stage kidney disease, requiring renal replacement therapy (RRT) with dialysis or kidney transplantation.

**Hypertension (high blood pressure)** - High blood pressure can damage the blood vessels in the kidneys, heart and brain. If you control it well,

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you may be able to slow down the progression of kidney damage. In many instances, hypertension is associated with diabetes and obesity. In some patients, particularly those of African American ancestry, the disease can be clustered in families.

Hypertension generally develops as the result of kidney disease, regardless of cause. Around 80% of patients who start dialysis have an elevated blood pressure. Since hypertension also leads to heart failure and stroke, it is important to bring it under control, first by salt restriction, but most often using anti-hypertensive medications.

**Glomerulonephritis** - Glomerulonephritis is an inflammation of the filters of both the kidneys. Most of the time, this inflammation results from the abnormalities in the immune system affecting the delicate kidney filters. It can sometimes occur due to infection. It often results in slow, progressive damage, but severe and rapid loss of kidney function can also occur. Early symptoms include small amounts of blood or protein leaking into the urine. A kidney biopsy may be needed for definitive diagnosis.

**Nephrotic Syndrome** - When excessive amounts of protein, including albumin pass through the kidneys and into the urine, you may be developing the nephrotic syndrome. The loss of protein results in the body retaining water and salt, and it is characterized by swelling, also known as edema.

**Polycystic Kidney Disease** - Polycystic kidney disease (PKD) is an inherited disease, passed down from either parent, in which abnormal fluid-filled sacs, called cysts, develop in the kidneys. As these cysts grow, they block the normal kidney anatomy and causes other parts of the kidney to fail. These cysts can cause pain. They can also become infected and can bleed. If you have polycystic kidney disease, you may still urinate in normal amounts, but not necessarily remove harmful waste products from the body. This condition is normally diagnosed by imaging, such as a CT scan, ultrasound or MRI.

**Systemic Lupus Erythematosus “Lupus”** - In this disorder antibodies that are a necessary part of the body's defense system trigger a response that attack the body's own cells. This can result in a variety of disease manifestations in the kidney and other organs.

**Chronic Pyelonephritis or Kidney Infection** - Kidney infection is an

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inflammation of the tissues of the kidneys surrounding the filters. Infection and other forms of inflammation, if left untreated, can lead to kidney damage. There is no evidence that kidney infections alone (i.e. without structural abnormalities like obstruction or scarring) can cause kidney failure.

**Kidney Stones** - Kidney stones can form anywhere in the urinary tract. The stones may cause painful or pain-free blockages in the drainage system of the kidney. When this happens, the kidneys can be damaged due to the pressure of urine backup or infections. Your doctor can obtain simple tests that help determine what is causing your kidney stones, and how you can treat and prevent them.

**Prostate Obstruction** - As men age, the prostate can grow, blocking normal urine drainage. Elderly men may first notice they must spend more time urinating and that their stream is not as forceful. Men noticing these symptoms should address them with their doctor.

**Family Connection** - If you have a family member who is on dialysis or who has had a kidney transplant, you may be at an increased risk of developing kidney disease, particularly if you are of African-American or Hispanic descent.

## Diabetes and Hypertension



*A Friendly Note: Don't be alarmed with these statistics. Instead, use this information to understand what you should do to protect your kidneys.*

**If I don't watch my blood sugar levels, what can happen to my kidneys?**

If you have diabetes, it's because your body does not make enough insulin or cannot properly use the insulin it does make. Your body uses insulin to convert sugar into energy. If your body doesn't have the insulin it needs to do this, the sugar stays in your blood and damages parts of your body. The high blood sugar can damage (weaken) your kidney's glomeruli – the filtering system for your kidneys. To protect your kidneys, it's important you control your sugar levels. Diabetes is often related to obesity. Increased intake of fat reduces certain hormones in the body that govern how this fat is distributed. It also stimulates inflammation. All of these changes interfere with the action of insulin to make sugar available as a source of energy, leading to an extra large amount of sugar in the blood stream. Excessive sugar and inflammation both damage the delicate inner walls of blood vessels. Since the kidneys have lots of blood vessels, they can be heavily damaged by diabetes over time.

**How else can diabetes damage my kidneys?**

When kidneys are working well, the filters keep protein inside your body. You need the protein to stay healthy.

High blood sugar (described above) and high blood pressure damage the kidneys' filtering system. When the kidneys are damaged, protein leaks out of the kidneys into the urine. Damaged kidneys don't do a good job of cleaning out waste and extra fluids. So not enough waste and fluids go out of the body as urine. Instead, they build up in your blood.

An early sign of kidney damage is when your kidneys leak small amounts of a protein called albumin into the urine. This is called moderate albuminuria. Most of the patients who develop early signs of diabetic nephropathy can undertake measures to slow disease progression.

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With more damage, the kidneys leak more and more protein. This condition is called proteinuria. Also, as diabetes advance, the kidney develops a scar-tissue type of response called fibrosis. This too damages the kidney, destroying its ability to filter wastes and minerals. More and more wastes build up in the blood. When the damage gets worse the kidneys fail, altogether.

### **How can I prevent diabetic kidney problems?**

- Keep your blood sugar as close to normal as you can. Ask your doctor what blood sugar numbers are healthy for you.
- Keep your blood pressure below < 140/90 mm Hg to help prevent kidney damage related to diabetes. Ask your doctor what blood pressure medications are best for you. If you take blood pressure pills, take them as your doctor tells you to. Keeping your blood pressure under control will also slow damage to your eyes, heart and blood vessels. Many people with high blood pressure purchase their own blood pressure cuff in order to monitor it daily at home. The Joint National Committee on Hypertension changed their recommendations in 2014 (JNC 8) and now recommend that patients who have diabetes should be treated with an ACE (angiotensin converting enzyme) inhibitor or an ARB (angiotensin receptor blocker) unless they are allergic to these drugs or have some other contraindication.
- Follow the healthy eating plan you work out with your doctor or dietitian. Change your meal plan as suggested by your doctor and/or dietitian. In particular, reduce the salt in your diet.
- Have your kidneys checked at least twice a year by having your urine tested for small amounts of protein.
- Have any other kidney tests that your doctor thinks you need.
- See a doctor immediately if you think you have a bladder or kidney infection. You may have an infection if you have any of these symptoms:
  - Pain or burning when you urinate.
  - Frequent urge to go to the bathroom.
  - Urine that looks cloudy, reddish or brown.
  - Fever or a shaky feeling.
  - Pain in your back or on your side below your ribs.

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## HYPERTENSION (HIGH BLOOD PRESSURE)

### How does high blood pressure damage the kidneys?

Hypertension or high blood pressure is very common, affecting one out of three people in the United States. If you are over 55 years of age you have a 90% chance of developing hypertension. High blood pressure is a condition that can damage your kidneys. Your kidneys act like a filtering system to get rid of excess water and wastes in the blood. Blood pressure is the force, or pressure, of the blood on the walls of your blood vessels. Over time, uncontrolled high blood pressure can damage the blood vessels and nephrons (filtering units) in the kidneys. The damaged nephrons can't do their job of filtering wastes, sodium and excess fluids from your blood. This excess fluid and sodium stays in your bloodstream putting extra pressure on the walls of your blood vessels – further raising your blood pressure. This extra pressure leads to further kidney damage. High blood pressure also affects many other organs, slowly destroying them. This includes the heart, brain and eyes.

