KIDNEY CANCER (ADULT) - RENAL CELL CARCINOMA

What is cancer?

Cancer develops when cells in a part of the body begin to grow out of control. Although there are many kinds of cancer, they all start because of out-of-control growth of abnormal cells.

Normal body cells grow, divide, and die in an orderly fashion. During the early years of a person's life, normal cells divide more rapidly until the person becomes an adult. After that, cells in most parts of the body divide only to replace worn-out or dying cells and to repair injuries.

Because cancer cells continue to grow and divide, they are different from normal cells. Instead of dying, they outlive normal cells and continue to form new abnormal cells.

Cancer cells develop because of damage to DNA. This substance is in every cell and directs all its activities. Most of the time when DNA becomes damaged the body is able to repair it. In cancer cells, the damaged DNA is not repaired. People can inherit damaged DNA, which accounts for inherited cancers. Many times though, a person’s DNA becomes damaged by exposure to something in the environment, like smoking.

Cancer usually forms as a tumor. Some cancers, like leukemia, do not form tumors. Instead, these cancer cells involve the blood and blood-forming organs and circulate through other tissues where they grow.

Often, cancer cells travel to other parts of the body, where they begin to grow and replace normal tissue. This process is called metastasis. Regardless of where a cancer may spread, however, it is always named for the place it began. For instance, breast cancer that spreads to the liver is still called breast cancer, not liver cancer.

Not all tumors are cancerous. Benign (non-cancerous) tumors do not spread (metastasize) to other parts of the body and, with very rare exceptions, are not life threatening.

Different types of cancer can behave very differently. For example, lung cancer and breast cancer are very different diseases. They grow at different rates and respond to different treatments. That is why people with cancer need treatment that is aimed at their particular kind of cancer.

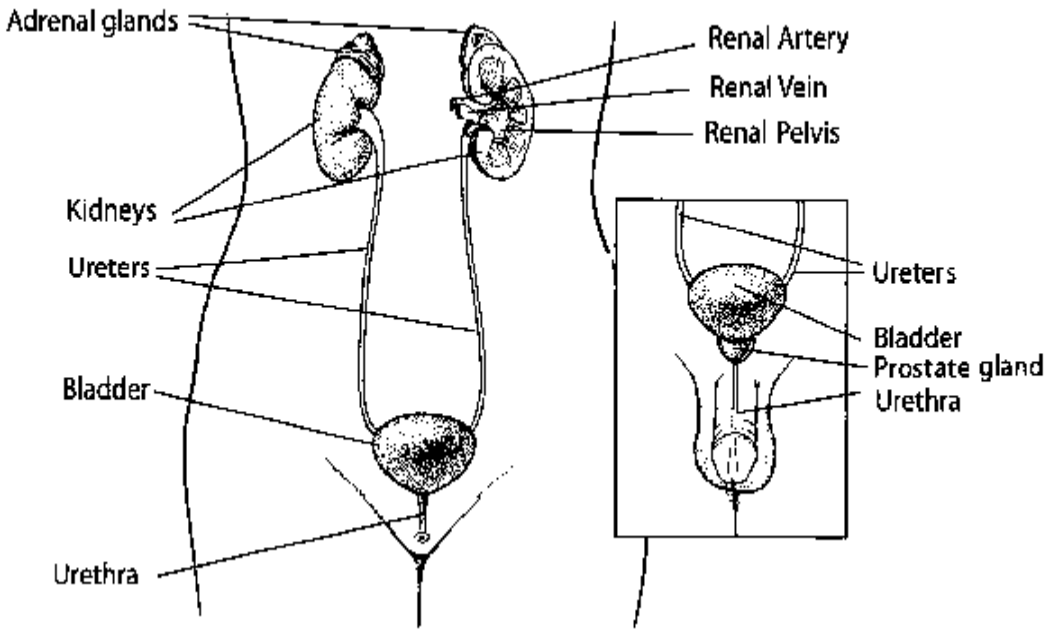
Cancer is the second leading cause of death in the United States. Nearly half of all men and a little over one third of all women in the United States will develop cancer during their lifetimes. Today, millions of people are living with cancer or have had cancer. The risk of developing most types of cancer can be reduced by changes in a person's lifestyle, for example, by quitting smoking and eating a better diet. The sooner a cancer is found and treatment begins, the better are the chances for living for many years.

What Is Kidney Cancer (Renal Cell Carcinoma)?

Kidney cancer is a cancer that starts in the kidneys. In order to understand kidney cancer, it helps to know about the normal structure and function of the kidneys.

About the Kidneys

The kidneys are a pair of bean-shaped organs, each about the size of a fist and weighing about 4 to 5 ounces. They are fixed to the upper back wall of the abdominal cavity. One kidney is just to the left and the other just to the right of the backbone. Both are protected by the lower ribcage.



The kidneys' main job is to filter the blood and rid the body of excess water, salt, and waste products. The filtered waste products are concentrated into urine. Urine leaves the kidneys through long slender tubes called ureters that connect to the bladder. Urine flows down the ureters into the bladder, where it is stored until urination.

The kidneys also help make sure the body has enough red blood cells. It does this by making a hormone called erythropoietin, which tells the bone marrow to make more red blood cells.

Although our kidneys are important, we actually need less than 1 complete kidney to do all of the functions discussed above. Tens of thousands of people in the United States are living normal healthy lives with just 1 kidney. Some people may not have any working kidneys at all, and survive with the help of a medical procedure called dialysis. Dialysis uses a specially designed machine that acts like a real kidney to filter the blood.

Renal Cell Carcinoma (RCC)

Renal cell carcinoma (also known as renal cell cancer or renal cell adenocarcinoma) is by far the most common type of kidney cancer. It accounts for about 9 out of 10 kidney cancers.

Although RCC usually grows as a single mass within the kidney, sometimes tumors are found in more than one part of the kidney or even in both kidneys at the same time. Some renal cell carcinomas are noticed only after they have become quite large, but most are found

before they metastasize (spread) to distant organs in the body. Like most cancers, RCC is hard to treat once it has metastasized.

There are several subtypes of RCC, based mainly on how the cancer cells look under a microscope:

Clear Cell RCC

This is the most common form of renal cell carcinoma. About 8 out of 10 people with renal cell carcinoma have this kind of cancer. When viewed under a microscope, the cells that make up clear cell RCC appear very pale or clear.

Papillary RCC

This is the second most common subtype -- about 10% to 15% of people have this kind. These cancers form little finger-like projections (called papillae) in some, if not most, of the tumor. Some doctors call these cancers *chromophilic* because the cells take up certain dyes used in preparing the tissue to be viewed under the microscope, causing them to appear pink.

Chromophobe RCC

This subtype accounts for about 5% of RCCs. The cells of these cancers are also pale, like the clear cells, but are much larger and have certain other features that can be recognized.

Collecting Duct RCC

This subtype is very rare. The major feature is that the cancer cells can form irregular tubes.

Unclassified RCC

In rare cases, renal cell cancers are labeled as "unclassified" because their appearance doesn't fit into any of the other categories or because there is more than one type of cell present.

Other Cancerous Kidney Tumors

Less common cancers of the kidney include transitional cell carcinomas, Wilms tumors, and renal sarcomas.

Transitional Cell Carcinoma

About 5% to 10% of cancers in the kidney are transitional cell carcinomas, also known as *urothelial carcinomas*. Transitional cell carcinomas begin in the renal pelvis (where the kidney meets the ureter). Under the microscope, the cells look like bladder cancer cells. Studies have shown that, like bladder cancer, these cancers are often linked to cigarette smoking and workplace exposures to certain cancer-causing chemicals.

People with transitional cell carcinoma often have the same signs and symptoms as patients with renal cell cancer -- blood in the urine and, sometimes, back pain.

These cancers are usually treated by surgically removing the whole kidney and the ureter, as well as the portion of the bladder where the ureter attaches. Smaller, less aggressive cancers can sometimes be treated with less involved surgeries. Chemotherapy is sometimes given after surgery, depending on how much cancer is found. It's important to talk with your doctor to be aware of your options and the benefits and risks of each of them.

About 9 out of 10 transitional cell carcinomas of the kidney are curable if they are found at an early stage. The chances for cure drop dramatically if the tumor has grown into the ureter wall or main part of the kidney or if it has a more aggressive (high-grade) appearance when viewed under the microscope.

After treatment, follow-up visits to your doctor for monitoring with cystoscopy (looking into the bladder with a lighted tube) and imaging tests are extremely important because transitional cell carcinoma can come back in the bladder, as well as other places in the body.

Wilms Tumor

About 5% of all kidney cancers are Wilms tumors. This type of cancer is almost always found in children and is extremely rare among adults. To learn more, see the American Cancer Society document, *Wilms Tumor*.

Renal Sarcoma

Renal sarcomas are a rare type of kidney cancer (less than 1% of all kidney tumors) that begin in the kidney's connective tissue. More information on sarcomas is available in the American Cancer Society document, *Sarcoma -- Adult Soft Tissue Cancer*.

Benign (Non-cancerous) Kidney Tumors

Some types of kidney tumors are benign (non-cancerous) -- they do not usually spread (metastasize) to other parts of the body, although they can still grow and cause problems. These include renal cell adenomas, renal oncocytomas, and angiomyolipomas.

Renal Adenoma

Renal adenomas are the most common form of benign kidney tumor. They are small, slow-growing tumors that are often found on imaging tests (such as CT scans) when looking for something else. They look a lot like low-grade renal cell carcinomas under a microscope. In rare cases, tumors first thought to be renal adenomas may turn out to be small renal cell carcinomas. Because they are hard to tell apart, suspected adenomas are often treated like renal cell cancers.

Oncocytoma

Oncocytomas are a type of benign kidney tumor that can sometimes grow quite large. As with renal adenomas, it can sometimes be hard to tell them apart from kidney cancers. Because oncocytomas do not normally spread to other organs, removing the kidney can often produce a cure.

Angiomyolipoma

Angiomyolipomas are another rare benign kidney tumor. They often develop in people with tuberous sclerosis. These tumors are made up of different types of connective tissues (blood vessels, smooth muscles, and fat). They can often just be watched closely if they aren't causing any symptoms, but they may need to be treated if they cause problems (such as bleeding).

The rest of this document focuses on renal cell carcinoma and not transitional cell carcinomas, Wilms tumors, renal sarcomas, or other less common types of kidney tumors.

What Are the Key Statistics About Kidney Cancer (Renal Cell Carcinoma)?

The American Cancer Society estimates that there will be about 54,390 new cases of kidney cancer (33,130 in men and 21,260 in women) in the United States in the year 2008, and about 13,010 people (8,100 men and 4,910 women) will die from this disease. These statistics include both renal cell carcinomas and transitional cell carcinomas of the renal pelvis.

Most people with this cancer are older. The average age at the time of diagnosis is 65. It is very uncommon under age 45, and its incidence is highest between the ages of 55 and 84.

Kidney cancer is among the 10 most common cancers in both men and women. Overall, the lifetime risk for developing kidney cancer is about 1 in 75 (1.34%). This risk is higher in men than in women. A number of other factors (described in the section, "What Are the Risk Factors for Kidney Cancer?") may also affect a person's risk.

