

Kidney Health & Diabetes

Protecting your kidneys

“Diabetes is the #1 cause of kidney failure.”¹ Over 20 million people in the United States have diabetes, and almost half (45 percent) of all kidney failure cases are caused by diabetes.¹

“Diabetes is a serious disease.”²

“Diabetes happens when the body cannot make or use insulin correctly. Insulin is a hormone that turns the sugars [glucose] in foods we eat into energy.”¹ Insulin controls the amount of sugar in your blood.² When a person has diabetes, too much sugar stays in the blood [called high blood sugar].^{1,2} This can damage different parts of the body, including the heart, blood vessels, eyes, feet, nerves, and kidneys.^{1,2}

This issue of *HealthHints* will focus on protecting your kidneys from kidney disease and, ultimately, kidney failure.



Kidney Function...

And failure

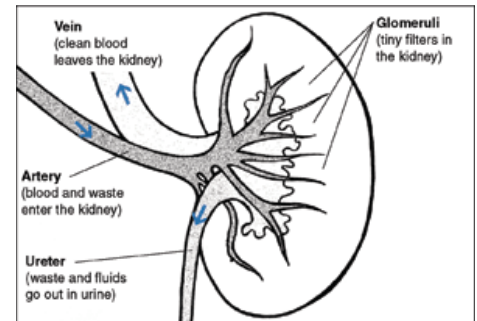
“Your kidneys are important because they keep the rest of your body in balance. They:

- remove waste products from the body,
- balance the body’s fluids,
- help keep blood pressure under control,
- keep bones healthy, and
- help make red blood cells.”²

You have two kidneys. The kidneys are organs about the size of a fist and occupy a space near the middle of the back below the rib cage.³ Your kidneys clean your blood and make urine.⁴

Healthy kidneys clean your blood by removing excess fluid, minerals, and wastes.⁵ They take excess salt and water out of your blood and turn them into urine, helping to regulate blood pressure.⁶ They also make hormones that keep your bones strong and your blood healthy.⁵

“When our bodies digest the proteins we eat, the process creates waste products. In the kidneys, millions of tiny blood vessels (capillaries) with even tinier holes in them act as filters. As blood flows through the blood vessels, small molecules such as waste products squeeze through the holes. These waste products become part of the urine. Useful



Source: http://diabetes.niddk.nih.gov/dm/pubs/complications_kidneys/

substances, such as protein and red blood cells, are too big to pass through the holes in the filter and stay in the blood.”⁷

When kidneys are healthy, an artery brings blood and wastes from the bloodstream into the kidneys.

The filters (called glomeruli) clean the blood. Then wastes and extra fluid go out into the urine through the ureter. Clean blood leaves the kidneys and goes back into the bloodstream through a vein.⁴

Kidney disease (sometimes called chronic kidney disease or CKD) means that the kidneys have been damaged. Kidneys can be damaged by a physical injury or a disease like diabetes or high blood pressure.² Diabetes can harm the kidneys by doing damage to the blood vessels, nerves, and urinary tract.²

Blood vessels. With diabetes, the small blood vessels in the kidneys can become injured, making them unable to clean/filter your blood properly.⁸ High levels of blood sugar can make kidneys filter too much blood; all of this extra work

is hard on the filters.⁷ After many years of this overwork, the kidneys will start to leak useful protein into the urine.⁷ Having small amounts of protein in your urine is called microalbuminuria (albumin is a type of protein); having large amounts of protein in the urine is called macroalbuminuria. “When kidney disease is diagnosed early (during microalbuminuria), several treatments may keep kidneys from getting worse.... When kidney disease is caught later (during macroalbuminuria), end-stage renal disease, [ESRD, also called kidney failure] usually follows.”⁷ Kidney damage can be slowed down if detected early.⁹

Nerves. “Diabetes also may cause damage to nerves in your body.”⁸ Nerves carry messages between your brain and all other parts of your body, including your bladder. They let your brain know when your bladder is full. But if the nerves of the bladder are damaged, you may not be able to feel when your bladder is full. This can cause difficulty in emptying your bladder. The pressure resulting from your full bladder can back up and damage the kidneys.²

Urinary tract. If urine remains in your bladder for a long time, you can develop a urinary tract infection (UTI) from the rapid growth of bacteria in urine.⁸ “Bacteria are tiny organisms like germs that can cause disease. They grow rapidly in urine with a high sugar level. Most often, these infections affect the bladder, but they can sometimes spread to the kidneys.”² In time, the stress of overwork causes the kidneys to lose their filtering ability. Waste products then start to build up in the blood.⁷ Your body may retain more water and salt than it should, which can result in weight gain and ankle swelling.⁸ Finally, the kidneys fail. This failure, end-stage renal disease, is very serious. A person

with ESRD needs to have a kidney transplant or to have the blood filtered by machine (dialysis).⁷

Protecting & Maintaining Kidney Function

Preventive & early treatment strategies

So how can you protect your kidney function with diabetes?