### My doctor told me that controlling my kidney disease means controlling my blood pressure. What does this mean?

Blood pressure is the force of blood inside an artery. The readings are made up of a systolic number (the top number) and a diastolic number (the bottom number). The systolic blood pressure measures when the heart beats and the diastolic blood pressure measures when the heart is at rest. A blood pressure reading consists of an upper number and a lower number. As an example, this is stated as “120 over 80 or 120/80.” Blood pressure readings are measured in units called millimeters of mercury or “mm Hg.”

Your blood pressure is considered high if the top number (systolic number) is equal to or greater than 140 mm Hg or the bottom number (diastolic number) is more than or equal to 90 mm Hg. Hypertension can be both a cause and result of kidney disease.

The Joint National Committee on the Prevention, Detection and Treatment of Hypertension states that blood pressure for patients with kidney disease should be controlled to 140/90 mm Hg. This can help preserve kidney function and protect the kidneys from further damage.

These recommendations were changed in 2014, and now recommend

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that drug therapy should be used to lower the blood pressure to 150/90 or lower in the general population of persons over the age of 60 WITHOUT kidney disease or diabetes. Patients with kidney disease including diabetes should be treated with medications that are in either the ACE (angiotensin converting enzyme) inhibitor class or the ARB (angiotensin receptor blocker) class of drugs. Both drugs should not be used together. Of course if one has an allergy or contraindication to ACE inhibitor or ARB therapy, these drugs should not be used. (See below)

Atherosclerosis is the development of plaque composed of fat (cholesterol), fibrous tissue and inflammatory cells that hardens and narrows the arteries. It is aggravated by hypertension. High blood pressure increases the workload on the heart. It can strain the heart muscle, affecting the heart's pumping ability. It may lead to heart failure. High blood pressure affects blood vessels all through the body and therefore can damage the tissues and organs supplied by these vessels. It increases the risk of coronary artery disease, aneurysms (deformities in the blood pressures), stroke, kidney disease and eye problems. Most patients with hypertension eventually develop abnormal albuminuria as an early tell-tale sign that something is going on.

### **Are there medicines to slow down kidney damage?**

Yes. We all should watch for these very early signs that hypertension is damaging the body. The strategy to control blood pressure is to use medicines that have additional benefits. Angiotensin is a hormone your body makes that constricts smooth muscles in the vessels of the kidney and in other vessels as well. There are two types of drugs that can block the action of this hormone: angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs). ACE inhibitors block the enzyme that forms an active form of angiotension. ARBs work by blocking the hormone at the receptor site on blood vessels. Both decrease your blood pressure by keeping blood vessels from becoming too narrow. By opening or dilating blood vessels help reduce the progression of kidney disease, especially in diabetics.

Since the target blood pressure required to help protect the kidneys may be lower than you can achieve with one drug, your doctor may have you take additional medications. Calcium can cross channel pathways into the cells of blood vessel walls and tighten them. Blocking these

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calcium channels helps blood vessels to relax. Therefore, calcium channel blockers are also useful, and if you have kidney disease or diabetes are recommended for use once you are already on an ACE inhibitor or ARB. The calcium channel blocker dilates the blood vessels by relaxing the muscles in the vessel walls, thus making it easier for blood to flow through the vessels. Other drugs such as beta blockers are also used. In African-American persons WITHOUT diabetes or kidney disease, diuretics and calcium channel blockers are recommended before starting ACE inhibitor or ARB therapy according to the recommendations of 2014.

Your doctor may prescribe a diuretic for you. You have probably heard them referred to as “water pills.” Diuretics are used to remove extra sodium and fluid from the body. Eliminating excess fluid may lower your blood pressure and assist the other drugs mentioned above.

Blood pressure can also be reduced with diet, especially one lower in salt. Exercise which is very important, and it is recommended that we exercise at least four times a week. Most people with hypertension will also need to take medication over the course of their lifetime in order to achieve optimal blood pressure and slow the progression of CKD.



*A Friendly Note: Don't let this information overwhelm you. Education is the key to living a healthy life and knowledge is power! Having diabetes or hypertension doesn't mean you'll experience kidney failure. In fact, only three percent of all diabetics today have complete kidney failure. But, it does mean those with diabetes and high blood pressure must be extra alert about their kidney health. Lowering your blood pressure to within the recommended range of 140/90 with kidney disease or diabetes may also reduce your risks of stroke and heart disease.*

## Side Effects of CKD



*A Friendly Note: Having CKD doesn't just mean you're at risk for kidney failure. However, it means you may also experience other problems with your health as well. As it has been explained earlier, the kidneys do a lot more than create urine. I learned early that I'm the one who knows my body best. I knew something wasn't right when I constantly felt tired and worn out. I talked to my doctor who recommended that I exercise more, take iron and bicarbonate tablets. My diet was also changed. Right now my anemia is mild, but if it gets worse I might require a drug called erythropoietin.*



Advanced CKD (Stage G3b to G5) may make you feel extremely tired, weak or exhausted. This is called fatigue. You may find it hard to do some of your normal daily tasks or activities. There are many causes of fatigue in patients with CKD. It can cause changes in your sleeping habits. It also makes some people feel depressed. Many patients with CKD do not get adequate exercise. Anemia, metabolic acidosis and inflammation may also contribute to your feeling tired all the time.

The main side effects of kidney disease are a buildup of body wastes, volume overload, hypertension, anemia, abnormal mineral metabolism, acidosis and the inability to eliminate many medications.

### BUILDUP OF BODY WASTES AND ACIDS. INFLAMMATION

The body is constantly repairing or replacing worn out body tissue. Therefore, proper diet is essential to provide the building blocks needed for repair. Worn out body tissues are often effectively recycled by the body, but at some point, waste products must be eliminated by the kidney. When kidney function declines, waste products and acids build up. In early disease, this may not cause symptoms, but should not be ignored. While it is not clear at what stage the buildup of wastes cause lasting harm, it is important that persons who discover they have reduced kidney function pay attention to their eating and lifestyle habits, watch what medications they take, and try to reduce inflammation and acidosis through their diet. The waste products that build up may stimulate inflammation.

Chronic inflammation occurs with many diseases, and can also result from several of the disorders that lead to kidney failure. Since inflammation can lead to damage to the heart and blood vessels, we must do our part to prevent or reduce it. Poor and unhealthy eating habits worsen inflammation regardless of its original cause, and you are encouraged to speak with

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your physician and dietitian about ways to reduce it. Advanced kidney disease can cause a decreased appetite weight loss, muscle breakdown and weakness. If allowed to progress, the buildup of wastes can make you feel irritable and can even interfere with your ability to think clearly. These findings are most likely to be seen with advanced disease.

### VOLUME OVERLOAD

When the kidneys do not work as they should, they cannot regulate the amount of water and salt we normally have in our bodies. It is easy to become dehydrated, and as the disease advances, overload with fluids. Sometimes the overload is the result of an inability to eliminate sodium, a mineral that makes up table salt. This causes a fluid buildup inside of blood vessels, increasing their pressure. This is recognized as high blood pressure or hypertension.

