

Kidney Cancer



Each year, 36,000 Americans are diagnosed with kidney cancer. The vast majority of these patients suffer from renal cell carcinoma, a malignancy in the tissue cells where blood is filtered into urine. Most kidney cancers are primary tumors meaning they originate in the kidney rather than spreading from other areas of the body. They can still be deadly if not found early and treated aggressively.

Fortunately, urologists—doctors who specialize in diseases of the male and female urinary tracts and the male reproductive system—have effective ways today to diagnose and treat kidney cancer, especially if it is caught early. Imaging tests that involve little or no discomfort for patients allow physicians to pinpoint these malignancies with accuracy, efficiency and relative speed. Similarly, because of advances in techniques and technology, surgeons can now eliminate the malignancy by either removing all or part of the kidney. If they catch the tumor before it has spread, patients have a five- to 10-year cancer survival rate of at least 90 percent. Obviously, this rate decreases if the tumor has spread.

The path to a cure for kidney cancer, however, starts with information. This pamphlet is designed to help you understand this disease, know the symptoms and be able to discuss your options with your physician.

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WHAT ARE THE KIDNEYS AND HOW DO THEY WORK?

The kidneys are the body's waste treatment plant. Fixed to the back wall of the abdominal cavity, to the left and right of your backbone, these bean-shaped, fist-sized organs filter the blood of any excess water, salt and other wastes. Working together, they convert products into a liquid called urine. It travels from the kidneys through narrow tubes called ureters to the bladder where it is stored temporarily until exiting the body through the urethra during urination. While the kidneys are essential to your good health, you do not need both of these organs to keep your body's fluids and electrolytes in balance by eliminating wastes. You can function with one compensating for the missing other. In fact, dialysis, a blood-washing technique that removes toxins from the body, allows thousands of people to live with less than one working kidney.

WHAT CAUSES KIDNEY CANCER?

Like other malignancies, kidney cancer begins in the cells, the basic building blocks of your body's tissues and organs. Under normal circumstances, cells grow and divide, reproducing as you need them. But in cancer, this orderly process goes haywire. Even when new cells are not called for, existing ones replicate aggressively, eventually forming a mass called a tumor. Sometimes

these tumors invade nearby tissue or spread (metastasize) through the bloodstream to other organs where they develop secondary tumors.

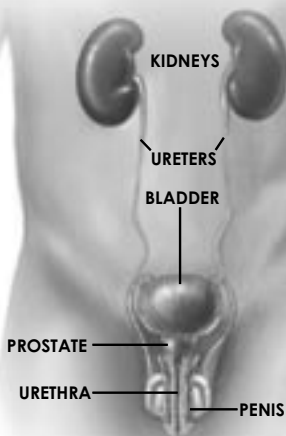
Scientists believe that damage to DNA, the genetic substance inside the cell that drives all of its biologic activity, is behind this cascade of events. But they are just beginning to understand how genes, the individual segments of DNA and chromosomes, change to make kidney cells cancerous.

FAMILIAL KIDNEY CANCER

Some of these mutations are passed from one generation to the next. Accounting for 3 to 4 percent of all cases, familial kidney cancer affects people with a family history of either cancer or certain rare genetic disorders linked to it. People with conditions such as von Hippel-Lindau (VHL)

MALE

*Front view,
interior of male
urinary system*



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tend to develop tumors earlier in life (before 50). They also may suffer multiple tumors, affecting both kidneys and possibly other organs as well.

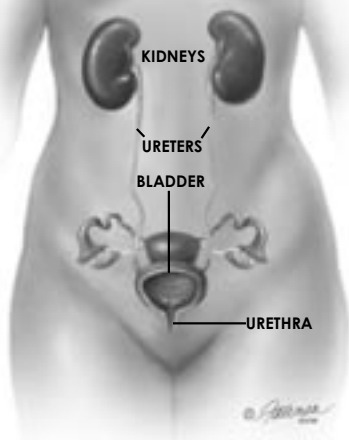
If you have a family history of kidney cancer or a disease related to it, you should be followed closely with regularly scheduled appointments and exams. You may also want to undergo genetic testing for one of the known genetic traits that can lead to kidney cancer. Doctors now have sophisticated ways to screen people for syndromes associated with this cancer. The most important first step, however, is to provide as much information as possible to your doctor about other cancers and medical issues in your family.

