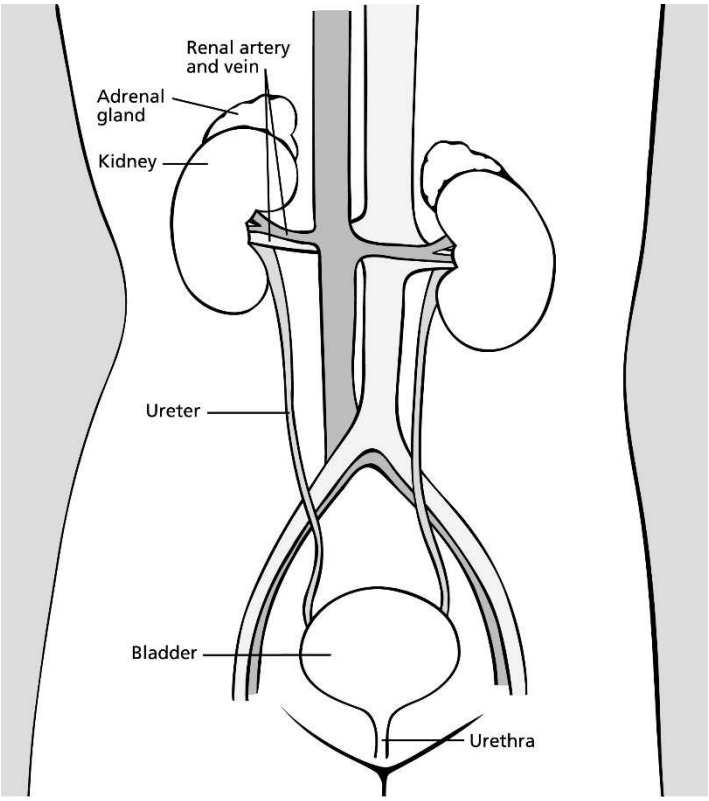
Adrenal Cancer

Cancer starts when cells in the body begin to grow out of control. Cells in nearly any part of the body can become cancer, and can spread to other areas of the body. To learn more about how cancers start and spread, see *What Is Cancer?*

What is adrenal cancer?

About the adrenal glands

The adrenals are small glands that sit above each of the kidneys. The kidneys are located deep inside the upper part of the abdomen.



The adrenal gland has 2 parts. The outer part, called the *cortex*, is where most tumors develop. The function of the cortex is to make certain hormones for the body. These hormones all have a similar chemical structure and are called *steroids*. They include:

- *Cortisol* causes changes in metabolism that help the body to handle stress.
- *Aldosterone* helps the kidneys regulate the amount of salt in the blood and helps regulate blood pressure.
- *Adrenal androgens* are hormones which can be converted to more common forms of the sex hormones estrogen and testosterone in other parts of the body. The amount of these hormones that result from conversion of adrenal androgens is small compared to what is made in other parts of the body. The testicles produce most of the androgens (male hormones) in men. The ovaries produce most of the estrogens (female hormones) in women.

The inner part of the adrenal gland, called the *medulla*, is really an extension of the nervous system. Nervous system hormones such as *norepinephrine* and *epinephrine* (also called *adrenaline*) are made in the medulla. Tumors and cancers that start in the adrenal medulla include *pheochromocytomas* (which are most often benign) and *neuroblastomas*.

This document is about tumors and cancers of the adrenal cortex. It does not discuss tumors of the adrenal medulla. *Neuroblastomas* are covered in a separate document.

Adrenal cortex tumors

There are 2 main types of adrenal cortex tumors: benign (non-cancerous) and malignant (cancers). Most of these tumors are benign and are called *adenomas*. Cancers of the adrenal cortex are rare. These 2 types of tumors can sometimes be hard to tell apart when the cells are looked at under the microscope. Although experienced pathologists (doctors that are trained to diagnose diseases by looking at tissue under the microscope) can tell the difference in most cases, sometimes the only way to know for sure that the tumor is a cancer is when it spreads. If it spreads to lymph nodes or other organs and tissues, it is a cancer. Adenomas do not spread outside the adrenal gland.

Adrenal cortex adenomas

Most tumors of the adrenal cortex are not cancer. They are benign tumors known as *adenomas*. These tumors are small, usually less than 2 inches (5 centimeters) across. They usually occur in only a single adrenal gland, but sometimes affect both.

Most people with adrenal adenomas have no symptoms and are unaware that they have an adrenal tumor. Some of these adenomas are discovered by accident (incidentally) when CT or MRI scans of the abdomen are done because of an unrelated health problem. About 5% of people who have a CT scan of the abdomen are found to have an adrenal tumor that was not suspected. Many of these are nonfunctional, meaning that they don't

make adrenal hormones. Sometimes these tumors are known by the nickname *incidentalomas* because they aren't causing problems and were only found by accident.

Some adenomas produce too much adrenal steroid hormones. Sometimes the excess hormone can cause symptoms. Many of the hormone-related symptoms of adenomas are the same as those from adrenal carcinomas (cancers). These symptoms are discussed in the section, “Signs and symptoms of adrenal cancer.” Adenomas are much more likely than carcinomas to produce high levels of aldosterone, which can cause high blood pressure.

Treatment: Adenomas can be cured by removing the adrenal gland that contains the adenoma. Some adrenal adenomas that cause hormone-related symptoms can be treated effectively with medicines to block the production or actions of these hormones. This may be the best treatment choice for patients with other serious medical problems who might not be able to withstand a major operation.

The treatment of incidentalomas depends on the chance that it may be a cancer and whether or not it is raising hormone levels. When an adrenal tumor is found accidentally, tests are often done to see if it is making hormones. If it is, surgery is often recommended. Otherwise, surgery may only be recommended if it is likely to be a cancer. Small tumors are less likely to be cancer, and are often watched but not treated. The CT (or MRI) scan can be repeated in 6 to 24 months to see if the tumor has grown. If it has, it may need to be removed. If it hasn't grown, hormone levels will be watched over the next few years. If the tumor remains small and doesn't make any hormones, it may not need to be treated at all.

The remainder of this document refers to adrenal cancers only, and not to adenomas.

Adrenal cortical cancer

The type of cancer that develops in the cortex of the adrenal gland is called *adrenal cortical carcinoma*. It is also known as *adrenocortical cancer* (or carcinoma) or just *adrenal cancer*. In this document, the term adrenal cancer is used to mean cancer that starts in the adrenal cortex.

Adrenal cancer most often is discovered when:

- It is found accidentally on an imaging test done looking for something else.
- It produces hormones that cause changes such as weight gain and fluid retention, early puberty in children, or excess facial or body hair growth in women.
- It starts causing symptoms because it has gotten very large. Large tumors can press on other organs in the abdomen, causing pain or a feeling of fullness. Generally, adrenal cancers are much larger than adrenal adenomas. An adrenal tumor larger than 5 or 6 centimeters (about 2 to 2 1/2 inches) is assumed to be a cancer. In one study, the average size of an adrenal cancer was about 13 cm (or 5 inches).

Most cancers found in the adrenal gland did not start there and are not adrenal cancers. Instead, they start in other organs or tissues and then spread (metastasize) through the bloodstream to the adrenal glands. For example, lung cancers, melanomas, and breast cancers often spread to the adrenals. Even when other cancers spread to the adrenals; however, they are still named after the place they started and are treated like other cancers that start in the same place. They are not considered adrenal cancer. Their treatment is described in our documents on these cancers.

What are the key statistics about adrenal cancer?

Adrenal carcinomas are very rare and the real number diagnosed in the United States is not known. It is probably around 200 per year. They are much less common than benign adrenal tumors (adenomas), which are found fairly often among middle aged and elderly people. Adrenal tumors (most of which are adenomas) are found in about one in every 10 people who have an imaging test (like a CT or MRI) of the adrenal gland.