### HYPERTENSION

Hypertension is the result of the kidney's inability to eliminate salt as it should. It can cause kidney disease, and most assuredly results from diseased kidneys that retain salt. Over time the high blood pressure inside arteries damages them, and also hurts the downstream organs that arteries flow into. This leads to heart damage and stroke. The good news is that hypertension can be controlled, both in the early stages of kidney disease, and once dialysis becomes necessary.

### ANEMIA

Anemia is a condition in which the body doesn't have enough red blood cells. Red blood cells carry oxygen throughout your body. Oxygen acts like fuel for the body, providing energy for muscles and organs to work. It's the lack of oxygen supplied to the tissues that causes the extreme fatigue.

Normally functioning kidneys make a hormone called erythropoietin (Epo). This hormone helps form red blood cells. When you have reduced kidney function, your body may lack this hormone and cause anemia, but this typically does not appear until stage 3b CKD.

#### What are the symptoms of anemia?

One of the more common side effects of anemia is fatigue, or excessive tiredness. You might feel exhausted, even after a good night's sleep.

## What can be done to prevent or control anemia?

Taking iron by mouth (oral iron) or by vein (intravenous) is the first line of therapy for anemia associated with kidney disease. Red blood cells carry oxygen to body tissues by attaching it to iron. Iron is a very common mineral. It gives the red color to our most beautiful mountains because it combines with the oxygen in the air. The same process causes metal to rust. As you would expect, iron and oxygen are attracted to each other. As new red blood cells are being formed, they need iron to carry oxygen to cells. This oxygen is what helps your body make and store energy.

Erythropoietin is a hormone made by your kidneys that stimulates your bone marrow to make more red blood cells. As a person with CKD, you may not be making enough erythropoietin and your doctor may prescribe a man-made form of erythropoietin called erythropoietin stimulating agents or ESAs. It may be given by injection into your vein, called an intravenous or IV injection. It can also be given by a very small injection under your skin, called a subcutaneous or S.C. injection.

## How will my doctor know if I'm anemic?

A blood test will give your doctor a picture of how many and healthy your red blood cells are. It will show if you are anemic.

There are other blood tests that show how your red blood cells are doing and there are blood tests that show where the iron is in your body and how it's being used.

## The red blood cell tests are:

- **Hemoglobin:** This is the amount of the substance that carries oxygen to your body tissues. It contains iron. The hemoglobin target range for CKD patients on dialysis receiving ESA therapy is between 10g/dL (grams per deciliter) and not more than 11g/dL. Under some circumstances ESAs may be prescribed for patients with CKD, not on dialysis.

- **Hematocrit:** This is the fraction of the blood, which consists of red blood cells and plasma, that is red blood cells. The target hematocrit range for CKD patients receiving ESAs is between 30 and 33 percent.

## The iron blood tests are:

- **Ferritin:** This is a protein that keeps iron in "storage" until it's needed. To optimize blood cell production, your serum ferritin should

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be maintained at greater than 100 ng/ml if you have CKD and not on dialysis or if you are on peritoneal dialysis. It should be greater than 200 ng/ml if you're on hemodialysis. Your doctor will know when to start iron and when to stop it. When you have a serious infection, it's possible that your body will hold onto the iron in storage. In this case, you may have a high ferritin level but the body cannot use it even though you don't have enough iron in your blood cells. If this happens to you, you should receive treatment for your infection before continuing to receive your supplemental iron therapy.

● **Transferrin saturation:** Transferrin is a protein that takes the iron from the storage protein (ferritin), or the iron that you're being treated with, and takes it to the bone marrow where it may be used to build healthy red blood cells. This blood test measures the amount of iron on the transferrin protein. If your transferrin saturation is less than 20 percent, it means you do not have enough iron for your red blood cells. The normal transferrin saturation range should be between 20 and 50 percent.

### **What type of iron may my doctor prescribe?**

There are two ways of taking iron if not enough is being consumed through your diet alone. Your doctor may first prescribe oral iron pills that you may buy without a prescription. Oral iron is usually given three times a day between meals. How and when you take oral iron is very important.

- Take iron one hour before or two hours after a meal.
- Do not take with antacids.
- Do not take with phosphate binders.
- Avoid alcohol.

If you begin to get constipated, have nausea or a feeling of fullness; try increasing your iron dose slowly.

If you're not able to reach a good blood count with oral iron, your doctor may prescribe intravenous (given as an IV) iron.

### **Abnormal Mineral Metabolism**

Another mineral that builds up is phosphorus. Vitamin D is important for good health, but with kidney damage, it does not become active. The combination of a high serum phosphorus and low levels of active vitamin D leads to many abnormalities that weaken the heart and

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bones can cause a build up of calcium inside blood vessels, resulting in the formation of hardening of the arteries. You might hear the term, parathyroid hormone. This is the hormone causing much damage to bones as it tries to replace the calcium your body lacks. This is a problem because with kidney disease, there is not a lack of calcium in the body; it is just in the wrong place.

### **Acidosis**

When the kidney does not work as it should, it cannot buffer or trap acids and they build up in the body. This is because after the blood is filtered the remaining fluids go through long tubes – tubules as we call them – that recycle much of the body's vital minerals. Many simple chemical reactions that take place in the tubules move the accumulated acids safely into the urine or generate buffers that can enter the circulation and neutralize acids.

In another part of the kidney, bicarbonate is made, and that returns to the body to buffer or neutralize acids in the system. Think of bicarbonate when you open that can of soda pop (you really should not be drinking it). The fizzing is caused because bicarbonate and acid released a gas – carbon dioxide when you lower the pressure. Have you even noticed when you put your mouth to the foam it stops? Saliva contains a special enzyme, carbonic anhydrase, that causes the carbon dioxide and water to combine with each other. You have carbonic anhydrase in your kidneys, too. It breaks up the water molecule and traps acid that can be swapped out for sodium. Hence the name, sodium bicarbonate. The bicarbonate can be sent back to your body to trap more acid. Did you know you also have the acid trapping enzyme, carbonic anhydrase in your red blood cells? With kidney disease you may not have enough bicarbonate being made by the kidneys. Your doctor may recommend that you take oral sodium bicarbonate or sodium citrate. It has been suggested that this may help protect the kidneys and stall disease progression. Many fruits and vegetables are high in alkaline content, and like bicarbonate, may also help the kidneys. A vegetarian diet is preferred to a diet rich in red meat as red meat can promote acidosis.

### **Inability to eliminate many medications**

The kidney is important in eliminating many of the medications or by products of the medications that are prescribed and taken every day. Often times, this is taken for granted. If you are discovered to have

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reduced kidney function, however, you should discuss your medications with your doctor and make sure the dose is correct. Many over the counter painkillers like ibuprofen and other medications such as the proton pump inhibitors, omeprazol are commonly used. Since they can be purchased without a prescription, one assumes they are safe in all circumstances. On the other hand, patients who have reduced kidney function may not tolerate these medications and they can potentially harm the kidneys and cause additional complications. It is important to make sure your doctor knows about all the medications you are taking, even those you purchased over the counter without a prescription.