For reasons that are not totally clear, the rate of people developing kidney cancer has been rising slowly since the 1970s. At least part of this is likely due to the development of newer imaging tests such as CT scans, which have picked up some cancers that may never have been found otherwise. The death rates for these cancers have remained fairly stable since the mid 1980s.

Survival rates for people diagnosed with kidney cancer are discussed in the section, "How Is Kidney Cancer Staged?"

What Are the Risk Factors for Kidney Cancer (Renal Cell Carcinoma)?

A risk factor is anything that affects your chance of getting a disease such as cancer. Different cancers have different risk factors. For example, unprotected exposure to strong sunlight is a risk factor for skin cancer.

But risk factors don't tell us everything. Having a risk factor, or even several risk factors, does not mean that you will get the disease. And some people who get the disease may not have had any known risk factors. Even if a person with kidney cancer has a risk factor, it is often very hard to know how much that risk factor may have contributed to the cancer.

Scientists have found several risk factors that may make you more likely to develop kidney cancer.

Lifestyle-Related and Job-Related Risk Factors

Smoking

Smoking increases the risk of developing renal cell carcinoma. The increased risk seems to be related to the amount you smoke. The risk drops if you stop smoking, but it takes many years to approach the level of someone who never smoked.

Obesity

People who are very overweight have a higher risk of developing renal cell cancer. Some doctors think obesity is a factor in about 2 out of 10 people who get this cancer. Obesity may cause changes in certain hormones that can lead to renal cell carcinoma.

Workplace Exposures

Many studies have suggested that workplace exposure to certain substances increases the risk for renal cell carcinoma. Some of these are asbestos, cadmium (a type of metal), some herbicides, benzene, and organic solvents, particularly trichloroethylene.

Genetic and Hereditary Risk Factors

Some people inherit a tendency to develop certain types of cancer. The DNA that you inherit from your parents may have certain changes that account for this tendency to develop cancer. Kidney cancer can be caused by some rare inherited conditions. People who have these conditions have a much higher risk for getting kidney cancer, although they account for only a small portion of cases overall.

von Hippel-Lindau Disease

People with this condition often develop several kinds of tumors and cysts (fluid-filled sacs) in different parts of the body. They are at increased risk for developing clear cell renal cell carcinoma, especially at a younger age. They may also have benign tumors in their eyes, brain, spinal cord, pancreas and other organs; and a type of adrenal gland tumor called pheochromocytoma. This condition is caused by mutations (changes) in the VHL gene.

Hereditary Papillary Renal Cell Carcinoma

People with this condition have an inherited tendency to develop one or more papillary renal cell carcinomas, but they do not have tumors in other parts of the body, as is the case with the other inherited conditions listed here. This disorder is thought to be caused by changes in the MET gene.

Hereditary Leiomyomatosis and Renal Cell Carcinoma

People with this syndrome develop smooth muscle tumors called leiomyomas or fibroids of the skin and uterus (in women) and have a higher risk for developing papillary renal cell cancers. It has been linked to changes in the fumarate hydratase (FH) gene.

Birt-Hogg-Dube Syndrome

People with this syndrome, which is characterized by the development of small benign skin tumors, have an increased risk of developing different kinds of renal cell cancers. They may also have benign or malignant tumors of several other tissues. The gene linked to this condition is known as BHD.

Hereditary Renal Oncocytoma

Some people inherit the tendency to develop a kidney tumor called oncocytoma, which has a very low potential for being malignant.

It is important that people who have hereditary causes of renal cell cancer see their doctors frequently, particularly if they have already had a renal cell cancer diagnosed. Some doctors recommend regular imaging tests (such as CT scans) for these people.

Other Risk Factors

Family History of Kidney Cancer

People with a strong family history of renal cell cancer (without one of the known inherited conditions listed above) also have a higher chance of developing this cancer. This risk is even higher in siblings (brothers or sisters) of those affected. It's not clear if this is due to genetics, a shared environmental exposure, or some combination of these.

High Blood Pressure

The risk of kidney cancer is higher in people with high blood pressure. Some studies have suggested that certain medicines used to treat high blood pressure may raise the risk of kidney cancer, but it is hard to tell whether the condition or the medication (or both) may be the cause of the increased risk.

Certain Medicines

Phenacetin, once a popular non-prescription pain reliever, has been linked to renal cell cancer in the past. Because this medicine has not been available in the United States for over 20 years, this no longer appears to be a major risk factor.

Some studies have suggested that diuretics (medicines that treat high blood pressure by causing the kidneys to remove salt and fluid from the body) may be linked to renal cell

carcinoma. It is not clear whether the cause is the drugs or the high blood pressure itself. If you need diuretics, you should take them. You shouldn't avoid them to try to reduce the risk of kidney cancer.

Advanced Kidney Disease

People with advanced kidney disease, especially those needing dialysis, have a higher risk of renal cell carcinoma. Dialysis is a treatment used to remove toxins from your body if the kidneys do not work properly.

Gender

Renal cell carcinoma is about twice as common in men as in women. Men are more likely to be smokers and are more likely to be exposed to cancer-causing chemicals at work, which may account for some of the difference.

Race

Blacks have a slightly higher rate of renal cell cancer than whites. The reasons for this are not clear.

Do We Know What Causes Kidney Cancer (Renal Cell Carcinoma)?

Although many risk factors may increase the chance of developing kidney cancer, it is not yet known exactly how some of these risk factors cause kidney cells to become cancerous.

Changes (Mutations) in Genes

Researchers are beginning to understand how certain changes in DNA can cause normal kidney cells to become cancerous. DNA is the chemical in each of our cells that makes up our genes -- the instructions for how our cells function. We usually resemble our parents because they are the source of our DNA. However, DNA affects more than how we look.

Some genes contain instructions for controlling when our cells grow, divide, and die. Certain genes that speed up cell division are called *oncogene*s. Others that slow down cell division, or cause cells to die at the right time, are called *tumor suppressor genes*. Cancers can be caused by DNA mutations (changes) that "turn on" oncogenes or "turn off" tumor suppressor genes.

Inherited Gene Mutations

Certain *inherited* DNA changes can lead to conditions running in some families that increase the risk of kidney cancer. These syndromes, which cause a small portion of all kidney cancers, were described in the section, "What Are the Risk Factors for Kidney Cancer (Renal Cell Carcinoma)?"

For example, the VHL gene is a tumor suppressor gene. It normally helps keep cells from growing out of control. Mutations (changes) in this gene can be inherited from one's parents, causing von Hippel-Lindau disease. When the VHL gene is mutated, it no longer functions to suppress abnormal growth, and kidney cancer is more likely to develop. The genes linked to hereditary leiomyomatosis and renal cell carcinoma (the fumarate hydratase gene) and Birt-Hogg-Dube syndrome (the BHD gene) are also tumor suppressor genes, and inherited changes in these genes also lead to an increased risk of kidney cancer.

People with hereditary papillary renal cell carcinoma inherit changes in the MET oncogene that cause it to be "turned on" all the time. This makes the person more likely to develop papillary renal cell cancer.

Acquired Gene Mutations

Most DNA mutations related to kidney cancer, however, occur during a person's life rather than having been inherited. These *acquired* mutations of oncogenes and/or tumor suppressor genes may result from factors such as exposure to cancer-causing chemicals (like those found in tobacco smoke), but in many cases the cause of these changes is not known.

About 3 out of 4 people with sporadic (non-inherited) clear cell renal cancer have changes in the VHL gene that cause it not to function properly. These changes were acquired during life rather than being inherited.

Other gene changes may also cause renal cell carcinomas. Researchers continue to look for these changes.

Progress has been made in understanding how tobacco increases the risk for developing renal cell carcinoma. Many of the cancer-causing chemicals in tobacco smoke are absorbed into the bloodstream by the lungs. Because the kidneys filter this blood, many of these chemicals become highly concentrated in the kidneys. Several of these chemicals are known to damage kidney cell DNA in ways that can cause the cells to become cancerous.

Obesity, another cause of this cancer, alters the balance of some of the body's hormones. Researchers are now learning how certain hormones help control the growth (both normal and abnormal) of many different tissues in the body, including the kidneys.

Knowledge of the gene changes that lead to kidney cancer is being used to help develop new treatments for this disease. For example, researchers now know that the VHL gene normally stops cells from making a substance called vascular endothelial growth factor (VEGF). This substance causes the formation of new blood vessels, which tumors need to survive and grow. Newer drugs that target VEGF are now being used to treat kidney cancer. They are described in the section, "How Is Kidney Cancer (Renal Cell Carcinoma) Treated?"

Can Kidney Cancer (Renal Cell Carcinoma) Be Prevented?

In many cases the cause of kidney cancer is not known, and in some other cases (such as with inherited conditions that raise kidney cancer risk), even when the cause is known it may not be preventable.

But there are some ways you may be able to reduce your risk of this disease. Cigarette smoking is responsible for a large percentage of cases, and stopping smoking may lower your risk. Obesity and high blood pressure are also risk factors for renal cell cancer. Maintaining a healthy weight by exercising and choosing a diet high in fruits and vegetables, and getting treatment for high blood pressure may also reduce your chance of getting this disease. Finally, avoiding workplace exposure to large amounts of harmful substances such as cadmium, asbestos, and organic solvents may reduce your risk for renal cell cancer as well.

Can Kidney Cancer (Renal Cell Carcinoma) Be Found Early?

Many kidney cancers are found fairly early, while they are still confined to the kidney. But others are found at a more advanced stage. There are a few reasons for this:

- These cancers can sometimes become quite large without causing any pain or other problems.
- Because the kidney is deep inside the body, small kidney tumors cannot be seen or felt during a physical exam.
- There are no simple tests that can be used to screen for kidney cancer in people who are not at increased risk.

A routine urine test (urinalysis), which is sometimes part of a complete medical checkup, may find small amounts of blood in the urine of some people with early renal cell cancer. But there are many other causes of blood in the urine, including urinary tract infections, bladder infections, bladder cancer, and benign (non-cancerous) kidney conditions such as kidney stones. On the other hand, some people with kidney cancer do not have blood in their urine until the cancer is quite large and may have spread to other parts of the body.

Imaging tests such as computed tomography (CT) scans and magnetic resonance imaging (MRI) scans can find small renal cell carcinomas. But these tests are expensive and cannot always tell benign tumors from small renal cell carcinomas. For these reasons, doctors

generally recommend CT and MRI for early detection of kidney cancer only in people who have certain risk factors, such as von Hippel-Lindau (VHL) disease or other inherited conditions. Some doctors also recommend that people with kidney diseases treated by long-term dialysis have periodic tests (CT or MRI scans) to look for kidney cancer.

Often, kidney cancers are found incidentally during tests for some other illness such as gallbladder disease. These cancers usually cause no pain or discomfort at the time of discovery. The survival rate for kidney cancer found this way is very high because these cancers are usually found at a very early stage.