The average age of patients with adrenal cancer is around 46, but adrenal cortical cancer can occur in people of any age; even in children.

What are the risk factors for adrenal cancer?

A risk factor is anything that changes your chance of getting a disease such as cancer. Different cancers have different risk factors. Some risk factors, like smoking, can be changed. Others, like a person's age or family history, can't be changed.

Scientists have found few risk factors that make a person more likely to develop adrenal gland tumors. Even if a patient does have one or more risk factors for adrenal gland tumors, it is impossible to know for sure how much that risk factor contributed to causing the cancer.

But having a risk factor, or even several, does not mean that you will get the disease. Many people with risk factors never develop adrenal cancer, while others with this disease may have few or no known risk factors.

Genetic syndromes

The vast majority of adrenal cortex cancers are sporadic (not inherited), but some (up to 15%) are caused by a genetic defect. This is more common in adrenal cancers in children.

Li-Fraumeni syndrome

The Li-Fraumeni syndrome is a rare condition which is most often caused by a defect in the *TP53* gene. People with this syndrome have a high risk of several types of cancers, including include breast cancer, bone cancer, brain cancer, and adrenal cortex cancer.

Beckwith-Wiedemann syndrome

People with this problem have large tongues, are large themselves, and have an increased risk for developing cancers of the kidney, liver, and adrenal cortex.

Multiple endocrine neoplasia (MEN1)

People with MEN1 have a very high risk of developing tumors of 3 glands: the pituitary, parathyroid, and pancreas. About one-third to one-half of people with this condition also develop adrenal adenomas or enlarged adrenal glands. These usually do not cause any symptoms. This syndrome is caused by defects in a gene called *MEN1*. People who have a family history of MEN1 or pituitary, parathyroid, pancreas, or adrenal cancers should ask their doctor if they might benefit from genetic counseling.

Familial adenomatous polyposis (FAP)

People with this syndrome develop hundreds of polyps in the large intestine. These polyps will lead to colon cancer if the colon is not removed. FAP also increases the risk of other cancers, and may increase the risk for adrenal cancer. Still, most adrenal tumors in patients with FAP are benign adenomas. This syndrome is caused by defects in a gene called *APC*.

Hereditary nonpolyposis colorectal cancer

Patients with hereditary nonpolyposis colorectal cancer (HNPCC, also called *Lynch syndrome*) have a high risk of colorectal cancer as well as, in women, endometrial cancer. They also have an increased risk of some other cancers, including cancer of the adrenal cortex.

In most cases, this disorder is caused by an inherited defect in either the gene *MLH1* or the gene *MSH2*, but other genes can also cause HNPCC. HNPCC is discussed in more detail in our document *Colorectal Cancer*.

Lifestyle and environmental factors

Risk factors such as a high-fat diet, smoking, sedentary lifestyle, and exposure to cancer-causing substances in the environment have a great impact on a person's risk of developing many types of cancer. Although none of these factors has been definitely found to influence a person's risk of developing adrenal cancer, smoking has been suggested as a risk factor by some researchers.

Do we know what causes adrenal cancer?

We do not know exactly what causes most adrenal cortical tumors. Over the past several years, experts have made great progress in understanding how certain changes in a person's DNA can cause cells in the adrenal gland to become cancerous. DNA is the

molecule that carries the instructions for nearly everything our cells do. We usually look like our parents because they are the source of our DNA. However, DNA affects more than the way we look. It also determines our risk for developing certain diseases, including some types of cancer.

Some genes (parts of our DNA) control when our cells grow and divide. Some genes that promote cell division are called *oncogenes*. Other genes that slow down cancer cell division or make them die are called *tumor suppressor genes*. We know that cancers can be caused by DNA mutations (changes) that turn on oncogenes or turn off tumor suppressor genes. Some people with cancer have DNA mutations they inherited from a parent, which increase their risk for developing the disease. But most DNA mutations that are seen in cancers happen during life rather than having been inherited. These mutations may result from exposure to radiation or carcinogens (cancer-causing chemicals). But most of these mutations happen for no apparent reason.

The DNA mutations that cause tumors in people with the genetic syndromes discussed in the previous section have been identified. Overall though, these rarely cause adrenal cortical cancer. However, because adrenal cancer is so rare, if you have adrenal cancer, it may be worthwhile to consider genetic testing to find out if you have one of these syndromes. If you do, you (and your family members) may have an increased risk to develop other cancers also.

The Li-Fraumeni syndrome is caused by inherited mutations that inactivate the p53 tumor suppressor gene. This syndrome causes few cases of adrenal cancer in adults (1 of every 20), but is often the cause of adrenal cancer in children. In fact, about 8 of every 10 cases of adrenal cancer in children are caused by Li-Fraumeni syndrome. Many other adrenal cancers have also been found to have abnormal p53 genes that were acquired after birth (not inherited).

Can adrenal cancer be prevented?

Since there are no known preventable risk factors for this cancer, it is not now possible to prevent this disease, specifically. Not smoking is a way to lower the risk for many cancers, and perhaps even adrenal cortical cancer.

Can adrenal cancer be found early?

It is hard to find adrenal carcinomas early and they are often quite large when diagnosed. Adrenal carcinomas are often found earlier in children than in adults because adrenal cancers in children more commonly secrete hormones. Children will show outward signs of excess hormone production early. For example they may develop very early signs of puberty due to the sex hormones that sometimes are produced by adrenal cancer. In adults, these tumors may be found early by accident, when a CT (computed tomography) scan is done for some other health concern.

The American Cancer Society has official recommendations for the early detection of several types of cancer. Because adrenal cancers occur so rarely, the Society does not recommend routine testing for this cancer in people without any symptoms.

Signs and symptoms of adrenal cancers

In about half of people with adrenal cancer, symptoms are caused by the hormones made by the tumor. In the other half, symptoms occur because the tumor has grown so large that it presses on nearby organs. If you or your child has any of the signs or symptoms described in this section, discuss them with your doctor without delay. These symptoms may be caused by an adrenal tumor or by something else. Getting the proper medical tests is the only way to find out. The sooner you get a correct diagnosis, the sooner you can start treatment and the more effective your treatment will be.

Symptoms caused by androgen or estrogen production

In children, the symptoms are most often caused by the *androgens* (male-type hormones) that the tumor might secrete. The most common symptoms are excessive growth of facial and body hair (such as in the pubic and underarm areas). Male hormones may also enlarge the penis in boys or the clitoris in girls.

If the tumor secretes estrogens (female-type hormones), girls can start puberty early. This can cause the breasts to develop and menstrual periods to start. Estrogen-producing tumors also may enlarge breasts in boys.

The symptoms from high levels of sex hormones are less noticeable in adults because they have already gone through puberty and have breasts and adult patterns of body hair. Women with estrogen-producing tumors and men with androgen-producing tumors usually do not have any symptoms from the hormones, and so may have no symptoms until the tumor is large enough to press on nearby organs.

Symptoms are easier to notice if the tumor is making the hormone usually found in the opposite sex. For example, men with tumors that make estrogen (female hormone) may notice breast enlargement with tenderness. They may also have sexual problems such as erectile dysfunction (impotence) and loss of sex drive. Women with tumors that make androgens (male hormones) may notice excessive facial and body hair growth, receding hairline, irregular menstrual periods, and deepening of their voice.

Symptoms caused by cortisol production

Excessive levels of cortisol causes a problem known as *Cushing syndrome*. Some people have all of these symptoms, but many people with high cortisol levels have only 1 or 2 symptoms. These signs and symptoms include:

- Weight gain, usually greatest above the collar bone and around the abdomen
- Fat deposits behind the neck and shoulders

- Purple stretch marks on the abdomen
- Excessive hair growth on the face, chest, and back in women
- Menstrual irregularities
- Weakness and loss of muscle mass in the legs
- Easy bruising
- Depression and/or moodiness
- Weakened bones (osteoporosis), which can lead to fractures
- High blood sugar, often leading to diabetes
- High blood pressure

Cushing syndrome may be caused by an adrenal cancer or an adrenal adenoma that produces high levels of cortisol and/or related hormones. Benign pituitary gland tumors can produce high levels of another hormone called *adrenocorticotropic hormone* (ACTH). This is often called *Cushing disease*. The high levels of ACTH in turn cause normal adrenal gland tissue to produce more cortisol. This results in the same symptoms as Cushing syndrome. Very rarely ACTH can be produced by other tumors and cause the same symptoms.