SPORADIC KIDNEY CANCER

Most kidney cancer is sporadic. It occurs for reasons other than an inherited mutation. Instead

FEMALE

*Front view,
interior of female
urinary system*



of passing through the family, the cell changes occur long after birth, possibly due to cancer-causing chemicals or other outside risk factors. While scientists do not know all of the sources, they suspect certain lifestyle and job-related triggers are at work. They include:

- **Cigarette smoking.** Tobacco increases the chance of developing kidney cancer by about 40 percent, making it perhaps the major risk factor for this disease. Scientists believe that many of the cancer-causing chemicals in smoke, which are absorbed into the bloodstream, actually settle in large concentrations in the kidneys during filtering. Several of these substances are known to damage kidney cell DNA, possibly causing a tumor to form. Once a person stops smoking, however, the kidneys are no longer exposed to those chemicals. The risk drops, even though it takes many years to reach the level of a non-smoker.
- **Workplace hazards.** Many studies indicate that people exposed to chemicals (e.g., asbestos, cadmium, some herbicides, benzene, lead and organic solvents such as trichloroethylene) in their jobs have a higher risk of kidney cancer than others without such occupational hazards.
- **Obesity, high blood pressure and a sedentary lifestyle.** Taken separately or combined, these factors add up to an increased risk for kidney cancer. Several studies have shown, for instance, that inactive adults are more likely to develop a kidney tumor than people who exercise regularly. Some physicians suspect that obesity is a factor in

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20 percent of kidney cancer cases. It alters the body's balance of hormones, which affects the normal (and abnormal) growth of kidney tissue. Other statistics suggest that excess weight, in combination with high blood pressure, triples the risk.

- **Kidney disease.** Patients with advanced kidney disease have an increased risk of developing kidney cancer, especially if they undergo long-term dialysis. While the process cleans toxins from the blood of people whose kidneys do not work properly, it is related to a slightly raised incidence of kidney cancer.

WHAT IS RENAL CELL CARCINOMA?

Several different kidney cancers can occur in adults, but renal cell carcinoma (adenocarcinoma) comprises almost 90 percent of all cases. It involves several cell types, all derived from the parenchyma, the kidney tissue that filters urine. There are several types of renal cell carcinoma that can be identified under a microscope. No matter what cell type, all renal cell carcinomas can be successfully treated with surgery if the tumor is contained. If it has spread, treatments vary.

WHAT ARE SOME OTHER TYPES OF KIDNEY CANCER?

- **Transitional cell carcinoma.** Accounting for 5 to 10 percent of all kidney tumors, it forms in the lining of the renal pelvis, the funnel-like area of the kidneys where urine collects before passing down the ureters into the bladder.

- **Wilms tumor.** Also known as nephroblastoma, accounts for about 5 to 6 percent of all kidney tumors. It is the most common kidney cancer found in children; yet it is extremely rare in adults. It is linked to certain birth defects or syndromes.
- **Renal sarcomas.** Comprising less than 1 percent of all kidney tumors, these rare masses begin in the connective tissue of the kidney.

Not all kidney tumors are life threatening (malignant). Some (e.g., renal adenoma, oncocytoma and angiomyolipoma) are relatively harmless (benign). They usually can be removed and seldom come back. They also do not invade other tissues or parts of the body. However, they can still grow and cause problems so they need to be addressed.

WHAT ARE THE SYMPTOMS OF KIDNEY CANCER?