Genetic Tests for Inherited Conditions Linked to Kidney Cancer

It is important to tell your doctor if family members (blood relatives) have or had kidney cancer, especially at a younger age, or if they have been diagnosed with an inherited condition linked to this cancer, such as VHL disease. Your doctor may recommend that you consider genetic testing. Genetic testing for these conditions is used only in people with clinical signs of these conditions and in their blood relatives.

Before having genetic tests, it's important to speak with a genetic counselor so that you understand what the tests can -- and can't -- tell you, and what any results would mean. Genetic tests look for the gene mutations that cause these conditions in your DNA. They are used to diagnose these inherited conditions, not kidney cancer itself. Your risk may be increased if you have one of these conditions, but it does not mean that you have (or definitely will get) kidney cancer. For more information on genetic testing, see the separate American Cancer Society document, *Genetic Testing: What You Need to Know*.

If you have been diagnosed with one of these conditions, you may need frequent CT or MRI scans to look for early kidney cancer.

How Is Kidney Cancer (Renal Cell Carcinoma) Diagnosed?

Signs and Symptoms of Kidney Cancer

Unfortunately, early kidney cancers do not usually cause any signs or symptoms, but larger ones may. Some possible signs and symptoms of kidney cancer include:

- blood in the urine (hematuria)
- low back pain on one side (not caused by injury)
- a mass or lump on the side or lower back
- fatigue
- unexplained weight loss

- fever that is not caused by a cold or other infection and that doesn't go away after a few weeks
- swelling of ankles and legs (edema)

These symptoms may be caused by cancer, but more often they are due to non-cancerous diseases. For example, blood in the urine may be a sign of kidney, bladder, or prostate cancer, but most often it is caused by a bladder infection or a kidney stone. Still, if you have any of these symptoms, consult a doctor so that the cause can be evaluated and treated, if needed.

Medical History and Physical Exam

If you have any signs or symptoms that suggest you might have kidney cancer, your doctor will want to take a complete medical history to check for risk factors and symptoms. A physical exam can provide information about signs of kidney cancer and other health problems. For example, the doctor may be able to feel an abnormal mass when he or she examines your abdomen.

If symptoms and/or the results of the physical exam suggest kidney cancer might be present, more involved tests will likely be done. These might include imaging tests and/or lab tests.

Imaging Tests

Imaging tests use x-rays, magnetic fields, or radioactive substances to create pictures of the inside of your body. Imaging tests may be done for a number of reasons, including to help find out whether a suspicious area might be cancerous, to learn how far cancer may have spread, and to help determine if treatment has been effective.

Unlike most other cancers, doctors can often be fairly certain of a diagnosis of kidney cancer without the need for a biopsy (removal of a sample of the tumor to be looked at under a microscope). In many cases, imaging tests can give doctors a reasonable amount of certainty that a kidney mass is (or is not) cancerous. In some cases, however, a biopsy may be needed to be sure.

Computed tomography (CT) scans, magnetic resonance imaging (MRI) scans, intravenous pyelograms, and ultrasound can be very helpful in the diagnosis of most kinds of kidney tumors, although patients rarely need all of these tests. Other tests described here, such as chest x-rays and bone scans, are more often used to help determine if the cancer has spread (metastasized) to other parts of the body.

Computed Tomography (CT or CAT) Scan

The CT or CAT scan is an x-ray test that produces detailed cross-sectional images of your body. Instead of taking one picture, like a regular x-ray, a CT scanner takes many pictures as it rotates around you while you lie on a table. A computer then combines these pictures into images of slices of the part of your body being studied. Unlike a regular x-ray, a CT scan creates detailed images of the soft tissues in the body.

After the first set of pictures is taken you may be asked to drink a contrast solution and/or receive an IV (intravenous) line through which a contrast dye is injected. This helps better outline structures in your body. A second set of pictures is then taken.

The contrast may cause some flushing (a feeling of warmth, especially in the face). Some people are allergic and get hives. Rarely, more serious reactions like trouble breathing or low blood pressure can occur. Be sure to tell the doctor if you have ever had a reaction to any contrast material used for x-rays.

CT scans take longer than regular x-rays. You need to lie still on a table while they are being done. During the test, the table moves in and out of the scanner, a ring-shaped machine that completely surrounds the table. You might feel a bit confined by the ring you have to lie in while the pictures are being taken.

In recent years, *spiral CT* (also known as helical CT) has become available in many medical centers. This type of CT scan uses a faster machine. The scanner part of the machine rotates around the body continuously, allowing doctors to collect the images much more quickly than standard CT. This lowers the chance of "blurred" images occurring as a result of breathing motion. It also lowers the dose of radiation received during the test. The biggest advantage may be that the "slices" it images are thinner, which yields more detailed pictures and allows doctors to look at suspicious areas from different angles.

CT scanning is one of the most useful tests for finding and looking at a mass inside your kidney. It is also useful in checking whether or not a cancer has spread to organs and tissues beyond the kidney. The CT scan will provide precise information about the size, shape, and position of a tumor, and can help find enlarged lymph nodes that might contain cancer.

Magnetic Resonance Imaging (MRI)

Like CT scans, MRI scans provide detailed images of soft tissues in the body. But MRI scans use radio waves and strong magnets instead of x-rays. The energy from the radio waves is absorbed and then released in a pattern formed by the type of body tissue and by certain diseases. A computer translates the pattern into a very detailed image of parts of the body. A contrast material called gadolinium is often injected into a vein before the scan to better see details.

MRI scans are a little more uncomfortable than CT scans. First, they take longer -- often up to an hour. Second, you have to lie inside a narrow tube, which is confining and can upset

people with claustrophobia (a fear of enclosed spaces). Newer, "open" MRI machines can sometimes help with this if needed. The machine also makes buzzing and clicking noises that you may find disturbing. Some centers provide headphones with music to block this out.

MRI scans are used less often than CT scans in people with kidney cancer. They may be done in cases where CT scans aren't practical, such as if a person is allergic to the CT contrast. MRI scans may also be done if there's a chance that the cancer involves a major vein in the abdomen (the inferior vena cava). Finally, they may be used to look for possible spread of cancer to the brain or spinal cord if a person has symptoms that suggest this might be the case.

Ultrasound (ultrasonography or US)

Ultrasound uses sound waves to create images of internal organs. For this test, a small, microphone-like instrument called a transducer is placed on the skin near the kidney. It emits sound waves and picks up the echoes as they bounce off the tissues in the kidney. The echoes are converted by a computer into a black and white image that is displayed on a computer screen. This test is painless and does not expose you to radiation.

Ultrasound can be helpful in determining if a kidney mass is solid or filled with fluid. The echo patterns produced by most kidney tumors look different from those of normal kidney tissue. Different echo patterns also can distinguish some types of benign and malignant kidney tumors from one another. If a kidney biopsy is needed, this test can be used to guide a biopsy needle into the mass to obtain a sample.

Positron Emission Tomography (PET) Scan

PET scans involve injecting a form of radioactive sugar (known as fluorodeoxyglucose or FDG) into the blood. The amount of radioactivity used is very low. Because cancer cells in the body are growing rapidly, they absorb large amounts of the radioactive sugar. A special camera can then create a picture of areas of radioactivity in the body. The picture is not finely detailed like a CT or MRI scan, but it provides helpful information about your whole body.

This test can be useful to see if the cancer may have spread to lymph nodes near the kidney. PET scans can also be useful if your doctor thinks the cancer may have spread but doesn't know where. PET scans can be used instead of several different x-rays because they scan your whole body.

Some newer machines are able to perform both a PET and CT scan at the same time (PET/CT scan). This allows the radiologist to compare areas of higher radioactivity on the PET with the appearance of that area on the CT.

Intravenous Pyelogram (IVP)

An intravenous pyelogram is an x-ray of the urinary system taken after a special dye is injected into a vein. This dye travels from the bloodstream into the kidneys and then passes into the ureters and bladder. An IVP can be useful in finding abnormalities of the urinary tract, such as cancer, but you might not need an IVP if you have already had a CT or MRI.

Angiography

Like the IVP, this x-ray test also uses a contrast dye. A catheter is usually threaded up a large artery in your leg into the artery leading to your kidney (renal artery). The dye is then injected into the artery to outline blood vessels. Because angiography can outline the blood vessels that supply a kidney tumor, it can help a surgeon plan an operation. Angiography can also help diagnose renal cancers since the blood vessels usually have a special appearance with this test.

Chest X-ray

If kidney cancer has been diagnosed (or is suspected), a plain x-ray of your chest may be done to see if the cancer has spread to your lungs. This is very unlikely unless the cancer is far advanced. This x-ray can be done in any outpatient setting. If the results are normal, you probably don't have cancer in your lungs.

Bone Scan

A bone scan can help show if a cancer has metastasized (spread) to your bones. For this test, a small amount of low-level radioactive material is injected into a vein (intravenously, or IV). The substance settles in areas of damaged bone throughout the entire skeleton over the course of a couple of hours. You then lie on a table for about 30 minutes while a special camera detects the radioactivity and creates a picture of your skeleton.

Areas of active bone changes appear as "hot spots" on your skeleton -- that is, they attract the radioactivity. These areas may suggest the presence of metastatic cancer, but arthritis or other bone diseases can also cause the same pattern. To distinguish between these conditions, your cancer care team may use other imaging tests such as simple x-rays or MRI scans to get a better look at the areas that light up, or they may even take biopsy samples of the bone.

Bone scans are done mainly when there is reason to think the cancer may have spread to the bones (because a person is having symptoms like bone pain). PET scans can usually show the spread of cancer to bones as well, so if you've had a PET scan you might not need a bone scan.

Lab Tests

Lab tests are not usually used to diagnose kidney cancer, but they can sometimes give the first hint that there may be a problem with the kidneys. They are also done to get a sense of a person's overall health and to help tell if cancer may have spread to other areas. Prior to surgery, they can help tell if a person is healthy enough to have an operation.

Urinalysis

Urinalysis (urine testing) is sometimes part of a complete physical exam, but it may not be done as a part of more routine physicals. It is likely to be one of the first tests done if kidney cancer is a possibility.

Microscopic and chemical tests are done on the urine to look for small amounts of blood and other substances not seen with the naked eye. About half of all patients with renal cell cancer will have blood in their urine. Sometimes special microscopic examination of urine samples (called urine cytology) will show actual cancer cells in the urine.

Complete Blood Count

A complete blood count can detect findings sometimes seen with renal cell cancer. Anemia (having too few red blood cells) is very common. Less often, a person may have too many red blood cells because the kidney cancer makes a hormone (erythropoietin) that causes the bone marrow to make more red blood cells. Blood counts are also important to make sure a person is healthy enough for surgery.

Blood Chemistry Tests

Blood chemistry tests are usually done in people who may have kidney cancer, as it can affect the levels of certain chemicals in the blood. For example, high levels of liver enzymes are sometimes found, although the reasons for this are not known. High blood calcium levels may indicate that cancer is spread to the bones, and may therefore prompt a doctor to order a bone scan.

Fine Needle Aspiration (FNA) Biopsy

This test is rarely used to diagnose kidney tumors. Imaging studies usually provide enough information for a surgeon to decide whether or not an operation is needed.