Some people with immune system problems or some cancers, such as lymphomas, are treated with drugs chemically related to cortisol. Because there are so many causes of high cortisol levels that can lead to Cushing syndrome, doctors do a number of blood tests, urine tests, and imaging tests to find out whether the patient has an adrenal cortical tumor or some other cause of Cushing syndrome.

Symptoms caused by aldosterone production

The main signs and symptoms caused by aldosterone-producing adrenal tumors are:

- High blood pressure
- Weakness
- Muscle cramps
- Low blood potassium levels

Adrenal adenomas often produce aldosterone, but adrenal cancers rarely do so.

Symptoms caused by a large adrenal cancer pressing on nearby organs

As an adrenal cancer grows, it presses on nearby organs and tissues. This may cause pain near the tumor, a feeling of fullness in the abdomen, or trouble eating because of a feeling of filling up easily.

How is adrenal cancer diagnosed?

Medical history and physical exam

The first step is for the doctor to take your complete medical history to check for any symptoms. Your doctor will want to know if anyone in your family has had adrenal cancer or any other type of cancer. Your doctor will also ask about your menstrual or sexual function and about any other symptoms that you may be having. A physical exam will give other information about signs of adrenal gland cancer and other health problems. Your doctor will thoroughly examine your abdomen for evidence of a tumor (or mass).

Your blood and urine will be tested to look for high levels of the hormones produced by some adrenal adenomas and carcinomas. If an adrenal tumor or cancer is suspected, imaging tests will be done to look for a tumor. These tests can also help see if it has spread.

If a mass is seen on an imaging test and it is likely to be an adrenal cancer, doctors will recommend surgery to remove the cancer. Generally, doctors do not recommend a biopsy (removing a sample of the tumor to look at under the microscope to see if it is cancer) before surgery to remove the tumor. That is because doing a biopsy can increase the risk that an adrenal cancer will spread outside of the adrenal gland.

Imaging tests

Chest x-ray

This can show if the cancer has spread to the lungs. It may also be useful to determine if there are any serious lung or heart diseases.

Ultrasound

Ultrasound tests use sound waves to take pictures of parts of the body. A device called a *transducer* produces the sound waves, which are reflected by tissues of nearby organs. The pattern of sound wave echoes is detected by the transducer and analyzed by a computer to create an image of these tissues and organs. This test can show if there is a tumor mass in the adrenal gland. It can also diagnose tumor masses in the liver if the

cancer has spread there. In general, it is not used to look for adrenal tumors unless a CT scan isn't able to be done.

Computed tomography (CT)

CT scans show the adrenal glands fairly clearly and often can confirm the location of the cancer. It can also help show whether your cancer has spread into your liver or other organs nearby. CT scans can also show lymph nodes and distant organs where metastatic cancer might be present. The CT scan can help determine if surgery is a good treatment option.

The CT scan is an x-ray procedure that produces detailed cross-sectional images of your body. CT scans take longer than regular x-rays. Instead of taking one picture, like a conventional x-ray, a CT scanner takes many pictures as the camera rotates around you. A computer then combines these pictures into an image of a slice of your body. The machine will take pictures of many slices of the part of your body that is being studied.

A CT scanner has been described as a large donut, with a narrow table in the middle opening. You will need to lie still on the table while the scan is being done. CT scans take longer than regular x-rays, and you might feel a bit confined by the ring while the pictures are being taken. Before any pictures are taken, you may be asked to drink 1 to 2 pints of a liquid called *oral contrast.* This helps outline the stomach and intestine to make abnormal areas easier to spot. You may also receive an IV line through which a different kind of contrast dye (IV contrast) is injected. This helps better outline structures such as blood vessels in your body.

The injection can cause some flushing (redness and a feeling of warmth that may last hours to days). A few people are allergic to the dye and get hives. Rarely, more serious reactions like trouble breathing and low blood pressure can occur. Medicine can be given to prevent and treat allergic reactions. Be sure to tell the doctor if you have ever had a reaction to any contrast material used for x-rays.

CT scans can also be used to precisely guide a biopsy needle into a suspected metastasis. For this procedure, called a *CT-guided needle biopsy*, the patient remains on the CT scanning table, while a radiologist moves a biopsy needle toward the location of the mass. CT scans are repeated until the doctors are sure that the needle is within the mass. A fine needle biopsy sample (tiny fragment of tissue) or a core needle biopsy sample (a thin cylinder of tissue about ½ inch long and less than 1/8 inch in diameter) is removed and examined under a microscope.

Positron emission tomography (PET)

In this test, radioactive glucose (sugar) is injected into the patient's vein. Because cancer cells use sugar much faster than normal tissues, radioactivity will tend to concentrate in the cancer. A scanner can spot the radioactive deposits. This test can be helpful in spotting small collections of cancer cells and may be used to find cancer that has spread. It also may help in deciding if an adrenal tumor is likely to be benign or malignant (cancer).

A special type of PET scan is currently used only in research settings. It uses a radioactive form of a substance called *metomidate*. This substance seems to concentrate in adrenal cortical tissue, particularly adenomas and carcinomas. PET scanning with metomidate may in the future be helpful in distinguishing tumors that start in the adrenal cortex from cancers that started in other organs and then spread to the adrenals. It may also be helpful in finding adrenal cancer that has spread outside the adrenals.

Magnetic resonance imaging (MRI)

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 tissue and by certain diseases. A computer translates the pattern of radio waves given off by the tissues into a very detailed image of parts of the body. Not only does this produce cross sectional slices of the body like a CT scanner, it can also produce slices that are parallel with the length of your body. For some MRI scans, a contrast material called *gadolinium* is injected into a vein (IV). MRI may sometimes provide more information than CT scans because it can better distinguish adrenal cancers from benign tumors.

MRI scans are particularly helpful in examining the brain and spinal cord. In people with suspected adrenal tumors, an MRI of the brain may be done to examine the pituitary gland. Tumors of the pituitary gland, which lies underneath the front of the brain, can cause symptoms and signs similar to adrenal tumors.

MRI scans are a little more uncomfortable than CT scans. First, they take longer. You have to be placed inside a tube, which is confining and can upset people who become anxious in tight spaces (claustrophobia). If you have problems with tight spaces, tell your doctor before your MRI. Medicine may be given before the scan to help with anxiety. If that doesn't work, the exam may be scheduled at an open MRI scanner. These machines are not so enclosing and so are easier for some patients, although the drawback is that the pictures may not be as good. The machine also makes a thumping noise that you might find disturbing. Some places will provide headphones with music to block this sound out.

Other tests

Laparoscopy

This procedure uses a laparoscope, a thin, flexible tube with a tiny video camera on the end. It is inserted through a small surgical opening in the patient's side to allow the surgeon to see where the cancer is growing. It can spot distant spread as well as enlarged lymph nodes. Sometimes it is combined with ultrasound to give a better picture of the cancer. Laparoscopy may be done to help predict whether it will be possible to completely remove the cancer by surgery. In addition to viewing adrenal tumors through the laparoscope, surgeons can sometimes remove small benign adrenal tumors through this instrument. This method is described in the section, “Surgery for adrenal cancer.”