## Your Emotions



When you first learned about your condition, whether it was diabetes, high blood pressure, polycystic kidney disease, or other illness you most likely dealt with a variety of emotions. Adjusting to a change in your health status of the magnitude of kidney failure, may feel like you have been “hit by a freight train.” Many people feel anger, depression, confusion, frustration, sadness or even hopelessness. Everyone reacts differently and learning you may have be at risk for kidney failure may cause a rollercoaster of emotions. You may experience emotions shortly after you’re told about CKD or you may experience them much later. In either case, it’s important to know your healthcare team is available to answer your questions.

*A Friendly Note: No one benefits when you keep emotions bottled up inside of you. Talking about your feelings or concerns is often the first step toward helping you and/or your family better understand what you’re experiencing. Don’t be embarrassed to share your fears and concerns. When you talk about these things, many times it helps to ease those anxieties.*



### What emotional changes might I experience?

#### ● Depression and Anxiety

Depression and anxiety are two common feelings you may experience. These feelings are normal when a person is facing a change in his/her health. Sadness, anger, loss of appetite, trouble sleeping, lack of interest in sex or daily living can be signs you’re depressed. Anxiety can cause feelings of uneasiness or fear. It may also cause physical signs like a fast pulse rate, tiredness, irritability, excessive sweating, nausea and nervousness.

#### ● Anger

Anger is also a normal response to learning you have a chronic health condition. This is a time when you’ll have a lot of questions about your condition and the future. You may be angry because you feel like you have no control over your body or your illness. Education and involvement in your care can help you understand the best ways to help yourself emotionally and spiritually.

#### ● Despair

Despair may occur if you’re overwhelmed. You may feel hopeless. You may experience a loss of self-esteem, pride or sense of usefulness.

Concerns about your ability to do things you enjoy can leave you in despair. This is a very normal emotion when you have major changes in your life. Becoming involved and understanding your health can ease the feeling of despair.

### ● Isolation

Isolation can occur if you pull back from the people on which you usually depend. You may distance yourself from family and friends who want to help you. You may not want to depend on other people. You may feel people don't want to hear about your condition. Remember, your family and friends want to help you. It's OK to lean on someone for support.

Your feelings may change. Just because you feel one way today, doesn't mean you'll feel the same way tomorrow. And, you're not the only one who may be experiencing emotional changes. Your family and friends may have similar feelings. Many times it helps to share your feelings and learn what others are thinking. This strengthens the support system for you and your family/friends.

### **How do I tell my family and friends?**

Deciding who to talk to and who to tell you've been diagnosed with CKD is an individual decision. How did you tell people about other chronic diseases you may have such as diabetes? If that process worked well for you then, it should work well for you again. People often ask how to tell family and friends. There are no "cookie cutter" phrases that work for everyone. Sharing the information in an honest, open and direct way is the best approach. This can be challenging. Our natural instincts cause us to want to protect those we love and care about.

Unfortunately, when family members or friends don't know something or feel something is hidden, their imaginations often take over and they may begin to think the worst. For this reason, it's important to be open when explaining your CKD with young and old alike. Remember, your family and friends may experience many of the feelings you did when you found out. It's natural for them to feel sadness, fear, despair and isolation.

Sharing about your CKD with your family is also important to their health since relatives can have a higher incidence of kidney disease. You should suggest they also get tested for CKD.

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*A Friendly Note: : It's important not to block out your family and friends during this time. They're a great support network and can help you watch your health. I know this is scary and a lot of times we try to be strong for our families. It's the "I can handle anything" philosophy. I'm not saying you can't handle this, but I am saying it's a lot easier when you let someone help you. Talking about your health can be very helpful for children and help them feel comfortable asking questions.*



### **What else should I do?**

During any health condition, there will be difficult times when the support of others can influence you as well as provide support. Keep communication open with your family so they can understand and feel a part of decisions, too. Dealing with a chronic illness can be scary for spouses and children, but knowledge can be powerful and often provides strength. Scheduling a weekly or biweekly family meeting is an ideal way to keep the lines of communication open. It's a perfect opportunity to check how everyone is doing – not only regarding the diagnosis of CKD, but life in general. Even though you've been diagnosed with CKD, there are still life issues not necessarily related to CKD that will need to be addressed. You may also want to join a support group or attend a patient educational seminar. Check with the American Association of Kidney Patients (AAKP) for a support groups in your area or for information on educational webinars, or the AAKP National Patient Meeting. If no local support group exists, considering partnering with your healthcare team and fellow patients to start one.

## Your Healthcare Team



I'm facing a new team of healthcare professionals.  
What are their roles?

There are many people who will be involved with your care. This “team approach” is helpful to make sure all your needs are met. Although helpful, it can be confusing sorting out “who is who” and “who does what.” Each of these “team members” are responsible for certain areas of your care. You, however, are the expert on you and your family and crucial in ‘assuring’ others understand what you need. The team needs to know how CKD affects you and your family. Working together as a team will help you receive the treatment and care that will work best for everyone. Below is a summary of some of the members of your healthcare team.

- **Specialist** - A specialist is usually a kidney doctor - nephrologist, but could also be a cardiologist, diabetologist, vascular surgeon, primary care doctor or other specialist, particularly if you have high blood pressure, diabetes, lupus or any condition that put you at risk for kidney failure. This specialist should be aware of your health condition and your CKD and work with you to help preserve your kidney function and maintain your health. The specialist is there to answer questions you and your family may have. Take a written list of questions with you when visiting your doctor to help you remember your questions. Remember to take notes of your doctor’s answers.
- **Primary Care Physician** - A doctor who delivers basic or general care that is intended to be the patient’s first level of contact with the medical care system. Primary care physicians are trained in every major area of medicine, they serve as the primary source of a patient’s healthcare throughout life. Some patients with late stage or advanced CKD may receive much or all their care from a nephrologist and others may receive routine care from their primary physician and other care specific to their kidney disease or blood pressure from a nephrologists.
- **Nurses** - The experienced registered nurse (RN), licensed professional nurse (LPN) or nurse practitioner (ARNP) is an excellent person to answer questions about CKD and daily care. Most nurses realize that answering your questions now will help you make healthy choices. If you have a question, don’t hesitate to ask it.
- **Dietitian** - Your doctor may refer you to a dietitian. Since one way to preserve kidney function is to modify your diet, a dietitian will help you

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make good food choices. Watching what you eat and drink may be one of the hardest changes you make. A dietitian can help you make meal choices, which will help keep you healthy. Dietitians aren't there to restrict you, but to work with you to make the best choices possible by incorporating foods you enjoy into a safe and appropriate meal plan. If your doctor hasn't recommended a dietitian and you're interested in finding one in your area, visit the Academy of Nutrition and Dietetics at [www.eatright.org](http://www.eatright.org).

● **Advanced Practitioner (Advanced Practice Professional, Nurse Practitioner or Physician's Assistant)** -

These professionals often work as extenders of the physician and can answer questions about daily care as well as often are involved in 'decision making' of day-to-day medical care.