A fine needle aspiration (FNA) biopsy is sometimes used to get a small sample of cells from a suspicious area if imaging test results are not conclusive enough to warrant removing a kidney. It may also be done to confirm the diagnosis of cancer if a person's health is too poor for surgery and other local treatments (such as arterial embolization or cryotherapy) are being considered.

For this test, the skin where the needle is to be inserted is first numbed with local anesthesia. The doctor directs a hollow needle into the area while looking at your kidney with either ultrasound or CT scans. Unlike ultrasound, CT doesn't provide a continuous picture, so the needle is inserted in the direction of the mass, a CT image is taken, and the direction of the needle is guided based on the image. This is repeated a few times until the needle is within the mass. A small sample of the target area is sucked (aspirated) into a syringe and looked at under the microscope to see if cancer cells are present.

In cases where the doctors think kidney cancer may have spread to other sites, they may perform a biopsy of the metastatic site instead of the kidney.

Fuhrman Grade

The Fuhrman grade is determined by looking at kidney cancer cells (taken during a biopsy or during surgery) under a microscope. It is used by many doctors as a way to describe how aggressive the cancer is likely to be. The grade is based on how closely the cancer cells' nuclei (part of a cell in which DNA is stored) look like those of normal kidney cells.

Renal cell cancers are usually graded on a scale of 1 through 4. Grade 1 renal cell cancers have cell nuclei that differ very little from normal kidney cell nuclei. These cancers usually grow and spread slowly and tend to have a good outlook (prognosis). At the other extreme, grade 4 renal cell cancer nuclei look quite different from normal kidney cell nuclei and have a worse prognosis.

Although the cell type and grade are sometimes helpful in predicting a prognosis, the cancer's *stage* is by far the best predictor of survival. The stage describes the cancer's size and how far it has spread beyond the kidney. Staging is explained in the section, "How Is Kidney Cancer (Renal Cell Carcinoma) Staged?"

How Is Kidney Cancer (Renal Cell Carcinoma) Staged?

Staging is the process of finding out how far a cancer has spread. Your treatment and prognosis (the outlook for chances of survival) depend, to a large extent, on the cancer's stage.

Staging is based on the results of the physical exam, biopsies, and imaging tests (CT scan, chest x-ray, PET scan, etc.), which are described in the section, "How Is Kidney Cancer (Renal Cell Carcinoma) Diagnosed?"

There are actually 2 types of staging for kidney cancer. The *clinical stage* is your doctor's best estimate of the extent of your disease, based on the results of the physical exam, lab tests, and any imaging studies you have had. If you have surgery, your doctors can also determine the *pathologic stage*, which is based on same factors as the clinical stage, plus what is found during surgery and examination of the removed tissue. This means that if you have surgery, the stage of your cancer might actually change afterward (if cancer was found to have spread farther than was suspected, for example). Pathologic staging is likely to be more accurate than clinical staging, as it allows your doctor to get a firsthand impression of the extent of your disease.

AJCC (TNM) Staging System

A *staging system* is a standardized way in which the cancer care team describes the extent of the cancer. The most commonly used staging system is that of the American Joint Committee on Cancer (AJCC), sometimes also known as the TNM system. The TNM system describes 3 key pieces of information:

- **T** indicates the size of the main (primary) **tumor** and whether it has grown into nearby areas.
- **N** describes the extent of spread to nearby (regional) lymph **nodes**. Lymph nodes are small bean-shaped collections of immune system cells that are important in fighting infections.
- **M** indicates whether the cancer has spread (**metastasized**) to other organs of the body. (The most common sites of spread are to the lungs, bones, liver, and distant lymph nodes.)

Numbers or letters appear after T, N, and M to provide more details about each of these factors. The numbers 0 through 4 indicate increasing severity. The letter X means "cannot be assessed because the information is not available."

T Categories for Kidney Cancer

TX: Primary tumor cannot be assessed (information not available).

T0: No evidence of a primary tumor.

T1a: Tumor is 4 cm (about 11/2 inches) across or smaller and is limited to the kidney.

T1b: Tumor is larger than 4 cm but not larger than 7 cm (about 2¾ inches) across and is limited to the kidney.

T2: Tumor is larger than 7 cm across but is still limited to the kidney.

T3a: Tumor has spread into the adrenal gland (which sits on top of the kidney) or into fatty tissue around the kidney, but not beyond the fibrous layer that surrounds the kidney and nearby fatty tissue (Gerota's fascia).

T3b: Tumor has spread into the main vein leading out of the kidney (renal vein) and/or the part of the large vein leading into the heart (vena cava) that is within the abdomen.

T3c: Tumor has reached the part of the vena cava that is within the chest or it invades the wall of the vena cava.

T4: Tumor has spread beyond Gerota's fascia (fibrous layer around the kidney and nearby fatty tissue).

N Categories for Kidney Cancer

NX: Regional (nearby) lymph nodes cannot be assessed (information not available).

N0: No spread to nearby lymph nodes.

N1: Spread to 1 nearby lymph node.

N2: Spread to more than 1 nearby lymph node.

M Categories for Kidney Cancer

MX: Presence of distant metastasis cannot be assessed (information not available).

M0: No spread to distant lymph nodes or other organs.

M1: Distant metastasis is present; includes spread to distant lymph nodes and/or to other organs (such as the lungs, bones, or brain).

Stage Grouping

Once the T, N, and M categories have been assigned, this information is combined to assign an overall stage of I, II, III, or IV. The stages identify cancers that have a similar prognosis

and thus are treated in a similar way. Patients with lower stage numbers tend to have a better prognosis.

Stage I
T1a-T1b, N0, M0: The tumor is 7 cm across or smaller and limited to the kidney. There is no spread to lymph nodes or distant organs.

Stage II
T2, N0, M0: The tumor is larger than 7 cm across but is still limited to the kidney. There is no spread to lymph nodes or distant organs.

Stage III
Different combinations of T and N categories are included in this stage.

T3a-T3c, N0, M0: The main tumor has reached the adrenal gland, the fatty tissue around the kidney, the renal vein, and/or the large vein (vena cava) leading from the kidney to the heart. It has not spread beyond Gerota's fascia. There is no spread to lymph nodes or distant organs.

T1a-T3c, N1, M0: The main tumor can be any size and may be outside the kidney, but it has not spread beyond Gerota's fascia. The cancer has spread to 1 nearby lymph node but has not spread to distant lymph nodes or other organs.

Stage IV
There are several combinations of T, N, and M categories that are included in this stage.

T4, N0-N1, M0: The main tumor has invaded beyond Gerota's fascia. It has spread to no more than 1 nearby lymph node. It has not spread to distant lymph nodes or other organs.

Any T, N2, M0: The main tumor can be any size and may be outside the kidney. The cancer has spread to more than 1 nearby lymph node but has not spread to distant lymph nodes or other organs.

Any T, Any N, M1: The main tumor can be any size and may be outside the kidney. It may or may not have spread to nearby lymph nodes. It has spread to distant lymph nodes and/or other organs.

Survival Rates for Kidney Cancer by TNM Stage

The numbers below come from several different studies published within the past 10 years. There are some important points to note about these numbers:

- The *5-year survival rate* refers to the percentage of patients who live *at least 5 years* after being diagnosed. Many of these patients live much longer than 5 years after diagnosis.

- While these numbers are among the most current we have available, they represent people who were first diagnosed and treated many years ago. Improvements in treatment since then mean that the survival rates for people now being diagnosed with these cancers may be higher.

- While survival statistics can sometimes be useful as a general guide, they may not accurately represent any one person's prognosis. A number of other factors, including other tumor characteristics and a person's age and general health, can also affect outlook. Your doctor is likely to be a good source as to whether these numbers may apply to you, as he or she is familiar with the aspects of your particular situation.

Stage	5-Year Survival Rate
I	96%
II	82%
III	64%
IV	23%

Other Staging and Prognostic Systems

While the TNM staging system is useful, some doctors have pointed out that there are factors other than the extent of the cancer that should be considered when determining prognosis and treatment.

University of California Los Angeles (UCLA) Integrated Staging System

This is a more complex but probably more accurate system. Along with the stage of the cancer, it takes into account a person's overall health and the Fuhrman grade of the tumor to divide people into low, intermediate, and high risk groups. You may want to ask your doctor if he or she uses this system and how it might apply to your case.

Predictors of Shorter Survival

Researchers have identified certain factors that have been linked with shorter survival times in people with kidney cancer:

- high blood lactate dehydrogenase (LDH) level
- high blood calcium level
- anemia (low red blood cell count)
- cancer spread to 2 or more distant sites
- time of less than a year from diagnosis to the need for systemic treatment (targeted therapy, immunotherapy, or chemotherapy)
- low performance status (a measure of how well a person can do normal daily activities)

People with 3 or more of these factors are considered to have a poorer prognosis (outlook) and may be more or less likely to benefit from certain treatments.

How Is Kidney Cancer (Renal Cell Carcinoma) Treated?

This information represents the views of the doctors and nurses serving on the American Cancer Society's Cancer Information Database Editorial Board. These views are based on their interpretation of studies published in medical journals, as well as their own professional experience.

The treatment information in this document is not official policy of the Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor.

Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

The first part of this section describes the various types of treatments used for kidney cancer. This is followed by a description of the most common approaches used for these cancers based on the stage of the cancer.

Making Treatment Decisions

After the cancer is found and staged, your cancer care team will discuss your treatment options with you. It is important to take time and think about your possible choices. In choosing a treatment plan, one of the most important factors is the stage of the cancer. Other factors to consider include your overall health, the likely side effects of the treatment, and the probability of curing the disease, extending life, or relieving symptoms.

If you have kidney cancer, your treatment options may include surgery, radiation therapy, targeted therapy, immunotherapy, chemotherapy, or some combination of these, depending on the factors mentioned above.

In considering your treatment options it is often a good idea to seek a second opinion, if possible. This may provide you with more information and help you feel more confident about the treatment plan you have chosen.

Surgery

Surgery is the main treatment for most renal cell carcinomas. The chances of surviving a renal cell cancer without having surgery are small. Depending on the stage and location of the cancer and other factors, surgery may be used to remove either the cancer along with some of the surrounding kidney tissue, or the entire kidney. The adrenal gland (the small gland that sits on top of each kidney) and fatty tissue around the kidney may be removed as well.

Radical Nephrectomy

The most common operation to treat renal cell cancer is called a *radical nephrectomy*. In this operation, the surgeon removes your whole kidney, the attached adrenal gland, and the fatty tissue around the kidney. (Most people do just fine with only the one remaining kidney.)

The surgeon can make the incision in several places. The most common sites are the middle of the abdomen (belly), under the ribs on the same side as the cancer, or even in the back, just behind the cancerous kidney. Each has its advantages in treating cancers of different sizes and in different locations in the kidney.

Laparoscopic Nephrectomy

This approach to radical nephrectomy has quickly become, for some doctors, a preferred method for removing kidney tumors.