Biopsy

Imaging tests may find tumors, but often the only way to know for sure that a tumor is cancer is to remove a sample of tumor tissue to look at under the microscope. This is called a *biopsy*. If a thin needle that only removes tiny bits of tissue is used, it is called a *fine needle aspiration*, or FNA. When a larger needle that removes a thin cylindrical core of tissue is used, it is called a *core needle biopsy*. In either case, the biopsy is often done using a CT scan or ultrasound to guide the tip of the needle into the tumor.

Since adrenal adenomas and cancers can look alike under the microscope, a biopsy may not be able to tell whether or not an adrenal tumor is cancerous. Also, a needle biopsy of an adrenal cancer can actually spread tumor cells. For these reasons, a biopsy is generally not done before surgery if an adrenal tumor's size and certain features seen on imaging tests suggest it is cancer. A work-up with blood tests for hormone production and imaging studies are more useful than biopsies in the diagnosis of adrenal cancer.

If the cancer appears to have metastasized (spread) to another part of the body such as the liver, then a needle biopsy of the metastasis may be done. If a patient is known to have an adrenal tumor and a liver biopsy shows adrenal cells are present in the liver, then the tumor is cancer.

In general, a biopsy is only obtained in a patient with adrenal cancer when there are tumors outside the adrenals and the doctor needs to know if these are spread (metastases) from an adrenal cancer or are caused by some other cancer or disease. Adrenal tumors are sometimes biopsied when the patient is known to have a different type of cancer (like lung cancer) and knowing that it has spread to the adrenal glands would alter treatment.

Tests for adrenal hormones

Blood and urine tests to measure levels of adrenal hormones are important in deciding whether a patient with signs and symptoms of adrenal cancer has the disease. For urine tests, you may be asked to collect all of your urine for 24 hours. Blood and urine tests are as important as imaging tests in diagnosing adrenal cancer. Doctors choose which tests to do based on the patient's symptoms. Doctors know which symptoms are associated with high levels of certain hormones, so they can focus on ways to look for the hormones most likely to be affected. Often doctors will check hormone levels even when symptoms of high hormone levels are not present. This is because symptoms of abnormal hormone levels can be very subtle and blood tests may even be able to detect changes in hormone levels before symptoms occur.

Tests for high cortisol levels

The levels of cortisol are measured in the blood and in the urine. If an adrenal tumor is making cortisol, these levels will be abnormally high. These tests may be done after giving the patient a dose of dexamethasone. Dexamethasone is a drug that acts like cortisol. If given to someone who does not have an adrenal tumor, it will decrease production of cortisol and similar hormones. In someone with an adrenal cortex tumor,

these hormone levels will remain high after they receive dexamethasone. Blood levels of ACTH will also be measured to help distinguish adrenal tumors from other diseases that can cause high cortisol levels.

Tests for high aldosterone levels

The level of aldosterone will be measured and will be high if the tumor is making aldosterone. Also, high aldosterone leads to low levels of potassium and renin (a hormone produced by the kidneys) in their blood.

Tests for high androgen or estrogen levels

Patients with androgen-producing tumors will have high levels of dehydroepiandrosterone sulfate (DHEAS) or testosterone. Patients with estrogen-producing tumors will have high levels of estrogen in their blood.

How is adrenal cancer staged?

Staging is the process of finding out how far the cancer has spread. It's very important because treatment options and the course of the disease as well as prognosis (outlook) are determined by the stage of the cancer. Two major staging systems are used: the American Joint Committee on Cancer (AJCC) **TNM** staging system and the ENSAT (European Network for the Study of Adrenal Tumors) staging system. Both are based on the same TNM categories. They differ on how they combine those categories to determine the final stage (this is known as *stage grouping*).

TNM 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 how much the cancer has 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 site is the liver).

Numbers or letters appearing after T, N, and M 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.*

Once the values for T, N, and M are determined, they are combined together to decide the stage. This is called stage grouping.

T categories for adrenal cancer

T1: the tumor is 5 cm (about 2 inches) or less in size and it has not grown into tissues outside the adrenal gland

T2: the tumor is greater than 5 cm (2 inches) in size and it has not grown into tissues outside the adrenal gland

T3: the tumor is growing in the fat that surrounds the adrenal gland. The tumor can be any size.

T4: the tumor is growing into nearby organs, such as the kidney, pancreas, spleen, and liver. The tumor can be any size.

N categories

N0: the cancer has not spread to nearby lymph nodes

N1: the cancer has spread to nearby lymph nodes

M categories

M0: the cancer has not spread to distant organs or tissues (like liver, bone, brain)

M1: the cancer has spread to distant sites

Stage groupings for adrenal cancer in the AJCC system

Stage I

T1, N0, M0: The cancer is smaller than 5 cm (2 inches) and has not grown into surrounding tissues or organs. The cancer has not spread to lymph nodes (N0) or other body parts (M0).

Stage II

T2, N0, M0: The cancer is larger than 5 cm (2 inches) but still has not grown into surrounding tissues or organs. The cancer has not spread to lymph nodes (N0) or other body parts (M0).

Stage III

Either of the following:

T1 or T2, N1, M0: The tumor can be any size but it has not started growing outside the adrenal gland (T1 or T2). The cancer has spread to nearby lymph nodes (N1) but not to distant sites (M0).

OR

T3, N0, M0: The cancer has grown into the fat outside the adrenal gland (T3). It has not spread to nearby lymph nodes (N0) or to distant sites (M0).

Stage IV

Either of the following:

T3, N1, M0: the cancer has grown into the fat outside of the adrenal gland (T3) and it has spread to nearby lymph nodes (N1); it has not spread to distant body sites (M0)

OR

T4, N0 or N1, M0: the cancer has grown from the adrenal gland into organs or tissues nearby (T4) It may (N1) or may not (N0) have spread to nearby lymph nodes, but it has not spread to distant sites (M0)

OR

Any T, any N, M1: The cancer has spread to distant sites (M1). It can be any size and may or may not have spread to nearby tissues or lymph nodes.

Stage groupings for adrenal cancer in the ENSAT system

In the ENSAT system, stages I and II are the same as they are in the AJCC system. Stages III and IV are different.

Stage III

Either

T3 or T4, N0, M0: the cancer has grown into the fat outside of the adrenal gland (T3) or into nearby organs or tissues (T4). It has not spread to nearby lymph nodes (N0) or to distant sites (M0).

OR

Any T, N1, M0: the cancer can be any size and may have grown into nearby tissues (any T). It has spread to nearby lymph nodes (N1), but not to distant sites (M0).

Stage IV

Any T, any N, M1: The cancer has spread to distant sites (M1). It can be any size and may or may not have spread to nearby tissues or lymph nodes.

Survival rates by stage for adrenal cancer

Survival rates are often used by doctors as a standard way of discussing a person's prognosis (outlook). Some patients with cancer want to know the survival statistics for people in similar situations, while others might not find the numbers helpful, or not want to know them. If you decide you don’t want to know them, stop reading here and skip to the next section.

The 5-year survival rate refers to the percentage of patients who live *at least 5 years* after their cancer is diagnosed. Of course, many people live much longer than 5 years (and many are cured).

Five-year *relative* survival rates assume that some people will die of other causes and compare the observed survival with that expected for people without the cancer. This is a better way to see the impact of the cancer on survival.

In order to get 5-year survival rates, doctors have to look at people who were treated at least 5 years ago. Improvements in treatment since then may result in a more favorable outlook for people now being diagnosed with adrenal cortical cancer.

Survival rates are often based on previous outcomes of large numbers of people who had the disease, but they cannot predict what will happen in any particular person's case. Many other factors besides stage can affect a person's outlook, such as the grade of their cancer, the treatment they receive, their age, and overall health. Your doctor can tell you how the numbers below may apply to you, as he or she is familiar with the aspects of your particular situation.