“The better a person keeps diabetes and blood pressure under control, the lower the chance of getting kidney disease.”⁷

The best ways to prevent kidney damage are:

- Keep blood sugar levels as close to normal as possible¹⁰ (tight control). Check your blood sugar often. Ask your doctor what blood glucose numbers are right for you.⁴ Ask your doctor about a blood test called “hemoglobin A_{1c}”; it tests how normal your blood sugars have been over the past 2 or 3 months. It is a kind of “report card” for your blood sugar.¹ Tight or “intensive management of blood glucose is a treatment regimen that aims to keep blood glucose levels close to normal. The regimen includes testing blood glucose frequently, administering insulin throughout the day on the basis of food intake and physical activity, following a diet and activity plan, and consulting a health care team regularly.”¹¹

“The better a person keeps diabetes and blood pressure under control, the lower the chance of getting kidney disease.”⁷

- Keep [blood pressure](#) levels as close to normal as possible.¹⁰ Check your blood pressure as often as your doctor recommends. “Keep your blood

pressure below 130/80 to help prevent kidney damage. Blood pressure is written with two numbers separated by a slash. For example, 120/70 is said as ‘120 over 70.’”⁴ “The systolic, or higher, number reflects the heart’s pumping pressure; the diastolic, or lower, number reflects the pressure between heartbeats.”¹² An elevation in either or both of those numbers constitutes high blood pressure.¹² “Ask your doctor what numbers are best for you. If you take blood pressure pills every day, take them as your doctor tells you. Keeping your blood pressure under control will also slow down or prevent damage to your eyes, heart, and blood vessels.”⁴

You can also reduce your risk for kidney disease and kidney failure by taking control of these important factors:

- Get regular screenings for kidney disease.⁹ “Most people with early kidney damage do not have symptoms.”² By the time you have observable symptoms, your kidneys may already be failing.⁷ For this reason, it is crucial to get screened:
 - Have your kidneys checked at least once a year by having your urine tested for small amounts of protein. This test is called the microalbumin test.⁴ The first sign of kidney disease is usually albumin (protein) in the urine.
 - Have your blood tested at least once a year for creatinine.⁴ When the kidneys are damaged, they have trouble removing creatinine (a waste product) from your blood. Creatinine is stored in muscle tissue and blood.² The result of this test should be used to estimate

your glomerular filtration rate (GFR), a measure of kidney function.⁴

- Ask your doctor if you should take pills to slow down kidney damage. “Drugs used to lower blood pressure can slow the progression of kidney disease significantly.”¹¹ “Studies have shown that the use of these medicines can slow the loss of kidney function in all people with diabetes – even if your blood pressure is normal. They also help reduce heart disease in people with diabetes.”² Two types of drugs are available:
 - ACE (angiotensin converting enzyme) inhibitor, and
 - ARB (angiotensin receptor blocker).⁴

Many of these drugs can be purchased generically and at a reasonable monthly rate.^{13, 14} Your doctor may also prescribe an inexpensive diuretic (water pill) to help remove salt and water from your blood.²

- Follow a healthy eating plan.⁴ Eat fewer foods high in salt (sodium). Eat more fruits and vegetables, whole grain breads and cereals, and low-fat dairy products.¹⁵ If you already have kidney problems, your dietitian may suggest you cut back on protein, such as meat.⁴ “In people with diabetes, excessive consumption of protein may be harmful. Experts recommend that people with kidney disease of diabetes consume the recommended dietary allowance for protein, but avoid high-protein diets. For people with greatly reduced kidney function, a diet containing reduced amounts of protein may help delay the onset of kidney failure. Anyone following a reduced-protein diet should work with a dietitian to ensure adequate nutrition.”¹¹

- Increase physical activity. “Daily physical activity and exercise helps to control blood pressure and helps to lower your blood sugar.”⁹

- Quit smoking. “Smoking reduces blood flow to the kidneys; therefore, kidneys cannot function at their best.

Smokers are more likely to develop kidney disease. Smoking not only tends to raise blood sugar, it also



makes it harder for your body to use insulin.”⁹

- Use non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen and naproxen, with caution. “Regular use can trigger kidney damage. Seek the advice of your healthcare provider as regular use of these medications should be monitored.”⁹
- See a doctor right away for bladder or kidney infections. You may have an infection if you have these symptoms:
 - pain or burning when you urinate,
 - a frequent urge to go to the bathroom,
 - urine that looks cloudy or reddish,
 - fever or a shaky feeling,
 - pain in your back or on your side below the ribs.⁴

“Not everyone with diabetes develops kidney disease,”⁷ and “not everyone with kidney disease gets kidney failure.”² Take control

of your diabetes to take control of your health and reduce your risk for kidney damage.