The operation is done through several small incisions (which is why it is sometimes called "keyhole" surgery) as opposed to one large one. Special long instruments are inserted through the incisions, each of which is about 1/2-inch long, to perform the operation. One of the instruments has a small video camera on the end, which allows the surgeon to see inside the abdomen. Usually, one of the incisions has to be made longer in order to remove the kidney (although it's not as long as the incision for a standard nephrectomy).

This approach can be used to treat most renal tumors that cannot be treated with nephron-sparing surgery (see below). The technique is thought to be as effective as open radical nephrectomy and usually involves shorter hospital stay, a faster recovery, and less pain after surgery.

Regional Lymphadenectomy (Lymph Node Dissection)

This procedure involves removing nearby lymph nodes to see if they contain cancer. Many doctors do this along with the radical nephrectomy, although not all doctors agree that it is necessary. The main reason for doing it is to try to more accurately stage the cancer by determining if it has reached the lymph nodes (instead of relying only on imaging study results). This can be important for predicting chances for survival and deciding on further treatment options. In theory, removing the lymph nodes might also increase the chances that all of the cancer is removed, but this has not been proven.

Partial Nephrectomy (Nephron-Sparing Surgery)

In this procedure, the surgeon removes only the part of the kidney containing cancer, leaving the rest of the organ behind. As with a radical nephrectomy, the surgeon can make the incision in several places, depending on factors like the location of the tumor.

This approach is used most often when there is a need to preserve some of the remaining kidney function, such as in people with cancer in both kidneys, those who only have one kidney and develop cancer in that kidney, or in people who already have reduced kidney function for some other reason. It may also be used to try to preserve as much kidney function as possible in people who are more likely to develop other kidney cancers in the future, such as those with von Hippel-Lindau disease.

A partial nephrectomy may also be done in patients with a single kidney cancer that is smaller than 4 cm (about 1¾ inch) across. Studies have shown the long-term results to be about the same as for removing the whole kidney. The obvious benefit is that you retain more of your kidney function. Partial nephrectomies are generally not done for larger tumors, if there is more than one tumor in the same kidney, or if the cancer has spread to the lymph nodes or distant organs.

Some doctors at major medical centers are now studying whether laparoscopic partial nephrectomy is a possible option. But it is a difficult operation to do, and it is generally thought of as an investigational procedure at this time.

Removal of Metastases

About 1 out of 4 patients with renal cell carcinoma will already have metastatic spread of their cancer when they are diagnosed. In some cases, surgery may still be helpful.

Attempts at curative surgery: In rare cases where there is only one metastasis or if there are only a few that can be removed easily without causing serious side effects, surgery may lead to long-term survival in some people. This may be done at the same time as a radical nephrectomy or at a later time if the cancer recurs (comes back).

Surgery to relieve symptoms (palliative surgery): In cases where other treatments aren't helpful, surgically removing the metastases can sometimes relieve pain and other symptoms, although this usually does not help patients live longer.

Risks of Surgery

Risks with surgery include:

- bleeding during surgery or after surgery that may require blood transfusions
- wound infection
- damage to internal organs and blood vessels (such as the spleen, pancreas, aorta, vena cava, large or small bowel) during surgery
- pneumothorax (unwanted air in the chest cavity)
- incisional hernia (bulging of internal organs near the surgical incision due to problems with wound healing)
- kidney failure (if the remaining kidney fails to function well)

Other Local Therapies

Whenever possible, surgery is the main treatment for kidney cancers that can be removed. But for people who are too sick to have surgery, other approaches can sometimes be used to destroy kidney tumors. While they may be helpful for some people, there is much less data on their long-term effectiveness than there is for surgery, and some doctors may still consider them to be experimental.

Cryotherapy (Cryoablation)

This approach uses extreme cold to destroy the tumor. A hollow probe (needle) is inserted into the tumor either through the skin (percutaneously) or during laparoscopic surgery. Very cold gases are passed through the probe, creating an ice ball that destroys the tumor. To be sure the tumor is destroyed without too much damage to nearby tissues, the doctor carefully watches images of the tumor during the procedure (with ultrasound or other tests).

The type of anesthesia used for cryotherapy depends on how it is being done. Possible side effects include bleeding and damage to the kidneys or other nearby organs.

Radiofrequency Ablation (RFA)

This technique uses high-energy radio waves to heat the tumor. A thin, needle-like probe is placed through the skin and advanced until the end is in the tumor. Placement of the probe is

guided by ultrasound or CT scans. Once it is in place, an electric current is passed through the probe, which heats the tumor and destroys the cancer cells.

RFA is usually done as an outpatient procedure, using local anesthesia (numbing medicine) where the probe is inserted. You may be given medicine to help you relax as well. Major complications are uncommon, but they can include bleeding or excessive tissue damage.

Arterial Embolization

This technique is used to block the artery that feeds the kidney with the tumor. A small catheter (tube) is placed in an artery in the inner thigh and is advanced until it reaches the artery going from the aorta to the kidney (renal artery). Material is then injected into the artery to block it, cutting off the kidney's blood supply, causing it (and the tumor) to die. Although this procedure is rarely performed, it is sometimes done before nephrectomy to reduce bleeding during the operation.

Radiation Therapy

Radiation therapy uses high-energy radiation to kill cancer cells. *External beam therapy* focuses radiation from outside the body on the cancer. It is like getting an x-ray, but the radiation is much more intense. The procedure itself is painless.

Radiation therapy can be used to treat kidney cancer if a person's general health is too poor for them to have surgery. Unfortunately, kidney cancers are not very sensitive to radiation. Using radiation therapy before or after removing the cancer is not routinely recommended because studies have not shown this to improve survival rates.

Radiation therapy is more often used to *palliate*, or ease, symptoms of kidney cancer such as pain, bleeding, or problems caused by cancer spread (especially to the bones or brain).

A special type of radiation therapy known as *stereotactic radiosurgery* (using a machine called a Gamma Knife®) can sometimes be used for single tumors that have spread to the brain. This procedure does not actually involve surgery. Instead, multiple beams of high-dose radiation are focused on the tumor from different angles over a few minutes to hours. The head is kept in the same position by placing it in a rigid frame.

Side effects of radiation therapy may include mild skin changes (similar to sunburn), nausea, diarrhea, or tiredness. Often these go away after a short while. Radiation may also make side effects from some other treatments worse. Radiation therapy to the chest area may cause damage to the lungs and lead to shortness of breath. Side effects of radiation to the brain usually become most serious 1 or 2 years after treatment and can include headaches and trouble thinking.

Targeted Therapies

As researchers have learned more about the gene changes in cells that cause cancer, they have been able develop newer drugs that specifically target some of these changes. These targeted drugs work differently than standard chemotherapy drugs and have different side effects. Targeted drugs are proving to be especially important in diseases such as kidney cancer, where chemotherapy has not been shown to be very effective.

Several targeted drugs have been approved by the FDA within the past few years for use against advanced kidney cancer. These include drugs that stop angiogenesis (growth of the new blood vessels that nourish cancers) and drugs that target other important cell growth factors. These drugs are often used as the first line of treatment against advanced kidney cancers. While they may shrink or slow the growth of the cancer, it's not yet clear if any of these drugs can be curative.

Sorafenib (Nexavar)

This drug has been shown to slow the progression of the cancer in some patients with advanced disease. It acts by blocking both angiogenesis and growth-stimulating molecules in the cancer cell. It is taken in pill form. The most common side effects seen with this drug include rash, diarrhea, increases in blood pressure, and redness, pain, swelling, or blisters on the palms of the hands or soles of the feet.

Sunitinib (Sutent)

This drug is a pill that has been shown to shrink or slow the progression of kidney cancer in many cases. It attacks both blood vessel growth and other targets that stimulate cancer cell growth. The most common side effects are nausea, diarrhea, changes in skin or hair color, mouth sores, weakness, and low white blood cell counts. Other possible effects include tiredness, high blood pressure, bleeding, and low thyroid hormone levels.

Temsirolimus (Torisel)

Temsirolimus is given as an intravenous (IV) infusion. It works by blocking a cell protein known as mTOR, which normally promotes cell growth and division. This drug has been shown to be helpful against advanced kidney cancers that have a poorer prognosis because of certain factors. The most common side effects of this drug include skin rash, weakness, mouth sores, nausea, loss of appetite, fluid buildup in the face or legs, and increases in blood sugar and cholesterol levels. Rarely, more serious side effects have been reported.

Bevacizumab (Avastin)

This is an IV drug that works by slowing the growth of new blood vessels. Recent studies have shown it may be helpful against kidney cancer, especially when used along with interferon-alpha. It is not FDA approved for use against kidney cancer at this time, although it is approved for use against other cancers, and doctors can prescribe it for use in kidney cancer. But this drug is expensive, and not all insurance companies may cover the cost. If you are considering taking this drug, it is important to know beforehand whether or not your insurance will cover it.

Doctors are still learning the best ways to use these targeted drugs against advanced kidney cancers. As of now, they are most often used one at a time. If one doesn't work, another may be tried. It's not yet known if any one of these drugs is clearly better than the others, or if combining them might be more helpful than giving them one at a time. Studies are under way to help answer these questions.

Biologic Therapy (Immunotherapy)

The goal of biologic therapy is to boost the body's immune system to more effectively fight off or destroy cancer cells. Until recently, this was the most common first-line therapy for advanced kidney cancer, and it may still be helpful for some people. Because biologic therapy can be hard to give and can cause serious side effects, some doctors now reserve it for people who cancers don't respond to targeted therapies.

The main immunotherapy drugs used in kidney cancer are cytokines (proteins that activate the immune system). The 2 cytokines most often used are interleukin-2 (IL-2) and interferon-alpha. Both cytokines cause these cancers to shrink to less than half their original size in about 10% to 20% of patients. Patients who respond to IL-2 tend to have lasting responses.

Combining low doses of both cytokines was once thought to be as effective as high-dose IL-2, with fewer and less severe side effects, but recent studies have not supported this. Most doctors think that high-dose IL-2 has a better chance of shrinking the cancer.

The possible side effects of cytokine therapy, especially high-dose IL-2, include:

- extreme fatigue
- low blood pressure
- fluid buildup in the lungs
- trouble breathing
- kidney damage
- heart attacks
- intestinal bleeding
- diarrhea or abdominal pain
- high fever and chills

- rapid heart beat
- mental changes

These side effects are often severe and, rarely, can be fatal. For this reason, they are not used in people who are in poor overall health to begin with. Only doctors experienced in the use of these cytokines should give this treatment.

Cytokines can also be used as part of some experimental immunotherapy techniques. These are described in the section, "What's New in Kidney Cancer Research and Treatment?"

Chemotherapy

Chemotherapy uses anti-cancer drugs that are given into a vein or by mouth (in pill form). These drugs enter your bloodstream and reach all areas of the body, which makes this treatment potentially useful for cancer that has spread (metastasized) to organs beyond the kidney.

Unfortunately, kidney cancer cells are usually resistant to chemotherapy, and there is no standard way to treat it with these drugs. Some drugs, such as vinblastine, floxuridine, 5-fluorouracil (5-FU), capecitabine, and gemcitabine have been shown to help a small number of patients. Still, chemotherapy is often reserved for cancers in which targeted drugs and/or immunotherapy are not effective.