The numbers below come from the National Cancer Institute's SEER database, and are based on people diagnosed between 1988 and 2001. The SEER database does not list survival statistics by AJCC or ENSAT stages. Instead, it divides patients into 3 groups: localized, regional, and distant. *Localized* means that the cancer hasn't grown outside of the adrenal gland at diagnosis (like stages I and II). *Regional* means that the cancer has grown into nearby tissues or has spread to nearby lymph nodes (like ENSAT stage III). *Distant* means that the cancer has spread further to distant sites (like ENSAT stage IV).

Stage	**5-year Relative Survival**
Localized	65%
Regional	44%
Distant	7%

How is adrenal cancer treated?

General treatment information

After the cancer is diagnosed, your doctor will discuss your treatment options with you. It is important to take time and think about all of the choices. In choosing a treatment plan, factors to consider include your overall physical health and the stage of the cancer. Sometimes it is a good idea to get a second opinion. A second opinion can provide more information and help you feel more confident about the treatment plan that is chosen. Another reason for people with adrenal cortical cancer to get a second opinion is that, because these cancers are so rare, only large cancer centers will have much experience in treating them.

The main types of treatment for adrenal cancer are:

- Surgery
- Radiation
- Chemotherapy
- Other drugs

Depending on the type and stage of your cancer, you may need more than one type of treatment. Doctors on your cancer treatment team might include:

- A surgeon: a doctor who uses surgery to treat cancers or other problems
- An endocrinologist: a doctor who treats diseases in glands that secrete hormones
- A radiation oncologist: a doctor who uses radiation to treat cancer
- A medical oncologist: a doctor who uses chemotherapy and other medicines to treat cancer

Many other specialists may be involved in your care as well, including nurse practitioners, nurses, psychologists, social workers, rehabilitation specialists, and other health professionals. The next few sections describe the types of treatment used for adrenal cancers. This is followed by a discussion of when these treatments are used in different situations.

It is important to discuss all of your treatment options, including their goals and possible side effects, with your doctors to help make the decision that best fits your needs. It’s also very important to ask questions if there is anything you’re not sure about. You can find some good questions to ask in the section, “What should you ask your doctor about adrenal cancer?”

Thinking about taking part in a clinical trial

Clinical trials are carefully controlled research studies that are done to get a closer look at promising new treatments or procedures. Clinical trials are one way to get state-of-the art cancer treatment. In some cases they may be the only way to get access to newer treatments. They are also the best way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

If you would like to learn more about clinical trials that might be right for you, start by asking your doctor if your clinic or hospital conducts clinical trials. You can also call our clinical trials matching service at 1-800-303-5691 for a list of studies that meet your medical needs, or see “Clinical Trials” to learn more.

Considering complementary and alternative methods

You may hear about alternative or complementary methods that your doctor hasn’t mentioned to treat your cancer or relieve symptoms. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

Complementary methods refer to treatments that are used along with your regular medical care. Alternative treatments are used instead of a doctor’s medical treatment. Although some of these methods might be helpful in relieving symptoms or helping you feel better, many have not been proven to work. Some might even be dangerous.

Be sure to talk to your cancer care team about any method you are thinking about using. They can help you learn what is known (or not known) about the method, which can help you make an informed decision. See *Complementary and Alternative Medicine* to learn more.

Help getting through cancer treatment

Your cancer care team will be your first source of information and support, but there are other resources for help when you need it. Hospital- or clinic-based support services are an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help.

The American Cancer Society also has programs and services – including rides to treatment, lodging, support groups, and more – to help you get through treatment. Call our National Cancer Information Center at 1-800-227-2345 and speak with one of our trained specialists on call 24 hours a day, every day.

The treatment information given here is not official policy of the American Cancer 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.

Surgery for adrenal cancer

The main treatment for adrenal cancer is removal of the adrenal gland, which is called an *adrenalectomy*. The surgeon will try to remove as much of the cancer as possible, including any areas of cancer spread. If nearby lymph nodes are enlarged, they will need to be removed and checked for cancer spread.

There are 2 major ways to remove the adrenal gland. One way is to remove the gland through an incision in the back, just below the ribs. This works well for small tumors, but it can be hard to see larger tumors well.

For most adrenal cancers, the surgeon makes the incision through the front of the abdomen. This lets the surgeon see the tumor more clearly and makes it easier to see if it has spread. It also gives the surgeon room to remove a large cancer that has spread (locally) to tissues and organs near the adrenal gland. For example, if the cancer has grown into the kidney, all or part of the kidney must also be removed. If it has grown into the muscle and fat around the adrenal gland, these tissues will need to be removed as well.

Sometimes, the cancer has grown into the inferior vena cava, the large vein that carries blood from the lower body to the heart. Complete removal of these cancers requires a very extensive operation to remove the tumor and preserve the vein. To remove the tumor from the vein, the surgeon may need to bypass the body's circulation by putting the patient on a heart-lung bypass pump like that used in heart surgery. If the cancer has grown into the liver, the part of the liver containing the cancer may need to be removed as well.

It is also possible to remove small adrenal tumors through a hollow lighted tube called a *laparoscope*. The laparoscope is a thin tube with a tiny video camera on the end that is inserted through a small surgical opening in the patient's side. Other instruments inserted through this tube or through other very small incisions are used to remove the adrenal gland. The main advantage of this method is that because the incisions are smaller, patients recover from surgery more quickly.

Although laparoscopic surgery is often used to treat adenomas, it often is not an option for treating larger adrenal cancers. That is because it is important to remove the tumor in one piece. To remove a large tumor with a laparoscope, the surgeon might have to break it up into small pieces first. Doing that raises the risk of the cancer spreading. Also, adrenal cancers that have grown into nearby tissues or lymph nodes can be hard to remove completely using laparoscopy.

For more information about surgery, see our document *Understanding Cancer Surgery: A Guide for Patients and Families*.

Radiation therapy for adrenal cancer

Radiation therapy uses high-energy radiation to kill cancer cells. *External beam radiation therapy* focuses radiation on the cancer from a machine outside the body. Treatments are

often given once or twice a day, 5 days a week for several weeks. Each treatment lasts only a few minutes, and is similar to having a regular x-ray test. As with a diagnostic x-ray, the radiation passes through the skin and other tissues before it reaches the tumor. The actual radiation exposure time is very short, and most of the treatment time is spent precisely positioning the patient so that the radiation is aimed accurately at the cancer.

Brachytherapy (internal radiation therapy) uses small pellets of radioactive material placed next to or directly into the cancer, sometimes in thin plastic tubes. The tubes containing the pellets are left in place for a few days and then removed. The actual time is determined by the strength of the radioactive pellets and the size of the tumor. This type of radiation is not often used to treat adrenal cortical carcinoma.

Radiation therapy is not used often as the main initial treatment for adrenal cancer because the cancer cells are not easy to kill with x-rays. Radiation may be used after surgery to help keep the tumor from coming back. This is called *adjuvant therapy*. Radiation can also be used to treat areas of cancer spread, such as in the bones or brain.

Common side effects of radiation therapy include:

- Nausea and vomiting
- Diarrhea (if an area of the abdomen is treated)
- Skin changes in the area being treated, which can range from redness to blistering and peeling
- Hair loss in the area being treated
- Fatigue
- Low blood counts

More information about radiation therapy can be found in our document *Understanding Radiation Therapy: A Guide for Patients and Families.*

Chemotherapy for adrenal cancer

Systemic chemotherapy (chemo) is giving drugs into a vein or by mouth (in pill form). These drugs enter the bloodstream and reach throughout the body, making this treatment useful for cancer that has spread (metastasized) to organs beyond the adrenal gland. Chemo does not work very well in adrenal cancer, so it is most often used for adrenal gland cancer that has become too widespread to be removed with surgery. Chemo does not cure adrenal cancer.