● **Social Worker** - If you're referred to a social worker, he or she can provide you with a great deal of information, from financial resources to coping and support systems. The social worker can explain hard to understand information in easy to understand words. They can help you with work, insurance and rehabilitation issues. The social worker can help you adjust to the feelings you're experiencing.

● **Nephrologist** - You may be referred to a nephrologist. The nephrologist is a doctor who has had special training on how to treat kidney disease. Your nephrologist will work with you and the rest of the healthcare team. A plan to treat your disease and manage your health will be developed. You'll see your nephrologist on a regular basis. Your nephrologist will monitor your health. He or she will make changes as needed to help you stay healthy.

● **Diabetes Educator** - Diabetes educators are health professionals, nurses, dietitians, pharmacists, exercise specialists, doctors and social workers, who specialize in the treatment of people with diabetes. They help you learn to live a healthier, more productive life with diabetes. Diabetes educators work in a variety of settings. You will find many of them in hospitals teaching patients in group classes or they may work with patients individually. They also may be found in doctor's offices, nursing homes or neighborhood clinics.

● **Pharmacist** - A professional who fills prescriptions, and in the case of a compounding pharmacist, makes them. Pharmacists are familiar with medication ingredients, interactions, cautions and hints. Pharmacists are trained to prepare and distribute medicines and to give information about

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them. Let your pharmacist know you have CKD. Many medications, including over-the-counter medications are cleared from your body by your kidneys. Your pharmacist can check each medication and ensure their use with CKD is appropriate.



*A Friendly Note: That's a lot of healthcare people to remember. It should also make you feel safer. Look at how many people are available to help you maintain your health. The important factor to remember is that you should always feel comfortable asking your healthcare team questions. The more questions you ask, the more informed you become.*

### **How do I talk to my healthcare team?**

Many people find it helpful to have a notebook where they write down questions for their healthcare team. If you're like most people, you have questions you think of at home, and then when you see the team it's hard to remember those questions. A notebook that you carry with you can be a good way to make sure your questions are answered. Some people keep this information on a smart phone or electronic tablet. Sometimes when there's so much to learn, it's hard to know what questions to ask. Remember when you were in school and you had to keep notes on all the information you learned? Having chronic kidney disease is a learning process, too.



*A Friendly Note: It's important to remember that you can ask more than one healthcare professional the same question. If you ask someone a question and aren't satisfied with the answer, you should ask someone else. It's OK to get a second opinion. A second opinion can be a win-win in that any information could be helpful or alternatively if no new information is learned, you can feel comfort in the original diagnosis and plans.*

### **What questions should I ask at my doctor visits?**

To keep yourself as healthy as you can be, it's important to understand your condition and how it affects your health. The following is a list of some questions many people have. You can use this list to check off the questions you would like to have answered.

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### Checklist

- What has caused me to develop CKD?
- What are the stages of CKD and what is their significance?
- What stage am I?
- What does this mean for me?
- Am I going to need dialysis or a transplant soon? What medical tests have I had done?
- What medical tests can I expect to have done in the next three months?
- What medicines have I been prescribed? What does each one do? What side effects might I have?
- What medicines, vitamins and/or herbs should I avoid? Should I be following a special diet?

You may find it helpful to have a list of phone numbers and medications posted by the phone and on the inside of your “question notebook.” In addition, the notebook is a good place to keep track of medical records as well as track how you’re feeling and what you’re experiencing.

# Medications



## What medicines must I take?

It's your right and responsibility to understand what medicines you're taking, why you're taking these and how to take them. For example, some medicines should be taken with meals and other medicines should be taken on an empty stomach. It's important to tell every member of your medical team if you

have stopped or changed your medicines or if another physician involved with your care has made a change in a medication or a change in a dose of one of your ongoing medications. This may occur if you are seen in an emergency department or urgent care center or by another specialist or even your primary doctors. Always let your pharmacist know you have CKD and be sure to ask if there is anything you should know about the medication. Stopping or changing medicines may affect other areas of your treatment. Talk to your doctor if you have financial problems with purchasing needed medicines. When you have CKD, medications may be prescribed to: help your body make red blood cells, control blood pressure, help replace vitamins and minerals, keep your bones strong, get rid of phosphorus that builds up when your kidneys aren't working fully and treat infection or other illnesses you may have.

## Some common medications you may be prescribed include:

- **Iron** is used to help your body make red blood cells.
- **Erythropoietin (epoetin alfa)** is a hormone that helps stimulate red blood cell production. It's identical to the naturally occurring erythropoietin manufactured in the kidney.
- **Blood pressure medicine** is used to keep your blood pressure under control. If it's not controlled, you could have heart failure, a stroke or cause further damage to your kidneys.
- **Corticosteroids (steroids)** are often given to reduce inflammation or provide relief from pain. When your kidneys aren't working as well as they should, you may have some pain or swelling of the kidneys. Discuss any side effects of corticosteroids with your healthcare provider.
- **Vitamins (such as Vitamin D) and minerals** enhance your health and supplement your diet.
- **Calcium** helps keep your bones strong and your heart muscles healthy. But the amount of calcium should be limited.
- **Phosphorus binders** help your body "tie up" the phosphorus in your stomach so it cannot build up in your body. Not taking your binders can lead to long-term bone disease.

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- **Antibiotics** help your body fight infections. However, when your kidneys aren't working as well as they should, antibiotics dose and blood levels need to be carefully monitored. Thus, if another doctor gives you an antibiotic, be sure to ask your nephrologist if the dose is OK.

### **What medicines should I avoid?**

Many people take over the counter medicine, herbal remedies, vitamins or supplements, to help them to feel better. When you have CKD, some of these medicines or remedies may actually make you sick, be life threatening or even be harmful to your kidneys. Make sure you tell your medical team about all medicines and remedies you're taking.

#### **There are some common medicines to avoid:**

- **Alka Seltzer**, baking soda or other bubbling remedies. These are high in sodium.
- **Milk of Magnesia** or antacids containing magnesium. Magnesium can build up and cause neurological problems.
- **Aspirin**, unless ordered by the doctor. Aspirin can affect the clotting abilities of the blood and may cause bleeding.
- **NSAIDS** are anti-inflammatory medications like Advil, Nuprin, Ibuprofen or Aleve can damage the kidneys.
- **Enemas and laxatives** should be avoided, unless suggested by your doctor.
- **Vitamins or food supplements** may have potassium and magnesium in them. Large doses of Vitamin C should be avoided.
- **Any "cure all" remedies and over-the-counter medicines** that have not first been discussed with your doctor.
- **Herbal medicines or supplements** are unsafe if you have kidney disease since some herbal products can cause harm to your kidneys and even make your kidney disease worse. Also, your kidneys cannot remove waste products that can build up in your body causing toxic levels of certain nutrients such as potassium and phosphorus that are commonly found in herbal products.

### **What is alternative or complementary medicine?**

In recent years, there has been a growing trend to use alternative or complementary medicine. These are treatments that are used in addition to traditional Western medicine. Common kinds of these treatments include acupuncture, herbal remedies, chiropractic therapies, over-the-counter medicines, mind-body techniques and others. Some mind and body techniques such as breathing exercises and visualization are safe and

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effective to help manage stress. Although some people find benefit in these types of treatments and medicines, some may cause harmful side effects. Tell your doctor about all the medical treatments you're using. Before trying any complementary therapies or medicines, please check with your doctor.