Possible Side Effects

Chemotherapy drugs work by attacking cells that are dividing quickly, which is why they often work against cancer cells. But other cells in the body, such as those in the bone marrow, the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells are also likely to be affected by chemotherapy, which can lead to side effects.

The side effects of chemotherapy depend on the type of drugs, the amount taken, and the length of treatment. Possible side effects can include:

- hair loss
- mouth sores
- loss of appetite
- nausea and vomiting
- increased chance of infections (due to low white blood cell counts)
- easy bruising or bleeding (due to low blood platelet counts)
- fatigue (due to low red blood cell counts)

These side effects are usually short-term and go away after treatment is finished. There are often ways to lessen these side effects. For example, drugs can be given to help prevent or reduce nausea and vomiting.

Pain Control

Pain is a concern for some patients with advanced kidney cancer. It is important to let your doctor know about any pain you might have so that it can be treated. Unless your doctor knows about your pain, he or she can't help you.

There are many different forms of pain medicine, ranging from over-the-counter pain relievers to stronger drugs like morphine or other opioids. For treatment to be effective, the pain medicines must be taken on a regular schedule, not just when the pain becomes severe. Several long-acting forms of morphine and other long-acting opioid drugs have been developed that need only be given once or twice a day.

In some cases, palliative surgery or radiation therapy may be helpful in relieving pain caused by cancer spreading to certain areas. In people whose cancer has spread to the bones, drugs called bisphosphonates may be helpful.

Clinical Trials

You have had to make a lot of decisions since you've been told you have cancer. One of the most important decisions you will make is deciding which treatment is best for you. You may have heard about clinical trials being done for your type of cancer. Or maybe someone on your health care team has mentioned a clinical trial to you. Clinical trials are one way to get state-of-the art cancer care. Still, they are not right for everyone.

Here we will give you a brief review of clinical trials. Talking to your health care team, your family, and your friends can help you make the best treatment choice for you.

What Are Clinical Trials?

Clinical trials are carefully controlled research studies that are done with patients. These studies test whether a new treatment is safe and how well it works in patients, or they may test new ways to diagnose or prevent a disease. Clinical trials have led to many advances in cancer prevention, diagnosis, and treatment.

The Purpose of Clinical Trials

Clinical trials are done to get a closer look at promising new treatments or procedures in patients. A clinical trial is only done when there is good reason to believe that the treatment, test, or procedure being studied may be better than the one used now. Treatments used in clinical trials are often found to have real benefits and may go on to become tomorrow's standard treatment.

Clinical trials can focus on many things, such as:

- new uses of drugs that are already approved by the US Food and Drug Administration (FDA)
- new drugs that have not yet been approved by the FDA
- non-drug treatments (such as radiation therapy)
- medical procedures (such as types of surgery)
- herbs and vitamins
- tools to improve the ways medicines or diagnostic tests are used
- medicines or procedures to relieve symptoms or improve comfort
- combinations of treatments and procedures

Researchers conduct studies of new treatments to try to answer the following questions:

- Is the treatment helpful?
- What's the best way to give it?
- Does it work better than other treatments already available?
- What side effects does the treatment cause?
- Are there more or fewer side effects than the standard treatment used now?
- Do the benefits outweigh the side effects?
- In which patients is the treatment most likely to be helpful?

Phases of Clinical Trials

There are 4 phases of clinical trials, which are numbered I, II, III, and IV. We will use the example of testing a new cancer treatment drug to look at what each phase is like.

Phase I clinical trials: The purpose of a phase I study is to find the best way to give a new treatment safely to patients. The cancer care team closely watches patients for any harmful side effects.

For phase I studies, the drug has already been tested in lab and animal studies, but the side effects in patients are not fully known. Doctors start by giving very low doses of the drug to the first patients and increase the doses for later groups of patients until side effects appear or the desired effect is seen. Doctors are hoping to help patients, but the main purpose of a phase I trial is to test the safety of the drug.

Phase I clinical trials are often done in small groups of people with different cancers that have not responded to standard treatment, or that keep coming back (recurring) after treatment. If a drug is found to be reasonably safe in phase I studies, it can be tested in a phase II clinical trial.

Phase II clinical trials: These studies are designed to see if the drug works. Patients are given the best dose as determined from phase I studies. They are closely watched for an effect on the cancer. The cancer care team also looks for side effects.

Phase II trials are often done in larger groups of patients with a specific cancer type that has not responded to standard treatment. If a drug is found to be effective in phase II studies, it can be tested in a phase III clinical trial.

Phase III clinical trials: Phase III studies involve large numbers of patients -- most often those who have just been diagnosed with a specific type of cancer. Phase III clinical trials may enroll thousands of patients.

Often, these studies are randomized. This means that patients are randomly put in one of two (or more) groups. One group (called the control group) gets the standard, most accepted treatment. Another group (or more than one group) will get the new treatment being studied. All patients in phase III studies are closely watched. The study will be stopped early if the side effects of the new treatment are too severe or if one group has much better results than the others.

Phase III clinical trials are usually needed before the FDA will approve a treatment for use by the general public.

Phase IV clinical trials: Once a drug has been approved by the FDA and is available for all patients, it is still studied in other clinical trials (sometimes referred to as phase IV studies). This way more can be learned about short-term and long-term side effects and safety as the drug is used in larger numbers of patients with many types of diseases. Doctors can also learn more about how well the drug works, and if it might be helpful when used in other ways (such as in combination with other treatments).

What It Will Be Like to Be in a Clinical Trial

If you are in a clinical trial, you will have a team of experts taking care of you and watching your progress very carefully. Depending on the phase of the clinical trial, you may receive more attention (such as having more doctor visits and lab tests) than you would if you were treated outside of a clinical trial. Clinical trials are specially designed to pay close attention to you.

However, there are some risks. No one involved in the study knows in advance whether the treatment will work or exactly what side effects will occur. That is what the study is designed

to find out. While most side effects go away in time, some may be long-lasting or even life threatening. Keep in mind, though, that even standard treatments have side effects. Depending on many factors, you may decide to enter (enroll in) a clinical trial.

Deciding to Enter a Clinical Trial

If you would like to take part in a clinical trial, you should begin by asking your doctor if your clinic or hospital conducts clinical trials. There are requirements you must meet to take part in any clinical trial. But whether or not you enter (enroll in) a clinical trial is completely up to you.

Your doctors and nurses will explain the study to you in detail. They will go over the possible risks and benefits and give you a form to read and sign. The form says that you understand the clinical trial and want to take part in it. This process is known as giving your informed consent. Even after reading and signing the form and after the clinical trial begins, you are free to leave the study at any time, for any reason. Taking part in a clinical trial does not keep you from getting any other medical care you may need.

To find out more about clinical trials, talk to your cancer care team. Here are some questions you might ask:

- Is there a clinical trial that I could take part in?
- What is the purpose of the study?
- What kinds of tests and treatments does the study involve?
- What does this treatment do? Has it been used before?
- Will I know which treatment I receive?
- What is likely to happen in my case with, or without, this new treatment?
- What are my other choices and their pros and cons?
- How could the study affect my daily life?
- What side effects can I expect from the study? Can the side effects be controlled?
- Will I have to stay in the hospital? If so, how often and for how long?
- Will the study cost me anything? Will any of the treatment be free?
- If I am harmed as a result of the research, what treatment would I be entitled to?
- What type of long-term follow-up care is part of the study?
- Has the treatment been used to treat other types of cancers?

How Can I Find Out More About Clinical Trials That Might Be Right for Me?

The American Cancer Society offers a clinical trials matching service for patients, their family, and friends. You can reach this service at 1-800-303-5691 or on our Web site at http://clinicaltrials.cancer.org.

Based on the information you give about your cancer type, stage, and previous treatments, this service can put together a list of clinical trials that match your medical needs. The service will also ask where you live and whether you are willing to travel so that it can look for a treatment center that you can get to.

You can also get a list of current clinical trials by calling the National Cancer Institute's Cancer Information Service toll free at 1-800-4-CANCER (1-800-422-6237) or by visiting the NCI clinical trials Web site at www.cancer.gov/clinicaltrials.

For even more information on clinical trials, the American Cancer Society has a document called *Clinical Trials: What You Need to Know.* You can read this on the Web site, www.cancer.org, or have it sent to you by calling 1-800-ACS-2345.

Complementary and Alternative Therapies

When you have cancer you are likely to hear about ways to treat your cancer or relieve symptoms that are different from mainstream (standard) medical treatment. These methods can include vitamins, herbs, and special diets, or methods such as acupuncture or massage -- among many others. You may have a lot of questions about these treatments. Here are some you may have thought of already:

- How do I know if a non-standard treatment is safe?
- How do I know if it works?
- Should I try one or more of these treatments?
- What does my doctor know/think about these methods? Should I tell the doctor that I'm thinking about trying them?
- Will these treatments cause a problem with my standard medical treatment?
- What is the difference between "complementary" and "alternative" methods?
- Where can I find out more about these treatments?

The Terms Can Be Confusing

Not everyone uses these terms the same way, so it can be confusing. The American Cancer Society uses *complementary* to refer to medicines or methods that are used *along with* your regular medical care. *Alternative* medicine is a treatment used *instead of* standard medical treatment.

Complementary methods: Complementary treatment methods, for the most part, are not presented as cures for cancer. Most often they are used to help you feel better. Some methods that can be used in a complementary way are meditation to reduce stress, acupuncture to relieve pain or peppermint tea to relieve nausea. There are many others. Some of these methods are known to help, while others have not been tested. Some have been proven not be

helpful. A few have even been found harmful. However, some of these methods may add to your comfort and well-being.

There are many complementary methods that you can safely use right along with your medical treatment to help relieve symptoms or side effects, to ease pain, and to help you enjoy life more. For example, some people find methods such as aromatherapy, massage therapy, meditation, or yoga to be useful.

Alternative treatments: Alternative treatments are those that are used instead of standard medical care. These treatments have not been proven safe and effective in clinical trials. Some of these methods may even be dangerous and some have life-threatening side effects. The biggest danger in most cases is that you may lose the chance to benefit from standard treatment. Delays or interruptions in your standard medical treatment may give the cancer more time to grow.

Deciding What to Do

It is easy to see why people with cancer may consider alternative methods. You want to do all you can to fight the cancer. Sometimes mainstream treatments such as chemotherapy can be hard to take, or they may no longer be working.

Sometimes people suggest that their method can cure your cancer without having serious side effects, and it's normal to want to believe them. But the truth is that most non-standard methods of treatment have not been tested and proven to be effective for treating cancer.

As you consider your options, here are 3 important steps you can take:

- Talk to your doctor or nurse about any method you are thinking about using.
- Check the list of "red flags" below.
- Contact the American Cancer Society at 1-800-ACS-2345 to learn more about complementary and alternative methods in general and to learn more about the specific methods you are thinking about.

Red Flags

You can use the questions below to spot treatments or methods to avoid. A "yes" answer to any one of these questions should raise a "red flag."