Kidney cancer rarely causes symptoms in its earliest stages. Many cases are detected by chance during routine evaluation by imaging studies for an unrelated problem. The disease may also show up during regular screening in high-risk patients. Since there is no specific blood test to catch a kidney cancer tumor early, it can become quite large before it is actually found. The first symptoms you may experience are:

- blood in the urine (hematuria)
- low, one-sided back pain
- mass or lump in the abdomen

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- fatigue
- unexplained weight loss
- unexplained fever
- swelling of the ankles and legs (edema)

Most of the time, these signs do not mean cancer. They can indicate a cyst, infection or other benign problem. But if you have symptoms, contact your health care provider. When kidney tumors are diagnosed and treated early, they are usually treated successfully.

HOW IS KIDNEY CANCER DIAGNOSED?

Kidney cancer is diagnosed based on symptoms, a physical examination and various tests. If you have complaints that suggest this type of cancer, your doctor will perform:

- **Physical examination.** You will be asked first about your family and personal health histories to review any risk factors or symptoms for this disease. The doctor will then check your vital signs (e.g., blood pressure and temperature) to assess your general health. He or she will also feel your abdomen and side for any masses or tumors.
- **Urinalysis.** A sample of your urine will be taken for microscopic and chemical analysis. Laboratory tests are used to find tiny bits of blood and other substances that are not seen by the naked eye but may indicate kidney cancer. Cytology is also used to locate cancer cells present in the urine. Some patients with kidney

cancer do not have blood in their urine until the tumor is large and may even have spread. But blood can also indicate other benign conditions such as urinary tract and bladder infections, which require prompt treatment to keep them from becoming more serious.

- **Blood tests.** Your doctor can evaluate the function of your kidney and other organs through a complete blood count (CBC) and other chemical tests. Measuring white cells, red cells and platelets, a CBC can detect signs of kidney cancer, including anemia (too few red blood cells) and erythrocytosis (too many red blood cells.) A high level of substances such as creatinine, also can mean the kidneys are not working well.
- **Fine needle aspiration.** Unlike other malignancies, kidney cancer is usually diagnosed without a biopsy. Imaging studies generally provide sufficient detailed information, but your doctor may still want to examine the cells if the imaging studies are inconclusive. During a biopsy, small pieces of tissue or fluid are removed with a needle inserted through the skin into the kidney. A pathologist examines the sample under a microscope to identify the presence of any malignant cells.

Your doctor has several radiographic tests from which to choose in diagnosing your cancer:

- **Intravenous pyelogram (IVP).** Known also as urography, this test uses a special contrast

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material, injected into a vein in the arm, to light up tumors in the urinary tract. A technician takes X-rays as the dye travels through the bloodstream, collects in the kidneys and then moves through the ureters to the bladder. Malignant kidney tumors, which tend to be very rich in blood vessels, glow on the film. In contrast, benign tumors tend not to light up. While IVP is useful, your doctor may get enough information about your tumor from other imaging studies so you may not need it.

- **Angiography.** Similar to IVP, this test also uses a contrast dye to map the blood vessels that feed a kidney tumor. It is injected into a catheter that has been threaded to the kidney through the renal artery. X-ray images are snapped at intervals to show the flow of the injected dye through the system which highlight the distinctive appearance of tumor-related vessels. The information from an angiogram can help your doctor diagnose the cancer and plan surgery for it.
- **Ultrasound.** A painless test that relies on sonar—the same technology used to spot submarines—ultrasound offers doctors a quick and easy way to produce images of your urinary tract. A special wand, called a transducer, passes over the skin, emitting sound waves and detecting the echoes that bounce off the kidney. A computer then produces images based on patterns that are different for abnormal versus normal tissue. Since ultrasound can also pick up benign growths, further tests will be needed

to determine if your mass is malignant.

- **CT or CAT scan (computed tomography).** This technology combines X-rays and a computer to produce detailed cross-sectional images of your urinary tract. Unlike conventional X-rays, which yield a single static image, the CT scanner produces many “slices” of your kidneys as it rotates 360-degrees around your body. The computer then converts them into real-time pictures for display on a screen. A second set of scans, taken after radiocontrast material is injected intravenously, should provide an even clearer outline of your urinary tract. CT scanning is a very useful tool for locating a kidney tumor and checking any spread. It yields precise information about the size, shape and position of the mass, as well as the location of enlarged lymph nodes that might now be malignant.
- **MRI (Magnetic Resonance Imaging).** Similar to CT scanning, this diagnostic technique also creates high-quality cross sectional views. But instead of being exposed to X-rays (or radiation), the MRI scanner uses radio waves, a powerful electromagnet and a computer to view the soft tissues of the body. Because of their resolution, these cross-sectional views yield even more precise information about a tumor’s shape and mass than captured by other imaging techniques. The MRI is an effective, non-invasive way to detect any cancer that may have spread to the brain or spinal cord.