### **Are there any herbal products that may cause further damage to my kidneys?**

It's important to understand that pharmaceutical drugs and herbs are not regulated in the same way. Herbs and a number of other biologically active substances are classified as dietary supplements. Regulations of these supplements are based solely upon adverse events, i.e., they are considered safe until proven harmful. Unfortunately, since herbs are not regulated they can be potentially very dangerous. In contrast, drugs must prove they are safe through clinical trials before they are allowed on the market. As a result, herbals can contain pesticides, heavy metals and/or poisonous plants.

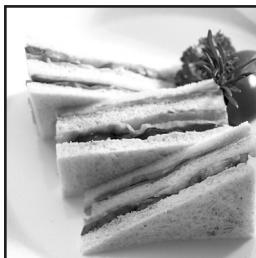
Another aspect of herbal supplementation use to consider is drug interaction. People with CKD are on a number of medications. Herbals can boost or decrease the effectiveness of prescribed medications. For instance, Ephedra, often used in weight loss products, causes an increase in heart rate and blood pressure and should not be used in patients with hypertension, congestive heart failure and/or diabetes. It's critical to mention to your doctor any herbals, over-the-counter medications and products purchased from health food stores you may be using.

Other herbs that may be problematic are those with diuretic properties. A diuretic is a drug that reduces the amount of water in your body. Goldenrod, parsley, uva ursi and juniper berries fall into this category. Other herbals may affect electrolyte balance. Alfalfa and dandelion contain high levels of potassium, of particular concern for those taking potassium-sparing diuretics.

Some herbs have been found to be extremely dangerous. Between 1990 and 1992, the herb Aristolochia, innocently used as a weight loss product, was found to be highly carcinogenic and a direct cause of irreversible kidney failure.

People with any form of kidney disease, should exercise caution when using herbal products. Be sure to tell your healthcare team if you are using any products containing herbs.

# Nutrition



## What is a CKD diet?

Much research has been done to determine if low protein diets will help delay the progression of kidney disease. The results are not conclusive. However, strict blood pressure control and a low protein diet may help in some kinds of kidney disease. Reducing salt in your foods is extremely helpful if you have CKD. The watchful eye of a dietitian is also very important and helpful.

Seeing a renal dietitian will help you develop and maintain a healthy diet. If you don't have access to a dietitian, learn as much as you can about the diet you should follow and if you have questions, ask your doctor.

Depending on your kidney function and your size, the amount of protein in your diet will be figured. Your doctor will tell you what amounts are good for you. If you have diabetes, be sure to talk to your doctor, as a very low-protein diet may not be recommended for you. A person with diabetes needs to eat enough protein to reduce the risks of tissue breakdown and infection. The secret of the diet is THE SIZE OF THE PORTION.

Below is a sample of a non-diabetic menu. This will show you where the protein is found in the diet. There are very small amounts of protein in fruits, juices and in non-dairy products, but to make matters easier, the sample menu did not count that protein in the daily allowance. There is no guarantee that a low-protein diet will delay the progression of kidney failure.

## If I have diabetes what else should I keep in mind?

If you have diabetes and have been diagnosed with CKD you should also remember:

- You may have problems with your blood glucose control and will need to monitor it more frequently. Discuss with your healthcare provider what your goals for blood glucose levels should be.
- You need to avoid treating hypoglycemia with orange juice due to its high potassium content.
- Talk to your doctor about your insulin dosages as they may be decreased or changed now that you have CKD.
- Maintain a healthy weight; discuss your target weight with your physician.

## How else can proper nutrition help me?

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One goal of proper nutrition is to reduce the workload of the kidneys and allow the best environment for optimal kidney function. Below are a few health tips. Discuss these issues with your physician and refer to this list frequently.

● **Have a Healthy Heart:**

Cardiovascular complications often accompany kidney disease - this is preventable. Monitor your fat intake, especially saturated fat (such as butter and trans fat) and know your total cholesterol and potassium levels.

● **Eat an Appropriate Amount of Protein:**

Limiting total protein intake may decrease the workload of the kidneys. Eating too much protein will make your kidneys work much harder, which can cause more damage to your kidneys. Albumin and total protein in the blood should be monitored to prevent malnutrition. Utilizing portion control will be helpful in controlling protein. One trick: three ounces of meat is about the size of a deck of cards. Also discuss ways to incorporate vegetable protein into your diet with your physician and dietitian.

● **Activity:**

Consistent aerobic exercise, such as walking, will help to control weight and improve cardiovascular function. Strength training exercises may prevent muscle breakdown. Discuss your exercise program with your physician. If you haven't exercised regularly before being diagnosed with CKD, don't start a new program until you discuss it first with your physician.

● **Calorie Intake:**

Calories are units used to measure the energy value in food. Make sure you're eating the right amount of calories each day for you. Talk to your doctor or dietitian and find out if you're receiving enough calories. If you're overweight, talk to your healthcare team about ways to reduce calories.

● **Limit Salt:**

Too much salt can lead to hypertension, swelling and thirst. Read food labels and become aware of hidden sodium in foods, especially processed foods, snack foods, frozen foods and restaurant fare. Be careful of salt substitutes as they can contain high levels of potassium. Be sure to discuss with your physician and dietitian the appropriate amount of salt intake for you.

● **Limit Phosphorus:**

When your kidneys aren't working properly, phosphorus will begin to build up in your blood. Phosphorus is a mineral found in foods. You'll need to limit the amount of phosphorus-containing foods you eat. Foods that have a lot of phosphorus include: beans, cheese (except cream cheese), chocolate, custard,

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meats, fish, milk (all kinds) and nuts. Be sure to discuss with your physician and dietitian the appropriate amount of phosphorus intake for you.

**● Take Care of Your Bones:**

Know your phosphorus level. Excessive levels of phosphorus can cause calcium to be leached out of the bones, leading to weak and brittle bones. High amounts of phosphorus are found in beans, nuts, liver, milk and other dairy products, such as cheese.

**● Understand Potassium:**

Potassium is a mineral found in many foods. Initially, this will not be restricted in your diet, however, if your CKD becomes worse your doctor will most likely tell you to watch your potassium. Foods high in potassium include: bananas, beans, chocolate, milk, nuts, oranges, prunes, spinach and tomatoes. Be sure to discuss with your physician and dietitian the appropriate amount of potassium intake for you.

**● Watch Your Fluids:**

If your doctor has restricted your fluid intake, talk to your dietitian about ways to control your thirst. Remember fluid is found in such unexpected things as jello, watermelon, gravy, sherbet and many other places. Decreasing salt in your diet also helps control thirst.

**● Help Yourself to a Wealth of Information:**

Contact a registered dietitian in your area for more personalized information. You can also order various dietary guides from AAKP.

*A Friendly Note: Watching what I ate was probably the hardest adjustment I had to make. Working with a dietitian to better understand the diet was extremely helpful. I learned a lot about nutrition and how it can affect my kidneys and my body. My family also learned about what foods were healthy and what foods were harmful.*



**Is a dietitian helpful?**

A dietitian is an active part of the medical team. The dietitian can enable and empower you to feel in control of your own health. With a little help from the dietitian, a little moderation and a little planning, you can feel in control of your diet and still enjoy meals by making good food choices.