- Does the treatment promise a cure for all or most cancers?
- Are you told not to use standard medical treatment?
- Is the treatment or drug a "secret" that only certain people can give?
- Does the treatment require you to travel to another country?
- Do the promoters attack the medical or scientific community?

The Decision Is Yours

Decisions about how to treat or manage your cancer are always yours to make. If you are thinking about using a complementary or alternative method, be sure to learn about the method and talk to your doctor about it. With reliable information and the support of your health care team, you may be able to safely use the methods that can help you while avoiding those that could be harmful.

Treatment Choices by Stage

The type of treatment(s) your doctor recommends will depend on the stage of the cancer and on your overall health. This section summarizes options usually considered for each stage of kidney cancer.

Stage I, II, or III

These cancers are usually removed surgically when possible. Radical nephrectomy is usually the operation of choice. If you have a smaller stage I tumor, have only one good kidney, have cancer in both kidneys, or have an inherited condition like von Hippel-Lindau (VHL) disease, a partial nephrectomy may be an option. For larger or more extensive tumors, radical nephrectomy is more likely than partial nephrectomy to be curative. Some patients may have an arterial embolization before surgery to reduce the amount of bleeding during nephrectomy. Lymph nodes around the kidneys may be removed as well. If the cancer has grown into nearby veins (as with some stage III cancers), the surgeon may cut open these veins, remove the cancer, and repair the vein.

Other than as part of a clinical trial, *adjuvant* (additional) treatments such as targeted therapy, chemotherapy, radiation therapy, or immunotherapy are usually not recommended after surgery, as the benefit of additional therapy has not been proven.

If you cannot have kidney surgery because of other serious medical problems, you may benefit from other local treatments such as cryotherapy, radiofrequency ablation, radiation therapy, or arterial embolization, although they are much less likely than surgery to cure the cancer.

Stage IV

Treatment of stage IV kidney cancer depends on how extensive the cancer is and on a person's general health. In some cases, surgery may still play a role in treatment.

In rare cases where the main tumor appears to be removable and the cancer has only spread to one other area (such as to one or a few spots in the lungs), surgery to remove both the kidney and the metastasis may be an option if a person is in good enough health. Otherwise, treatment with one of the targeted therapies would likely be the first option.

If the main tumor is removable but the cancer has spread extensively elsewhere, removing the kidney may still be helpful. This would likely be followed by systemic therapy, which might consist of one of the targeted therapies or cytokine therapy (IL-2 or interferon). It's not clear if any one of the targeted therapies is better than the others, although temsirolimus appears to be most useful in people with kidney cancers that have a poorer prognosis.

For cancers that can't be removed surgically (because of the extent of the tumor or a person's health), first-line treatment would likely be one of the targeted therapies or cytokine therapy.

Because advanced kidney cancer is very hard to cure, clinical trials of new combinations of targeted therapies, immunotherapy, or other new treatments are also options.

For some patients, palliative treatments such as embolization or radiation therapy may be the best option. A special form of radiation therapy called stereotactic radiosurgery (using a Gamma Knife) can be very effective in treating single brain metastases. Surgery or radiation therapy can also be used to help reduce pain or other symptoms of metastases in some other places, such as the bones.

Having your pain controlled appropriately can help you maintain your quality of life. It is important to realize that medicines to relieve pain do not interfere with your other treatments and that controlling pain will often help you be more active and continue your daily activities.

Cancer That Progresses or Recurs (Comes Back) After Treatment

Treatment of kidney cancer that comes back (recurs) after initial treatment depends on where it recurs, what treatments have been used, and on a person's health and wishes for further treatment.

For cancers that recur after initial surgery, further surgery might be an option in some cases. Otherwise, treatment with targeted therapies or immunotherapy will likely be recommended. Clinical trials of new treatments are an option as well.

For cancers that progress (continue to grow or spread) during treatment with a targeted therapy or cytokine therapy, another type of targeted therapy may be helpful, at least for a time. If these don't work chemotherapy may be tried, especially in people with non-clear cell types of kidney cancer. Clinical trials may be a good option in this situation for those who want to continue treatment.

Again, for some patients, palliative treatments such as embolization or radiation therapy may be the best option. Controlling symptoms such as pain is an important part of treatment at any stage of the disease.

More Treatment Information

For more details on treatment options -- including some that may not be addressed in this document -- the National Comprehensive Cancer Network (NCCN) and the National Cancer Institute (NCI) are good sources of information.

The NCCN, made up of experts from many of the nation's leading cancer centers, develops cancer treatment guidelines for doctors to use when treating patients. These are available on the NCCN Web site (www.nccn.org).

The NCI provides treatment guidelines via its telephone information center (1-800-4-CANCER) and its Web site (www.cancer.gov). Detailed guidelines intended for use by cancer care professionals are also available on www.cancer.gov.

What Should You Ask Your Doctor About Kidney Cancer (Renal Cell Carcinoma)?

It is important to have frank, open discussions with your cancer care team. They want to answer all of your questions, no matter how trivial they might seem. For instance, consider asking these questions:

- What kind of kidney cancer do I have?
- Do you think my cancer has spread beyond the primary site?
- What is the stage of my cancer and what does that mean in my case?
- What treatment choices do I have?
- What do you recommend and why?
- Based on what you've learned about my cancer, what is my long-term prognosis (outlook)?
- What risks or side effects are there to the treatments you suggest?
- What are the chances of recurrence of my cancer with these treatment plans?
- What should I do to be ready for treatment?
- How soon should I be treated?
- What type of follow-up will I need after treatment?

Along with these sample questions, be sure to write down some of your own. For example, you might want to know about how long it might take you to recover so that you can plan your work schedule. Or you may want to ask about second opinions or about clinical trials for which you may qualify.

What Happens After Treatment for Kidney Cancer (Renal Cell Carcinoma)?

Completing treatment can be both stressful and exciting. You will be relieved to finish treatment, yet it is hard not to worry about cancer coming back. (When cancer returns, it is called recurrence.) This is a very common concern among those who have had cancer.

It may take a while before your confidence in your own recovery begins to feel real and your fears are somewhat relieved. Even with no recurrences, people who have had cancer learn to live with uncertainty.

Follow-up Care

After your treatment is over, it is very important to keep all follow-up appointments. During these visits, your doctors will ask about symptoms, examine you, and may order blood tests or imaging studies such as CT scans. Follow-up is needed to check for cancer recurrence or spread, as well as possible side effects of certain treatments. This is the time for you to ask your health care team any questions you need answered and to discuss any concerns you might have.

For people whose kidney cancer has been removed by surgery, doctor visits (which include physical exams and blood tests) are usually recommended about every 6 months for the first 2 years after treatment, then yearly for the next several years. A CT scan is usually recommended about 4 to 6 months after surgery and may be repeated at later times if there's reason to suspect the cancer may have returned. (Treatment of recurrent cancer is described in the section, "How Is Kidney Cancer [Renal Cell Carcinoma] Treated?")

Each type of treatment for kidney cancer has side effects that may last for a few months. You may be able to hasten your recovery by being aware of the side effects before you start treatment. You might be able to take steps to reduce them and shorten the length of time they last. Don't hesitate to tell your cancer care team about any symptoms or side effects that bother you so they can help you manage them.

Seeing a New Doctor

At some point after your cancer diagnosis and treatment, you may find yourself in the office of a new doctor. Your original doctor may have moved or retired, or you may have moved or changed doctors for some reason. It is important that you be able to give your new doctor the exact details of your diagnosis and treatment. Make sure you have the following information handy:

- a copy of your pathology report from any biopsy or surgery
- if you had surgery, a copy of your operative report
- if you were hospitalized, a copy of the discharge summary that every doctor must prepare when patients are sent home from the hospital
- finally, since some drugs can have long-term side effects, a list of your drugs (including any chemotherapy drugs), drug doses, and when you took them

It is also important to keep medical insurance. Even though no one wants to think of their cancer coming back, it is always a possibility. If it happens, the last thing you want is to have to worry about paying for treatment.

Lifestyle Changes to Consider During and After Treatment

Having cancer and dealing with treatment can be time-consuming and emotionally draining, but it can also be a time to look at your life in new ways. Maybe you are thinking about how to improve your health over the long term. Some people even begin this process during cancer treatment.

Make Healthier Choices

Think about your life before you learned you had cancer. Were there things you did that might have made you less healthy? Maybe you drank too much alcohol, or ate more than you needed, or smoked, or didn't exercise very often. Emotionally, maybe you kept your feelings bottled up, or maybe you let stressful situations go on too long.

Now is not the time to feel guilty or to blame yourself. However, you can start making changes today that can have positive effects for the rest of your life. Not only will you feel better but you will also be healthier. What better time than now to take advantage of the motivation you have as a result of going through a life-changing experience like having cancer?

You can start by working on those things that you feel most concerned about. Get help with those that are harder for you. For instance, if you are thinking about quitting smoking and need help, call the American Cancer Society's Quitline® tobacco cessation program at 1-800-ACS-2345.

Diet and Nutrition

Eating right can be a challenge for anyone, but it can get even tougher during and after cancer treatment. For instance, treatment often may change your sense of taste. Nausea can be a problem. You may lose your appetite for a while and lose weight when you don't want

to. On the other hand, some people gain weight even without eating more. This can be frustrating, too.

If you are losing weight or have taste problems during treatment, do the best you can with eating and remember that these problems usually improve over time. You may want to ask your cancer team for a referral to a dietitian, an expert in nutrition who can give you ideas on how to fight some of the side effects of your treatment. You may also find it helps to eat small portions every 2 to 3 hours until you feel better and can go back to a more normal schedule.

One of the best things you can do after treatment is to put healthy eating habits into place. You will be surprised at the long-term benefits of some simple changes, like increasing the variety of healthy foods you eat. Try to eat 5 or more servings of vegetables and fruits each day. Choose whole grain foods instead of white flour and sugars. Try to limit meats that are high in fat. Cut back on processed meats like hot dogs, bologna, and bacon. Get rid of them altogether if you can. If you drink alcohol, limit yourself to 1 or 2 drinks a day at the most. And don't forget to get some type of regular exercise. The combination of a good diet and regular exercise will help you maintain a healthy weight and keep you feeling more energetic.

Rest, Fatigue, Work, and Exercise

Fatigue is a very common symptom in people being treated for cancer. This is often not an ordinary type of tiredness but a "bone-weary" exhaustion that doesn't get better with rest. For some, this fatigue lasts a long time after treatment, and can discourage them from physical activity.

However, exercise can actually help you reduce fatigue. Studies have shown that patients who follow an exercise program tailored to their personal needs feel physically and emotionally improved and can cope better.

If you are ill and need to be on bed rest during treatment, it is normal to expect your fitness, endurance, and muscle strength to decline some. Physical therapy can help you maintain strength and range of motion in your muscles, which can help fight fatigue and the sense of depression that sometimes comes with feeling so tired.

Any program of physical activity should fit your own situation. An older person who has never exercised will not be able to take on the same amount of exercise as a 20-year-old who plays tennis 3 times a week. If you haven't exercised in a few years but can still get around, you may want to think about taking short walks.