Mitotane

The drug most often used for people with adrenal cancer is called *mitotane*. Mitotane blocks hormone production by the adrenal gland and also destroys both adrenal cancer cells and healthy adrenal tissue. This drug can suppress the usual adrenal steroid hormone

production from your other, normal adrenal gland. This can lead to low levels of cortisol and other hormones, which can make you feel weak and sick. If this occurs, you will need to take steroid hormone pills to bring your hormone levels up to normal. Mitotane can also alter levels of other hormones, such as thyroid hormone or testosterone. If that occurs, you would need drugs to replace these hormones as well.

Sometimes mitotane is given for a period of time after surgery has removed all the (visible) cancer. This is called adjuvant therapy and is meant to kill any cells that were left behind, but were too small to see. Giving the drug this way may prevent or delay the return of the cancer.

If the cancer has not been completely removed by surgery or has come back, mitotane will shrink the cancer in some patients. On average, the response lasts about one year, but can be longer for some patients.

Mitotane is particularly helpful for people with adrenal cancers who have problems caused by excessive hormone production. Even when it doesn't shrink the tumor, mitotane can reduce abnormal hormone production and relieve symptoms. About 80% of patients with excess hormone production are helped by mitotane. This drug can cause major side effects, however. The most common are nausea, vomiting, diarrhea, rashes, confusion, and sleepiness. Sometimes lower doses of the drug can still be effective and cause fewer side effects. This drug is a pill and is taken 3 to 4 times a day. Like other types of chemo, treatment with mitotane needs to be supervised closely by a doctor.

Other chemo drugs used for adrenal cancer

Other chemo drugs are sometimes combined with mitotane to treat advanced adrenal cancer. The drugs used most often are:

- The combination of cisplatin, doxorubicin (Adriamycin®), and etoposide (VP-16) plus mitotane
- Streptozocin plus mitotane

Some other chemo drugs are used less often, such as:

- Paclitaxel (Taxol®)
- 5-fluorouracil (5-FU)
- Vincristine (Oncovin®)

These drugs may be given in different combinations and are often given with mitotane.

Chemotherapy drugs kill cancer cells but also damage some normal cells, which can cause some side effects. Careful attention must be given to avoid or minimize chemo side effects. Side effects from chemo depend on the type of drugs, the amount taken, and the length of treatment. Common side effects might include:

- Nausea and vomiting

- Loss of appetite
- Loss of hair
- Hand and foot rashes
- Mouth sores
- Low blood counts

Because chemotherapy can damage the blood-producing cells of the bone marrow, patients may have low blood cell counts. This can lead to:

- Increased risk of infection (due to a shortage of white blood cells)
- Bleeding or bruising after minor cuts or injuries (due to a shortage of blood platelets)
- Anemia (due to low red blood cell counts)

Most side effects disappear once treatment is stopped. Hair will grow back after treatment ends, though it might look different. There are good treatments for many of the side effects of chemotherapy. For example, very good drugs are available to prevent or reduce nausea and vomiting.

Some chemo side effects can last a long time or even be permanent. For example, doxorubicin can damage the heart muscle over time. Your health care team will watch the dose of this drug closely, to make sure that the dose isn't high enough to cause this damage. Cisplatin and paclitaxel can both cause nerve damage (called *neuropathy*), leading to painful tingling and numbness in the hands and feet. This tends to get better after chemo stops, but it might not go away completely.

More information about chemotherapy can be found in our document *A Guide to Chemotherapy*.

Other drugs used to treat adrenal cancer

Other medicines besides mitotane may be used to block hormone production by the cancer or lower the effects of the hormones. Treatment with some of these drugs may need to be supervised by an endocrinologist (hormone doctor) because they affect several hormone systems and might make it necessary to replace other hormones.

Ketoconazole and metyrapone can reduce adrenal steroid hormone production. This can help relieve symptoms caused by these hormones, but doesn't shrink the cancer.

Some drugs block the effects of the hormones made by the tumor. These include:

- Spironolactone (Aldactone®), which decreases effects of aldosterone
- Mifepristone (Korlym®), which decreases cortisol effects

- Tamoxifen, toremifene (Fareston®), and fulvestrant (Faslodex®) can block the effects of estrogen. These drugs are more often used to treat a certain type of breast cancer, but can be useful in some patients (often men) who have adrenal tumors that make estrogen.

Treating adrenal cancer by stage

Stages I and II

Surgery is the main treatment for stage I and stage II adrenal cancer. The entire adrenal gland will be removed. Since a person has 2 adrenal glands, removal of the diseased one does not generally cause problems for the patient. If nearby lymph nodes are enlarged, they will be removed as well and checked to see if they contain cancer cells. Most surgeons do not remove these lymph nodes if their size is normal. In many cases, no further treatment may be necessary. If the tumor was not removed completely, treatment with radiation and/or mitotane may be given after surgery to help keep the cancer from coming back.

These treatments may also be given if the tumor has a higher chance of coming back later because it was large or appears to be growing fast (when looked at under the microscope). When treatment is given after surgery has removed all visible cancer, it is called *adjuvant therapy*. The goal of adjuvant therapy is to kill any cancer cells that may have been left behind but are too small to be seen. Killing these cells lowers the chance of the cancer coming back later.

Stage III

Surgery is also the main treatment for stage III adrenal cancer. The goal of surgery is to remove all of the cancer. The adrenal gland with the tumor is always removed, and the surgeon might also need to remove some tissue around the adrenal gland, including part (or all) of the nearby kidney and part of the liver. The lymph nodes near the adrenal gland will also be removed. After surgery, adjuvant treatment with radiation and/or mitotane may be given to help keep the cancer from coming back.

Stage IV

If it is possible to remove all of the cancer, then surgery may be done. When the cancer has spread to other parts of the body, it usually cannot be cured with surgery. Some doctors may still recommend surgery to remove as much of the tumor as possible. This type of surgery is called *debulking*. Removing most of the cancer may help reduce symptoms by lowering the production of hormones. Radiation therapy may also be used to treat any areas of cancer that are causing symptoms. For example, radiation can help people when cancer that has spread to the bones is causing pain. Mitotane therapy is also an option. Treatment may begin right away or it may be postponed until the cancer is causing symptoms. Other chemotherapy (chemo) drugs may also be used.

Recurrent adrenal cancer

Cancer is called *recurrent* when it comes back after treatment. Recurrence can be local (in or near the same place it started) or distant (spread to organs such as the lungs or bone). Local recurrence may be treated with surgery to remove the cancer. This is more likely to be done if all of the cancer can be removed. Distant recurrence is treated like stage IV disease. Debulking surgery may be done to relieve symptoms. People with recurrent disease are often treated with mitotane. They may also receive chemo and/or radiation therapy. If the mitotane doesn't work or cannot be tolerated, other drugs can be given to lower hormone production.

Most of the time, these treatments provide only temporary help because the tumor will eventually continue to grow. When this happens and these treatments are no longer helping, treatment aimed at providing as good a quality of life as possible may be the best choice. The best drugs to treat pain are morphine and other narcotic drugs. Many studies have shown that taking morphine as directed for pain does not mean a person will become addicted.

There are many other ways your doctor can help maintain your quality of life and control your symptoms. This means that you must tell your doctor how you are feeling and what symptoms you are having. Many patients don't like to disappoint their doctors by telling them they are not feeling well. This does no one any good.

What should you ask your doctor about adrenal cancer?

As you deal with your adrenal cancer and the process of treatment, you should be able to have frank, open discussions with your cancer care team. Ask any questions, no matter how trivial they might seem. Among the questions you might want to ask are:

- Do I have a benign or malignant adrenal gland tumor?
- Has my cancer spread beyond the adrenal gland?
- Is my tumor secreting excessive amounts of hormones?
- How will we treat the hormone excess?
- Are the changes to my body permanent?
- How will we treat the changes to my body?
- Is this form of adrenal gland cancer hereditary? Does my adrenal gland cancer affect any other organs?
- What other treatment choices do I have?
- What side effects can I expect from my treatments?