Experts on the psychology of eating explain that when restrictions are placed on anything, including food, what a person will want most is this forbidden food. You should not have to deprive yourself of your comfort

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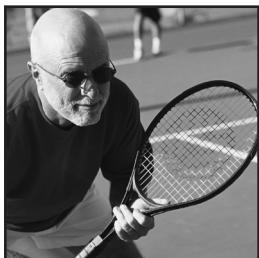
foods or favorite foods. With this in mind, discuss the foods you like with your dietitian. He or she can assist you in planning a menu to fit your likes and lifestyle. With the knowledge of appropriate portion sizes, rarely is there a forbidden food.

It's essential to know your lab values to make good food choices. Pay special attention to potassium, phosphorus and protein levels. It's just as important to become well versed in the amounts of potassium, phosphorus, protein and sodium found in the foods you eat. Make an effort to know and understand your potassium level and how much potassium is in certain fruits and vegetables. With this knowledge, you can work with the dietitian to schedule a cheat-time for your favorite high-potassium food. Your dietitian has many tricks-up-the-sleeve, such as using nondairy creamers as a substitute for milk on cereal. Discuss your degree of dietary flexibility with a dietitian.

### **What other activities should I avoid?**

Everyone, even if they don't have CKD, should not smoke. Smoking accounts for more than 480,000 deaths each year and it's the leading avoidable cause of death in the United States. For individuals with CKD, smoking can impair kidney function and put you at greater risk of kidney failure.

## Exercise



Anemia was once thought the major reason why people with CKD feel more tired than a person without CKD. This is known as fatigue. There are many reasons why a kidney patient may feel fatigued, and your healthcare team can assist you to determine its causes and help to overcome them.

### Developing and sticking to an exercise program can help you in the following areas:

- Improve physical functioning.
- Increase physical stamina.
- Improve blood pressure control and reduce the risk of coronary artery disease.
- Improve emotional well-being.
- Lower levels of cholesterol and triglycerides.
- Results in a better night's sleep.
- Better control of body weight.

*A Friendly Note: Exercise is beneficial for everyone – whether or not you have CKD. Because you didn't exercise before, doesn't mean you shouldn't start now. I never really exercised before I found out about CKD. Getting started was the biggest challenge. Once I got started, however, I became hooked. I noticed how much better I felt and I now look forward to my daily walks.*



### I have CKD and I continue to work. How will exercise help me?

Many CKD patients are able to continue working. With any person, it can sometimes be difficult to schedule exercise into a busy work and family schedule. However, this is something you will want to strive to add to your daily routine. Something as simple as walking 20-30 minutes per day will have a remarkable positive effect on your well-being. In addition, maintaining your physical strength, which also helps improve your emotional well-being, is useful in promoting job retention.

### Are there things I should know if I have diabetes and want to exercise?

Yes. First, be sure to talk to your doctor about exercising. Changes in your metabolism may change your blood glucose and cause different needs with your medicines. General guidelines to keep in mind are:

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- Be sure you have good shoes and practice proper foot care.
  - To reduce the risk of hypoglycemia, you should exercise 30 to 60 minutes after eating.
  - Follow a regular routine of exercising, eating meals and taking medicines.
  - Be careful starting a long or strenuous activity such as marathon running, heavy weight-lifting, etc., as these can cause your body to produce adrenaline and other hormones. Such activity may change the effects of insulin and cause blood glucose to rise, thus your insulin needs would change. Talk to your physician prior to starting such activities.
  - The saying, “No pain, no gain,” can be hazardous. Stop any exercise that causes pain.
  - Test your blood glucose before and after you exercise. If it is 100 mg/dL or lower before you start exercising, be sure to first eat a snack. If your blood glucose is 300 mg/dL or higher before starting, do not exercise.

**Why is it a good idea for me to exercise? I never did it before I had CKD.**

Exercise is a very important part of any program to stay healthy.

Cardiovascular disease is a major cause of hospitalization and death in kidney disease and dialysis patients. Endurance exercise training, such as running, swimming and bicycling, has been shown to improve HDL cholesterol (good cholesterol) in the general population.

Cardiovascular fitness is a predictor of mortality. Of course, patients who exercise regularly should have their doctor's approval. Patients with CKD need only to look to the sports pages for inspiration. In 1999, Sean Elliott helped the San Antonio Spurs to win four out of five playoff games over the New York Knicks for the NBA Championship. A few weeks later, he underwent a kidney transplant. It's evident that he had chronic kidney disease during the most illustrious time in his career. He never missed a game and scored double digits in most games! But you don't have to be a superstar. Simple activities, such as walking, can be beneficial.

Chronic kidney disease (CKD) can be associated with muscle wasting, but this may be related to decreased nutrition and inactivity. Although it's recommended that patients with chronic kidney disease limit their

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intake of protein (or at least not increase protein consumption), there is controversy as to how much. In the later stages of CKD, patients lose their appetite and may experience muscle wasting as a secondary complication of decreased kidney function. It has been shown resistance training (weights and exercise machines) increases muscle mass and helps patients on protein restriction better use what protein they do ingest.

But, remember to check with your doctor first. Above all, exercise makes one feel good. This is true regardless of the underlying condition. Patients with heart failure also benefit from cardiac rehabilitation. In the past, poor nutrition and anemia decreased exercise capacity. Now, we are aware of both of these problems and can focus on avoiding them.

## Rehabilitation and Employment



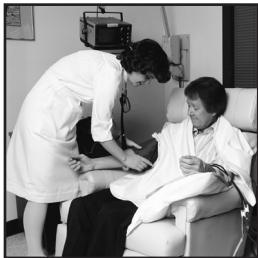
### How will CKD impact my ability to work?

A diagnosis of CKD may have no effect on your ability to continue to work at all and some patients continue to work even after their CKD has progressed on to Stage 5 which commonly indicates the need for dialysis or transplantation. Individuals with CKD, should continue to spend time doing the things they enjoy. CKD may require you to make a few changes to your lifestyle, however, you don't need to let it stop you from continuing to work. Staying active will help to keep you healthy.



*A Friendly Note: I When patients first hear the words, chronic kidney disease, it is natural to be worried. Am I going to be able to continue doing the things I enjoyed? Am I going to be able to continue working? Am I going to be able to continue caring for my family? Many quickly found out that the answer to these questions are “yes, yes, yes.” There are changes in your life that you’ll need to make to adapt to CKD, such as diet and exercise, but you don’t have to let CKD take over your life. You’re still in control and you are still capable of doing the things you enjoy. Maintain your health and be aware of your CKD, but don’t live in fear.*

## When and If My Kidneys Fail



If my kidneys begin to fail, what are some of the signs and symptoms?

You should interact regularly with your healthcare team so you can avoid the complications of CKD. Below is a brief outline of some of the most common symptoms experienced as CKD advances toward total kidney failure (CKD Stage 5); these

may indicate a complication. Remember, many of these symptoms can occur with other illnesses. Only your doctor can give you an accurate diagnosis. We recommend that you discuss this list and any of our similarities with your doctor. Remember, these symptoms and problems do not necessarily occur in the sequence they are listed and any of these symptoms should be brought to your doctor's attention.