If your cancer has spread, your doctor will order

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other tests to determine the extent. A simple chest X-ray, for instance, can show whether there are any changes in the lungs. Bone scans can reveal early changes in the spine and other skeletal areas that will not show up on an X-ray. They are performed by injecting small amounts of radioactive dye (called isotopes) into the bloodstream. When a special Gamma Camera scans your body, it picks up signals from the radiation and records them in a picture. Because abnormal bone cells take up more material than normal ones, any potential tumor is highlighted on the scan. Other tests may be needed, however, to differentiate whether any spots seen by the scan are anything worrisome.

WHY ARE KIDNEY TUMORS “STAGED?”

Once kidney cancer is diagnosed, imaging and other tests will be used to determine how far it has spread. “Staging” a cancer helps the doctor design the appropriate treatment plan and offer an outlook (prognosis) for the disease. While there are various staging methods, the most common (issued by the American Joint Committee on Cancer) categorizes each mass by assigning letters and a numerical scale. “T,” 0 to 3 describes the size of the mass and the extent to which the mass has spread to nearby tissues; “N,” 0 to 2 notes how far the mass has invaded the lymph nodes; and “M,” 0 or 1 suggests the extent the mass has spread to distant organs. The categories are then grouped into one of the following stages:

- **Stage I:** The tumor is 7.0 centimeters or smaller and limited to the kidney. There is no spread to lymph nodes or distant organs.



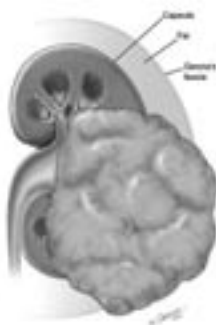
- **Stage II:** The tumor is larger than 7.0 centimeters but still limited to the kidney. There is no spread to lymph nodes or distant organs.



- **Stage III:** Tumor may be of any size, with or without spread to fatty tissue around the kidney, large veins leading from the kidney to the heart, and/or one nearby lymph node. It has not spread to distant lymph nodes or organs.



- **Stage IV:** The tumor is more widespread. It has spread to other organs, such as the lungs, liver or bone. Also includes tumors that have spread to more than one lymph node.



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HOW IS KIDNEY CANCER TREATED? —

Treatment for kidney cancer depends on whether the tumor is confined to the organ or has spread to other organs. Your overall health also enters into the decision.

Nephrectomy—or surgery to remove the kidney—is standard therapy for tumors that are “localized,” meaning they are limited to one kidney or nearby tissue and lymph nodes. Fortunately, this operation is generally well-tolerated with few complications. Your surgeon has several options to offer:

Radical nephrectomy. The most commonly performed surgery for this cancer, radical nephrectomy, involves removing the entire kidney along with the adjacent adrenal gland and surrounding fatty tissue. The surrounding lymph nodes may also be extracted during a procedure called a regional lymphadenectomy. While this surgery leaves patients dependent on the remaining kidney, most people do fine since they only need one organ to function well.

Partial nephrectomy. By removing only the portion of the kidney that harbors the tumor, this procedure preserves some function. Also known as nephron-sparing surgery, a partial nephrectomy has become more common during the past several years, particularly for small kidney tumors (less than four centimeters or 1-3/4 inches) for which a radical nephrectomy is not necessary or would be too drastic. It is often performed in patients who have already

lost a kidney, have cancer in both kidneys, have a hereditary tendency to kidney cancer or experience less than optimal kidney function.