Talk with your health care team before starting, and get their opinion about your exercise plans. Then, try to get an exercise buddy so that you're not doing it alone. Having family or

friends involved when starting a new exercise program can give you that extra boost of support to keep you going when the push just isn't there.

If you are very tired, though, you will need to balance activity with rest. It is okay to rest when you need to. It is really hard for some people to allow themselves to do that when they are used to working all day or taking care of a household. (For more information about fatigue, please see the publication, *Cancer-Related Fatigue and Anemia Treatment Guidelines for Patients.)*

Exercise can improve your physical and emotional health.

- It improves your cardiovascular (heart and circulation) fitness.
- It strengthens your muscles.
- It reduces fatigue.
- It lowers anxiety and depression.
- It makes you feel generally happier.
- It helps you feel better about yourself.

And long term, we know that exercise plays a role in preventing some cancers. The American Cancer Society, in its guidelines on physical activity for cancer prevention, recommends that adults take part in at least 30 minutes of moderate to vigorous physical activity, above usual activities, on 5 or more days of the week; 45 to 60 minutes of intentional physical activity are preferable. Children and teens are encouraged to try for at least 60 minutes a day of moderate to vigorous physical activity on at least 5 days a week.

How About Your Emotional Health?

Once your treatment ends, you may find yourself overwhelmed by emotions. This happens to a lot of people. You may have been going through so much during treatment that you could only focus on getting through your treatment.

Now you may find that you think about the potential of your own death, or the effect of your cancer on your family, friends, and career. You may also begin to re-evaluate your relationship with your spouse or partner. Unexpected issues may also cause concern -- for instance, as you become healthier and have fewer doctor visits, you will see your health care team less often. That can be a source of anxiety for some.

This is an ideal time to seek out emotional and social support. You need people you can turn to for strength and comfort. Support can come in many forms: family, friends, cancer support groups, church or spiritual groups, online support communities, or individual counselors.

Almost everyone who has been through cancer can benefit from getting some type of support. What's best for you depends on your situation and personality. Some people feel safe in peer-support groups or education groups. Others would rather talk in an informal

setting, such as church. Others may feel more at ease talking one-on-one with a trusted friend or counselor. Whatever your source of strength or comfort, make sure you have a place to go with your concerns.

The cancer journey can feel very lonely. It is not necessary or realistic to go it all by yourself. And your friends and family may feel shut out if you decide not include them. Let them in -- and let in anyone else who you feel may help. If you aren't sure who can help, call your American Cancer Society at 1-800-ACS-2345 and we can put you in touch with an appropriate group or resource.

You can't change the fact that you have had cancer. What you can change is how you live the rest of your life -- making healthy choices and feeling as well as possible, physically and emotionally.

What Happens if Treatment Is No Longer Working?

If cancer continues to grow after one kind of treatment, or if it returns, it is often possible to try another treatment plan that might still cure the cancer, or at least shrink the tumors enough to help you live longer and feel better. On the other hand, when a person has received several different medical treatments and the cancer has not been cured, over time the cancer tends to become resistant to all treatment. At this time it's important to weigh the possible limited benefit of a new treatment against the possible downsides, including continued doctor visits and treatment side effects.

Everyone has his or her own way of looking at this. Some people may want to focus on remaining comfortable during their limited time left.

This is likely to be the most difficult time in your battle with cancer -- when you have tried everything medically within reason and it’s just not working anymore. Although your doctor may offer you new treatment, you need to consider that at some point, continuing treatment is not likely to improve your health or change your prognosis or survival.

If you want to continue treatment to fight your cancer as long as you can, you still need to consider the odds of more treatment having any benefit. In many cases, your doctor can estimate the response rate for the treatment you are considering. Some people are tempted to try more chemotherapy or radiation, for example, even when their doctors say that the odds of benefit are less than 1%. In this situation, you need to think about and understand your reasons for choosing this plan.

No matter what you decide to do, it is important that you be as comfortable as possible. Make sure you are asking for and getting treatment for any symptoms you might have, such as pain. This type of treatment is called "palliative" treatment.

Palliative treatment helps relieve these symptoms, but is not expected to cure the disease; its main purpose is to improve your quality of life. Sometimes, the treatments you get to control your symptoms are similar to the treatments used to treat cancer. For example, radiation therapy might be given to help relieve bone pain from bone metastasis. Or chemotherapy might be given to help shrink a tumor and keep it from causing a bowel obstruction. But this is not the same as receiving treatment to try to cure the cancer.

At some point, you may benefit from hospice care. Most of the time, this is given at home. Your cancer may be causing symptoms or problems that need attention, and hospice focuses on your comfort. You should know that receiving hospice care doesn't mean you can't have treatment for the problems caused by your cancer or other health conditions. It just means that the focus of your care is on living life as fully as possible and feeling as well as you can at this difficult stage of your cancer.

Remember also that maintaining hope is important. Your hope for a cure may not be as bright, but there is still hope for good times with family and friends -- times that are filled with happiness and meaning. In a way, pausing at this time in your cancer treatment is an opportunity to refocus on the most important things in your life. This is the time to do some things you've always wanted to do and to stop doing the things you no longer want to do.

What's New in Kidney Cancer (Renal Cell Carcinoma) Research and Treatment?

There is always research going on in the area of kidney cancer. Scientists are looking for causes of and ways to prevent renal cell carcinoma. Doctors are working to improve treatments as part of a major effort to lower the number of people who die from this cancer.

Research on the treatments for renal cell carcinoma is now being done at many medical centers, university hospitals, and other institutions across the nation. The American Cancer Society supports research into the detection, diagnosis, and treatment of kidney cancer.

Genetics

Scientists are studying several genes that may play a part in changing normal kidney cells into renal cell carcinoma.

For example, problems with the von Hippel-Lindau (VHL) tumor suppressor gene are found in most clear cell kidney cancers. This allows other genes such as the hypoxia-inducible factor (HIF) gene to be activated when they shouldn't be, which drives a cell toward being cancerous. Newer treatments focus on attacking this cellular pathway.

Researchers now also have a better idea of the gene changes responsible for some other forms of kidney cancer. Doctors are now trying to determine which treatments are most

likely to be effective for certain types of kidney cancer. This information can also be used to develop new treatments.

New Approaches to Local Treatment

New surgical approaches are now being tested for use in kidney cancer. For example, some doctors at major medical centers are testing laparoscopic approaches (using long, thin instruments inserted into the body through small openings) to remove only part of a kidney (partial nephrectomy).

Other, newer approaches to destroying small kidney tumors are also being studied, especially for people who are too sick to have surgery:

- Cryosurgery uses a thin probe that is inserted into a tumor and cooled to very low temperatures to create an ice ball to kill the cancer cells. It is probably the most widely used of these techniques at this time.

- Radiofrequency ablation (RFA) involves inserting a metal probe into a tumor and passing an electrical current through it to heat up and destroy the tumor.

- High-intensity focused ultrasound (HIFU) is a fairly new technique that is now being studied for use in kidney cancer. It involves pointing very focused ultrasound beams from outside the body to destroy the tumor.

Research is now under way to determine how useful these techniques are in the long term and to refine them further.

Targeted Therapies

Because chemotherapy drugs have not been very effective against advanced kidney cancer, targeted therapies are now often used as the first-line option to treat kidney cancers that cannot be removed by surgery. At this time they are usually given separately. Clinical trials are now under way to try to determine if combining these drugs, either with each other or with other types of treatment, might be better than using them alone. Several new targeted therapies are now being tested as well.

Immunotherapy

Kidney cancer is one of a handful of cancers that may respond to immunotherapy. Clinical trials of new immunotherapy methods are being tested. Basic research is now being directed toward a better understanding of the immune system, how to activate it, and how it reacts to cancer.

Researchers are studying the use of cytokines to stimulate immune system cells that have been removed from circulating blood. After being mixed with the cytokines in the lab, the activated immune system cells are then injected back into the bloodstream. The hope is that the stimulated immune cells will then seek out and attack the cancer cells. This technique is now under study.

Some researchers have taken this approach further by identifying special immune system cells called tumor-infiltrating lymphocytes (TILs) that can be found within kidney tumors. These cells can be isolated in the tumor after surgery. Researchers are looking to stimulate these immune cells by exposing them to cytokines in the lab and then returning them to the body in the hope that they will attack the cancer cells. Research in this area is ongoing.

Vaccines

Several types of vaccines for boosting the body's immune response to kidney cancer cells are being tested in clinical trials. Unlike vaccines against infections like measles or mumps, these vaccines are designed to help treat, not prevent, kidney cancer. One possible advantage of these types of treatments is that they seem to have very limited side effects.

There are several ways to create vaccines that might stimulate the immune system. In one approach, cancer cells (removed during surgery) are altered in the lab to make them more likely to cause an immune response and are then returned to the body. In another approach, a special virus is altered so it is no longer infectious, but it carries a gene for a protein often found on cancer cells. Once the virus is injected into the body, the hope is that the protein will cause the immune system to react against cancer cells anywhere in the body.

At this time, these vaccines are only available in clinical trials.

Bone Marrow or Peripheral Blood Stem Cell Transplant

In people with advanced kidney cancer, the person's own immune system is not effectively controlling the cancer. Another approach to immunotherapy is to try to use someone else's immune system to attack the cancer cells.

First, very primitive immune system cells (called stem cells) are collected from a compatible donor, either from their bone marrow or their blood. The person with cancer is then treated with chemotherapy drugs, either in low doses to suppress the immune system or in higher doses to wipe out the immune system. They are then given the stem cells to try to build a new immune system that will be more likely to attack the cancer cells.

Some early studies of this technique have been promising, finding that it may help shrink kidney cancers in some people. But it can also cause major complications, and side effects

can be severe. Until more is known about its safety and usefulness, it will likely only be available in clinical trials.

Additional Resources

More Information From Your American Cancer Society

The following related information may also be helpful to you. These materials may be ordered from our toll-free number, 1-800-ACS-2345 (1-800-227-2345).

After Diagnosis: A Guide for Patients and Families (also available in Spanish)

Home Care for the Person With Cancer: A Guide for Patients and Families (also available in Spanish)

Immunotherapy

Living With Uncertainty: The Fear of Cancer Recurrence

Pain Control: A Guide for People With Cancer and Their Families (also available in Spanish)

National Organizations and Web Sites*

In addition to the American Cancer Society, other sources of patient information and support include:

American Urological Association
Telephone: 1-866-746-4282
Internet Address: www.urologyhealth.org

Kidney Cancer Association
Telephone: 1-800-850-9132 or 1-847-332-1051
Internet Address: www.kidneycancer.org

National Cancer Institute
Telephone: 1-800-4-CANCER (1-800-422-6237)
Internet Address: www.cancer.gov

VHL Family Alliance
Telephone: 1-800-767-4845 or 1-617-277-5667
Internet Address: www.vhl.org

**Inclusion on this list does not imply endorsement by the American Cancer Society.*

The American Cancer Society is happy to address almost any cancer-related topic. If you have any more questions, please call us at 1-800-ACS-2345 at any time, 24 hours a day.

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