- What are the other risks of treatments?
- How long will it take me to recover from treatment?
- When can I go back to work after treatment?
- What are the chances that my cancer will come back?
- What should I do to be ready for treatment?
- Do I need a second opinion?
- Based on what you've learned about my cancer, will it shorten my life?

You will no doubt have other questions about your personal situation. Be sure and write your questions down so you remember to ask them during each visit with your cancer care team. Keep in mind, too, that doctors are not the only ones who can provide you with information. Other health care professionals, such as nurses and social workers, may have the answers you seek. You can find more information about communicating with your health care team in our document *Talking With Your Doctor*.

What happens after treatment for adrenal cancer?

For some people with adrenal cancer, treatment may remove or destroy the cancer. Completing treatment can be both stressful and exciting. You may be relieved to finish treatment, but find it hard not to worry about cancer coming back. (When cancer comes back after treatment, it's called *recurrence*.) This is a very common concern in people who have had cancer.

It may take a while before your fears lessen. But it may help to know that many cancer survivors have learned to live with this uncertainty and are leading full lives. Our document, *Living With Uncertainty: The Fear of Cancer Recurrence*, gives more detailed information on this. It can be read online, or call us to have a free copy sent to you.

For other people, the cancer may never go away completely. These people may get regular treatments with chemotherapy, radiation therapy, or other therapies to try to help keep the cancer in check. Learning to live with cancer that does not go away can be difficult and very stressful. It has its own type of uncertainty. Our document, *When Cancer Doesn't Go Away*, talks more about this (see the section called "Additional resources for adrenal cancer" for a list of some other documents you may find helpful).

Follow-up care

When treatment ends, your doctors will still want to watch you closely. It is very important to go to all of your follow-up appointments. During these visits, your doctors will ask questions about any problems you might have and do exams and lab tests or x-rays and scans to look for signs of cancer or treatment side effects. Almost any cancer

treatment can have side effects. Some may last for a few weeks to months, but others can last the rest of your life. This is the time for you to talk to your cancer care team about any changes or problems you notice and any questions or concerns you have.

Follow-up care will be very important after treatment for adrenal cancer. One reason for this is that the cancer can come back (recur), even after treatment for early stage disease. You should see your doctor frequently after treatment and less often later on. If you are taking mitotane, your follow-up appointments may need to be more frequent to see if the mitotane levels in your blood are in a good range and if there are any side-effects from this drug. Remember that mitotane will also suppress the usual adrenal steroid hormone production from your other, normal adrenal gland. As a result, you will need to take hormone replacement tablets to protect you against cortisol deficiency. CT scans may be done periodically to see if the cancer has returned or is continuing to grow. Periodic tests of your blood and urine hormone levels will be done to evaluate the success of drugs in suppressing hormone production by the cancer.

It is important to keep health insurance. Tests and doctor visits cost a lot, and even though no one wants to think of their cancer coming back, this could happen.

Should your cancer come back, our document *When Your Cancer Comes Back: Cancer Recurrence* can give you information on how to manage and cope with this phase of your treatment. You can get this document by calling 1-800-227-2345, or you can read it online.

Seeing a new doctor

At some point after your cancer diagnosis and treatment, you may find yourself seeing a new doctor who does not know anything about your medical history. It is important that you be able to give your new doctor the details of your diagnosis and treatment. Gathering these details soon after treatment may be easier than trying to get them at some point in the future. Make sure you have the following information handy:

- A copy of your pathology report(s) from any biopsies or surgeries
- If you had surgery, a copy of your operative report(s)
- If you stayed in the hospital, a copy of the discharge summary that doctors prepare when patients are sent home
- If you received radiation, a copy of your treatment summary
- If you had chemotherapy (including mitotane) or other drugs, a list of your drugs, drug doses, and when you took them
- Copies of your x-rays and scans (these often can be placed on a DVD)

The doctor may want copies of this information for his records, but always keep copies for yourself.

Can I get another cancer after having adrenal cancer?

Cancer survivors can be affected by a number of health problems, but often their greatest concern is facing cancer again. If a cancer comes back after treatment it is called a "recurrence." But some cancer survivors may develop a new, unrelated cancer later. This is called a "second cancer." No matter what type of cancer you have had, it is still possible to get another (new) cancer, even after surviving the first.

Unfortunately, being treated for cancer doesn't mean you can't get another cancer. People who have had cancer can still get the same types of cancers that other people get. In fact, certain types of cancer and cancer treatments can be linked to a higher risk of certain second cancers

Survivors of adrenal cancer can still get any type of second cancer, but they have increased risks of:

- Lung cancer
- Bladder cancer
- Prostate cancer

Women who have had adrenal cancer also have an increased risk of melanoma of the skin.

Patients who were under 45 at the time their adrenal cancer was diagnosed have increased risks of breast cancer, bone and soft tissue sarcoma, brain tumor, and acute leukemia. These cancers, along with adrenal cancer, are seen in a family cancer syndrome called Li-Fraumeni syndrome.

Follow-up after treatment

After completing treatment for adrenal cancer you should see your doctor regularly and may have tests to see if the cancer has come back or spread. Experts do not recommend any additional testing to look for second cancers in patients without symptoms. Let your doctor know about any new symptoms or problems, because they could be caused by the cancer coming back or by a new disease or second cancer.

Survivors of adrenal cancer should follow the American Cancer Society guidelines for the early detection of cancer and stay away from tobacco products. Smoking increases the risk of many cancers and might further increase the risk of lung and bladder cancer.

To help maintain good health, survivors should also:

- Achieve and maintain a healthy weight
- Adopt a physically active lifestyle
- Consume a healthy diet, with an emphasis on plant foods

- Limit consumption of alcohol to no more than 1 drink per day for women or 2 per day for men

These steps may also lower the risk of some cancers.

See *Second Cancers in Adults* for more information about causes of second cancers.

Lifestyle changes after treatment for adrenal cancer

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 choices to help you stay healthy and feel as well as you can. This can 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 start during cancer treatment.

Making healthier choices

For many people, a diagnosis of cancer helps them focus on their health in ways they may not have thought much about in the past. Are there things you could do that might make you healthier? Maybe you could try to eat better or get more exercise. Maybe you could cut down on the alcohol, or give up tobacco. Even things like keeping your stress level under control may help. Now is a good time to think about making changes that can have positive effects for the rest of your life. You will feel better and you will also be healthier.

You can start by working on those things that worry you most. 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 for information and support at 1-800-227-2345. A tobacco cessation and coaching service can help increase your chances of quitting for good.

Eating better

Eating right can be hard for anyone, but it can get even tougher during and after cancer treatment. Treatment may change your sense of taste. Nausea can be a problem. You may not feel like eating and lose weight when you don't want to. Or you may have gained weight that you can't seem to lose. All of these things can be very frustrating.

If treatment caused weight changes or eating or taste problems, do the best you can and keep in mind that these problems usually get better over time. You may find it helps to eat small portions every 2 to 3 hours until you feel better. You may also want to ask your cancer team about seeing a dietitian, an expert in nutrition who can give you ideas on how to deal with these treatment side effects.

One of the best things you can do after cancer treatment is to start healthier eating habits. You may be surprised at the long-term benefits of some simple changes, like increasing the variety of healthy foods you eat. Getting to and staying at a healthy weight, eating a healthy diet, and limiting your alcohol intake may lower your risk for a number of types of cancer, as well as having many other health benefits. You can get more information in

our document *Nutrition and Physical Activity During and After Cancer Treatment: Answers to Common Questions*.

Rest, fatigue, and exercise

Extreme tiredness, called *fatigue*, is very common in people treated for cancer. This is not a normal tiredness, but a "bone-weary" exhaustion that often doesn't get better with rest. For some people, fatigue lasts a long time after treatment, and can make it hard for them to exercise and do other things they want to do. But exercise can help reduce fatigue. Studies have shown that patients who follow an exercise program tailored to their personal needs feel better physically and emotionally and can cope better, too.