Signs of Kidney Disease

See your doctor

If you have any of the signs or symptoms of kidney disease, it is important to see your doctor right away. The earlier kidney disease is discovered, the better your chances are to slow its progression. Remember, albumin (protein) in the urine is usually the first sign, and this is not something you will feel or see. You must be screened with a urine test. Once you develop symptoms, you may already be at a later stage of kidney disease, so be sure to take preventive steps and get screened with urine and blood tests at least once a year.

Signs and symptoms of kidney disease in patients with diabetes may include:

- albumin (protein) in the urine;
- high blood pressure;
- ankle and leg swelling, leg cramps;
- going to the bathroom more often at night;
- high levels of blood urea nitrogen (BUN) and creatinine (types of waste) in blood;
- less need for insulin or antidiabetic medications;
- morning sickness, nausea, and vomiting;
- weakness, paleness, and anemia;
- itching.⁸

Note: Urea nitrogen is a normal waste product in your blood that comes from the breakdown of protein from the foods you eat and from your body metabolism. It is normally removed from your blood by your kidneys, but when kidney function slows down, the BUN level rises. BUN can also rise

if you eat more protein, and it can fall if you eat less protein.¹⁶

Creatinine is a waste product in your blood that comes from muscle activity. It is normally removed from your blood by your kidneys, but when kidney function slows down, the creatinine level rises.¹⁶

As your kidneys fail, your blood urea nitrogen (BUN) levels will rise as well as the level of creatinine in your blood. You may also experience nausea, vomiting, a loss of appetite, weakness, increasing fatigue, itching, muscle cramps (especially in your legs), and anemia (a low blood count). You may find you need less insulin. This is because diseased kidneys cause less breakdown of insulin. If you develop any of these signs, call your doctor.⁸

Take control of your diabetes to take control of your health and reduce your risk for kidney damage.

When Kidneys Fail

Treatment options & life quality

If you develop kidney disease, a kidney doctor, called a nephrologist (from the word *nephron* – a part of the kidney filtration process), will plan your treatment with you, your family, and your dietitian.⁸ “Kidney failure is the last stage of kidney disease. When kidneys can longer function, no toxins or waste products can be eliminated from the body. All those waste products continue to circulate in the blood, causing it to become extremely toxic. When someone’s

kidneys have failed, it is known as end stage renal disease (ESRD).³

“End stage renal failure, or kidney failure, occurs when your kidneys are no longer able to support you in a reasonably healthy state, and dialysis or transplantation is needed. This happens when your kidneys function at only 10 to 15 percent. The usual span of time between the onset of diabetic kidney injury and kidney failure is about five to seven years.”⁸

Three types of treatment can be used once your kidneys have failed: hemodialysis, peritoneal dialysis, and kidney transplantation.⁸

Dialysis. “Hemodialysis is performed at a dialysis center three times a week by qualified personnel. The process takes 3-4 hours and over the course of that time, a patient’s blood is sent through a machine which filters it and gives it back. A permanent shunt is surgically implanted in a vein for access.”³

“Peritoneal dialysis can be performed at home by the patient. It requires a high level of commitment because it must be done every day. Both kinds of dialysis help prolong life.”³

Transplant. “Sometimes, a donated kidney can be transplanted into the body. The new kidney would take over the renal function for the two nonfunctioning kidneys. The transplanted kidney should match the tissue type of the person receiving the kidney, as closely as possible. After the transplant, immunosuppressant drugs must be taken for life, to prevent the rejection of the organ.”³ There are many people in line for kidney transplant;

therefore, dialysis may be necessary before this option comes available.

Each individual is different. Talk with your doctor and your family about these decisions and what will give you the best life quality. For more information, see [Choosing a Treatment That’s Right for You](#). **Note:** Most U.S. citizens who develop kidney failure are eligible for federally funded care.¹¹ Although treatment for kidney failure is expensive, Medicare and Medicaid pay much of the cost, usually up to 80 percent.⁵ Often, private insurance or state programs pay the rest. For more information, see [Financial Help for Treatment of Kidney Failure](#).

“Because kidney disease can take years to develop, people with diabetes can do many things to lower the risk.”³ “Once you have kidney damage, you cannot undo it, but you can slow it down or stop it from getting worse.”⁴ Keep tight control of your blood glucose levels to reduce long-term damage to the fragile blood vessels not only in the kidneys but elsewhere in the body. Check your blood pressure often, and try to keep it at or under 130/80. Get screened with urine and blood tests at least once every year. Take an ACE or ARB if your doctor prescribes it. Watch your weight and what you eat. Quit smoking. Be physically active. Use NSAIDs cautiously. Talk with your doctor about any concerns you have regarding diabetes and your kidneys. “All these things can go a long way towards keeping your kidneys working well for as long as possible.”³

To view the references used in this newsletter, go to:
<http://fcs.tamu.edu/health/healthhints/2010/aug/ref.php>

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