- Swelling in the legs, ankles, feet, face and/or hands
- Change in urination– changes in frequency of urinating, presence of blood
- Chills (may indicate an infection)
- Lower back pain
- Unexpected rash or itching of skin
- Lack of energy– fatigue
- Decreased appetite
- Metallic taste in your mouth
- Nausea and vomiting
- Problems breathing– a shortness of breath
- Difficulty concentrating, dizziness and problems with your memory
- Waking at night more often
- Decreased urine output
- Weight gain or loss
- Headaches
- High blood pressure

**What types of treatment options are there?**

Hemodialysis, peritoneal dialysis and transplantation. Dialysis is a medical word that means cleaning the blood by “artificial means.” During dialysis, wastes and extra fluid that build up with kidney failure

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are removed from the blood.

A person can receive a kidney transplant from another person (a donor) through surgery. The kidney is placed in your abdomen. A properly functioning transplanted kidney will replace your damaged kidneys by carrying out their functions. Remember, there are specific medicines required for patients even when the transplanted kidney is functioning well.

To learn more about kidney failure or end-stage renal disease and the treatment options, call the American Association of Kidney Patients at (800) 749-AAKP and request Phase 1 of the AAKP Patient Plan or any of AAKP's Understanding brochure series.

## Conclusion

In conclusion, there's a lot to learn and many questions to be answered. Keep asking questions until you have answers that you understand. You have both the right and responsibility to understand CKD and the treatments available to you. Remember, you aren't alone! There are people along the way who'll work with you to create a safe and caring environment – a place where your questions can be answered, your anxieties lessened and your concerns put to rest.

*A Friendly Note: It could be years before you need dialysis, months, or never at all. Don't despair. My father is on dialysis – has been for several years – and he plays golf twice a week. As someone with CKD, I am very active. I work, coach my son's baseball team and have a great tomato garden. Remember, a good attitude and being the leader of your healthcare team can keep you healthy, whether you're a CKD patient, on dialysis or have a transplant.*



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## Glossary

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## Glossary

**Albumin:** One of a simple group of water soluble blood proteins. In the blood, albumin acts as a carrier and helps to maintain blood volume and blood pressure. A blood test for albumin helps to determine if a patient has kidney disease or if the body is not absorbing enough protein.

**Anemia:** A decrease in the amount of red blood cells that are needed to carry enough oxygen to meet the body's needs.

**Anemic:** Condition in which someone has anemia.

**Atherosclerosis:** A thickening or hardening of the arteries caused by a formation of fatty plaques.

**Blood Urea Nitrogen (BUN):** Waste product of the kidneys normally excreted by the kidneys. Increased levels in the blood may signal early kidney damage.

**Chronic Kidney Disease (CKD):** A progressive condition, not requiring dialysis, in which the kidneys are not functioning effectively and may be unable to produce red blood cells, to control blood pressure or to rid the body of waste through urination.

**Complete Blood Count (CBC):** A test that includes red blood cell count, white blood cell count, hemoglobin level and platelet count, among others.

**Creatinine:** A substance found in the blood, urine and muscle tissue. It is measured in blood and urine tests to determine the level of kidney function.

**Creatinine Clearance Test:** A diagnostic test for kidney function. It measures the rate at which creatinine is cleared from the blood by the kidneys.

**Diabetes:** A condition characterized by high blood sugar resulting from the body's inability to use sugar (glucose) efficiently. In type 1 diabetes, the pancreas is not able to make enough insulin; in type 2 diabetes, the body is resistant to the effects of available insulin. Diabetes is the leading cause of kidney disease.

**Dialysis:** The process of cleaning wastes from the blood artificially. (See also hemodialysis and peritoneal dialysis.)

## Glossary

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**Dialyzer:** A part of the hemodialysis machine that removes wastes and extra fluid from the blood.

**End-Stage Renal Disease (ESRD):** Total chronic kidney failure, in which a person needs treatment to replace the work of the failed kidneys.

**Erythropoietin (EPO):** A hormone made by the kidneys to help form red blood cells. Lack of this hormone may lead to anemia.

**Ferritin:** A form of storage iron.

**Glomerular Filtration Rate (GFR):** A test that determines kidney function by measuring creatinine clearance or other substances' clearance.

**Glomeruli:** A tiny set of looping blood vessels in the nephron where blood is filtered in the kidney.

**Hematocrit:** A way of measuring the red cell content of the blood. It's measured as a percentage of the total blood volume.

**Hemodialysis:** The use of a machine to clean wastes from the blood after the kidneys have failed. The blood travels through tubes to a dialyzer, which removes wastes and extra fluid. The cleaned blood then flows through another set of tubes back into the body.

**Hemoglobin:** The substance in red blood cells that carries oxygen to all parts of the body. Hemoglobin is measured in grams (g) per deciliter (dL).

**Hypertension:** Blood pressure that is above the normal range. Uncontrolled hypertension is one of the leading causes of kidney disease.

**Hypoglycemia:** Low blood glucose. Most cases occur when there is too much insulin and not enough sugar in your body.

**Insulin:** A hormone that helps the body use glucose (sugar) for energy.

**Kidney Biopsy:** A diagnostic test where a small piece of kidney tissue is removed by a needle. The tissue is looked at under a microscope to determine the cause and status of the disease.

**Kidneys:** Two organs in the lower back that clean waste and poisons

## Glossary

from the blood. The kidneys are shaped like two large beans and they act as the body's filter. They also control the level of some chemicals in the blood such as sodium, potassium and phosphate. Kidneys also control blood pressure and regulate red blood cell production.

**Kidney Transplantation:** The surgical procedure of placing a kidney from a donor to the recipient.

**Microalbuminuria:** A small amount of protein found in the urine that may signal the early stages of kidney disease in people with diabetes.

**Myeloma:** A cancer of the bone marrow.

**Nephrons:** A tiny part of the kidney. Each kidney is made up of about one million nephrons, which are the working units of the kidneys, removing wastes and extra fluids from the blood.

**Peritoneal Dialysis:** Cleaning the blood by using the lining of the belly (abdomen) as a filter. A cleansing solution, called dialysate, is drained from a bag into the belly. Fluids and wastes flow through the lining of the belly and remain "trapped" in the dialysate. The dialysate is then drained from the belly, removing the extra fluids and wastes from the body.

**Protein:** One of the three main classes of food. Proteins are made of amino acids, which are called the building blocks of the cells. Protein is found in many foods such as meat, fish, poultry, eggs, vegetables, milk and nuts.

**Proteinuria:** Abnormally high levels of protein found in the urine, which is a sign of kidney disease or hypertension.

**Transferrin:** A protein in the blood that carries iron.

**Transferrin saturation:** Measures the amount of iron that is immediately available to produce red blood cells.

**Urea:** A waste product formed when protein is broken down in the body.

**Ureters:** Tubes that carry urine from the kidneys to the bladder.

**Urine:** The liquid waste product filtered from the blood by the kidneys.

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## notes



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