Laparoscopic surgery. Nephrectomies are usually performed by accessing the kidney through an incision in the side, abdomen or back and dissecting the organ with hands-on skill and instruments. But today, doctors also can remove it through what is called “keyhole surgery.” This technique involves threading a slender telescope through one small incision to view the kidney and then maneuvering miniaturized instruments through a second hole to detach and remove it. Accomplishing the same goals as “open surgery,” laparoscopy offers the advantage of a shorter hospital stay and faster recovery than the traditional approach.

Arterial embolization. In some cases, doctors recommend this procedure. Designed to shrink the tumor, it is performed by inserting a catheter into the groin and maneuvering it up the renal artery. Once the tube is in place, special particles are injected to block the flow of blood feeding it. While arterial embolization may slow the growth of a kidney tumor, it is used selectively to relieve the symptoms in patients for whom surgery is impossible. Performed prior to a nephrectomy, it also can reduce the bleeding during a nephrectomy.

WILL I RECEIVE RADIATION OR CHEMOTHERAPY?

At present, radiation therapy has limited use

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for patients with kidney cancer. Under certain circumstances, however, your doctor may recommend radiation, high-energy ionizing beams focused from outside the body onto your cancer, to destroy the malignant cells. Used to shrink the tumor prior to a nephrectomy, it can also be helpful if your health is too poor to undergo surgery or you need palliative care. This means your cancer is so advanced that the best course is to ease either the symptoms from the original cancer or those from the metastases in the bones or brain.

Kidney cancer cells are generally resistant to traditional forms of chemotherapy. With few exceptions, it has been ineffective in treating both primary and advanced kidney cancer tumors. Research continues into new anticancer drugs—and combinations of existing ones—that show early promise in killing the cancer, but not the healthy cells.

WHAT IF MY CANCER IS ADVANCED?

The treatment of advanced kidney cancer is gradually improving, but doctors are still searching for well-defined optimal therapies. If you are relatively healthy, you may benefit from surgical removal of the kidney. But beyond a radical nephrectomy, treatment depends on the type of cancer or, in the case of renal cell carcinoma, the type of cell.

Immunotherapy, for example, boosts the body's defenses to effectively attack and destroy

malignant cells. These drugs mimic the action of cytokines, the potent chemical messengers in your immune system that stimulate it to fight disease and infection. When administered to patients with kidney cancer that has spread, synthetic versions of these proteins “rev up” the same system to kill kidney cancer cells and limit tumor growth. Interleukin-2 (IL-2) and interferon-alpha 2b are two examples of immunotherapeutic agents. Research and clinical studies continue to find optimal dosages and new drugs. Ask your doctor about all of the options available to you.

If your cancer has spread, you may benefit by volunteering for a clinical trial. Research has resulted in many treatment advances to date, in part, because people are willing to participate in studies. Your doctor can help you determine the risks and/or benefits of a clinical trial. You might be among the first to benefit from a powerful new therapy.

WHAT CAN I EXPECT IN FOLLOW-UP CARE?

As with any malignancy, follow-up care after treatment for kidney cancer is important. Even if your tumor could be completely removed or destroyed, there is always the risk that it may return since cancer cells can remain in the body. Your doctor will want to see you periodically to monitor your recovery and watch for any recurrence of an existing tumor or a new growth. A check-up may include further chest X-rays, CT scans of your abdomen and laboratory and other tests. You also need to report any symptoms immediately.

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While everyone's body and disease course is unique, there are steps all kidney cancer patients can take to boost their own recovery. Making healthy lifestyle choices is a good start. Regular exercise and a well-balanced diet, high in fiber (e.g., whole grains, fruits and vegetables) and low in animal fat, not only promotes your recovery, but benefits your entire body as well. Also, with evidence mounting of tobacco's ill effects on all parts of the body, you only help yourself—and your kidneys—if you quit smoking.

WHAT ARE SOME RESEARCH AREAS IN KIDNEY CANCER?

Researchers are working diligently to find new and better ways to diagnose, treat and possibly even prevent kidney cancer.

Scientists hope that by understanding how some genes turn normal kidney cells into abnormal ones, they will eventually be able to reverse their cancerous behavior. But in the meantime, doctors have already begun pioneering many surgical and nonsurgical treatments.

Tumor ablation, for instance, kills off malignant cells by either freezing them (cryoablation) or exposing them to extreme heat (microwave ablation). Tumor vaccines use a patient's own malignant cells, removed during surgery and treated before injection, to stimulate the body's immune system to fight the cancer. Chemotherapeutic drugs either starve a tumor of its blood supply (anti-angiogenic agents) or

interfere with the ability of malignant cells to stimulate their own growth (anti-growth factor agents). Stem cell transplantation works by injecting healthy stem cells into patients whose cancer has spread to and compromised their bone marrow. By turning into blood and immune system cells, they cause tumors to shrink, disappear or perhaps not even form.

Each of these approaches has shown promise. Yet further study is needed to see if the therapies really improve the prognosis for advanced kidney cancer patients. In the meantime, they are giving hope to thousands of participants who've enrolled in the clinical trials evaluating them.

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GLOSSARY:

angiography: an examination of the blood vessels and lymphatics, after the injection of dye.

angiomyolipomas: benign, or non-cancerous tumors of the kidney.

arterial embolization: a blockage or obstruction of foreign substance or a blood clot, or an artery.

benign: non-malignant or not cancerous, benign growths do not generally spread to other organs or come back when they are removed.

chemotherapy: treatment with anti-cancer drugs.

computerized tomographic (ct) scans: an X-ray procedure that uses computer technology to show a detailed picture of the body.

cytokines: stimulants to the body's immune system, designed to fight tumor growth.

DNA: deoxyribonucleic acid, the substance within the cell that directs its activity.

hematuria: blood in the urine.

interleukin 2: a type of biological therapy that stimulates the growth of certain disease fighting blood cells in the immune system.

intravenously: injected into the vein.

intravenous pyelogram (IVP): X-ray of the urinary system after injecting a contrast solution that enables the doctor to see images of the kidneys, ureters and bladder.

kidneys: two bean-shaped organs located near the middle of the back that filter wastes from the blood and discharge these waste products in urine.

lymphadenectomy: removing lymph nodes so they can be examined for signs of cancer.

malignant: a cancerous growth which can possibly spread to other parts of the body.

magnetic resonance imaging (MRI): a diagnostic procedure that uses magnetic waves to provide detailed images of body structures.

metastases: the spread of cancer from one part of the body to another.

nephrectomy: the surgical removal of the kidney.

partial nephrectomy: the removal of the tumor and the part of the kidney that is affected by the tumor.

radical nephrectomy: removal of the kidney, adrenal gland, nearby lymph nodes and other surrounding tissue.

transitional cell carcinoma: cancer that develops in the lining of the renal pelvis; also occurs in the ureter and the bladder.

ultrasonography: a technique that bounces painless sound waves off organs to create an image of their structure to detect abnormalities.

urine cytologies: microscopic inspections of cells found in the urine.

urologist: a doctor who specializes in disease of the male and female urinary tracts and the male reproductive system.

von Hippel Lindau (VHL): an inherited disorder, which puts a person at greater risk of developing renal cell carcinoma, as well as tumors in other organs; researchers have isolated the gene responsible for VHL, and believe this will lead to improved methods of diagnosis, treatment, and even the prevention of some kidney cancers.

Wilms' Tumor: the most common kidney cancer in children; also called nephroblastoma.

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OTHER RESOURCES:

The National Cancer Institute (NCI)

Cancer Information Hotline:

1-800-4-CANCER (1-800-422-6237)

www.cancer.gov

The American Cancer Society (ACS)

1-800-ACS-2345 (1-800-227-2345)

www.cancer.org

The Kidney Cancer Association (KCA)

1-800-850-9132

www.curekidneycancer.org

The VHL Family Alliance

1-800-767-4845

www.vhl.org

To find a urologist in your area, visit
UrologyHealth.org/findaurologist

The American Urological Association Foundation was established to support and promote research, patient/public education and advocacy to improve the prevention, detection, treatment and cure of urologic disease.

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