If you were sick and not very active during treatment, it is normal for your fitness, endurance, and muscle strength to decline. Any plan for physical activity should fit your own situation. A person who has never exercised will not be able to take on the same amount of exercise as someone who plays tennis twice a week. If you haven't been active in a few years, you will have to start slowly – maybe just by taking short walks.

Talk with your health care team before starting anything. Get their opinion about your exercise plans. Then, try to find an exercise buddy so you're not doing it alone. Having family or friends involved when starting a new activity can give you that extra boost of support to keep you going when the push just isn't there.

If you are very tired, you will need to balance activity with rest. It’s OK to rest when you need to. Sometimes it's really hard for people to allow themselves to rest when they are used to working all day or taking care of a household, but this is not the time to push yourself too hard. Listen to your body and rest when you need to.

For more information on dealing with fatigue please see *Fatigue in People With Cancer* and *Anemia in People With Cancer*. The “Additional resources for adrenal cancer” section has a list of some other documents about side effects that you may find helpful,

Keep in mind physical activity can improve your physical and emotional health.

- It improves your cardiovascular (heart and circulation) fitness.
- Along with a good diet, it will help you get to and stay at a healthy weight.
- It makes your muscles stronger.
- It reduces fatigue and helps you have more energy.
- It can help lower anxiety and depression.
- It can make you feel happier.
- It helps you feel better about yourself.

And long term, we know that getting regular physical activity plays a role in helping to lower the risk of some cancers, as well as having other health benefits.

How about your emotional health after treatment of adrenal cancer?

When treatment ends, you may find yourself overcome with many different 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 each day. Now it may feel like a lot of other issues are catching up with you.

You may find yourself thinking about death and dying. Or maybe you're more aware of the effect the cancer has on your family, friends, and career. You may take a new look at your relationship with those around you. Unexpected issues may also cause concern. For instance, as you feel better and have fewer doctor visits, you will see your health care team less often and have more time on your hands. These changes can make some people anxious.

Almost everyone who has been through cancer can benefit from getting some type of 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 one-on-one counselors. 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 good for you to try to deal with everything on your own. And your friends and family may feel shut out if you do 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 1-800-227-2345 and we can put you in touch with a group or resource that may work for you. You can also read our document *Distress in People with Cancer* or see the Emotional Side Effects section of our website for more information.

If treatment for adrenal cancer stops working

If cancer keeps growing or comes back after one kind of treatment, it is possible that another treatment plan might still cure the cancer, or at least shrink it enough to help you live longer and feel better. But when a person has tried many different treatments and the cancer has not gotten any better, the cancer tends to become resistant to all treatment. If this happens, it's important to weigh the possible limited benefits of a new treatment against the possible downsides. Everyone has their own way of looking at this.

This is likely to be the hardest part of your battle with cancer -- when you have been through many medical treatments and nothing's working anymore. Your doctor may offer you new options, but at some point you may need to consider that treatment is not likely to improve your health or change your outcome or survival.

If you want to continue to get treatment for as long as you can, you need to think about the odds of treatment having any benefit and how this compares to the possible risks and side effects. In many cases, your doctor can estimate how likely it is the cancer will respond to treatment you are considering. For instance, the doctor may say that more chemo or radiation might have about a 1% chance of working. Some people are still tempted to try this. But it is important to think about and understand your reasons for choosing this plan.

No matter what you decide to do, you need to feel as good as you can. Make sure you are asking for and getting treatment for any symptoms you might have, such as nausea or pain. This type of treatment is called *palliative care*.

Palliative care helps relieve symptoms, but is not expected to cure the disease. It can be given along with cancer treatment, or can even be cancer treatment. The difference is its purpose -- the main purpose of palliative care is to improve the quality of your life, or help you feel as good as you can for as long as you can. Sometimes this means using drugs to help with symptoms like pain or nausea. Sometimes, though, the treatments used to control your symptoms are the same as those used to treat cancer. For instance, radiation might be used to help relieve bone pain caused by cancer that has spread to the bones. Or chemo might be used to help shrink a tumor and keep it from blocking the bowels. But this is not the same as treatment to try to cure the cancer.

You can learn more about the changes that occur when treatment to cure the cancer stops working, and about planning ahead for yourself and your family, in our documents *Advanced Cancer* and *Nearing the End of Life*. You can read them online or call us at 1-800-227-2345 to have free copies mailed to you.

At some point, you may benefit from hospice care. This is special care that treats the person rather than the disease; it focuses on quality rather than length of life. Most of the time, it is given at home. Your cancer may be causing problems that need to be managed, and hospice focuses on your comfort. You should know that while getting hospice care often means the end of treatments such as chemo and radiation, it doesn't mean you can't have treatment for the problems caused by your cancer or other health conditions. In hospice the focus of your care is on living life as fully as possible and feeling as well as you can at this difficult time. You can learn more about hospice in our document called *Hospice Care*.

Staying hopeful is important, too. 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. Pausing at this time in your cancer treatment gives you a chance to refocus on the most important things in your life. Now 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. Though the cancer may be beyond your control, there are still choices you can make.

What's new in adrenal cancer research and treatment?

Research focused on adrenal cancer is currently under way. Imaging tests for diagnosing this cancer, medical laboratory tests to more accurately distinguish adenomas from carcinomas, and new treatments are being studied. Progress in this research tends to be slow because adrenal cancer is so rare. Other studies of more general aspects of cancer that can be applied to adrenal cancers as well as other types of cancers are also being done.

Chemotherapy

Although adrenal cancer can be hard to study, experts are looking for new drugs that may help as well as looking at the value of accepted treatments.

One ongoing important study (called ADIUVO) is testing the value of mitotane in the treatment of patients with early-stage adrenal cancers that have been removed with surgery. The goal of the study is to see if mitotane lowers the chance of the cancer coming back and helps patients live longer.

Targeted therapy

Targeted therapy is a newer type of cancer treatment that uses drugs or other substances to attack the programming that makes cancer cells different from normal, healthy cells. Each type of targeted therapy works differently, but all alter the way a cancer cell grows, divides, repairs itself, or interacts with other cells. Targeted drugs have been effective for several more common types of cancer but their value for adrenal cancer is still not known.

Cixutumumab is a targeted drug that shows promise in treating adrenal cancer. This drug blocks the effect of a certain hormone called *insulin-like growth factor 2* (IGF2) that is suspected of increasing growth of adrenal cancers. In one study, giving this drug with another targeted drug called temsirolimus stopped tumor growth for months in many patients.

Some other targeted drugs have been studied in adrenal cancer, but have not been very helpful.

Genetics

Scientists are learning how changes in certain oncogenes and tumor suppressor genes can cause normal adrenal cortex cells to become cancerous. Understanding these genetic changes will help doctors develop better methods to diagnose this disease as well as treatments that are more effective and have fewer side effects than those currently available. Medical centers involved in research may ask their patients for blood samples and about diseases in other family members to learn more about adrenal cancer. This

happens usually as part of studies. These studies are different from treatment studies. The goal of these studies is to enhance research of this rare cancer, to learn more about how adrenal cancer forms, and in the future find new targets for adrenal cancer therapy.

For example, there have been several studies looking at what genetic syndromes can lead to adrenal cancer (these syndromes were discussed in the section about risk factors). International groups are working to understand how adrenal cancer develops. Hopefully, these efforts will give insight into how adrenal cancers develop and provide better targets for therapy.

Additional resources for adrenal cancer

More information from your American Cancer Society

We have a lot more information that you might find helpful. Explore www.cancer.org or call our National Cancer Information Center toll-free number, 1-800-227-2345. We're here to help you any time, day or night.

Books

Your American Cancer Society also has books that you might find helpful. Call us at 1-800-227-2345 or visit our bookstore online at cancer.org/bookstore to find out about costs or to place an order.

National organizations and websites*

Along with the American Cancer Society, other sources of information and support include:

National Cancer Institute (NCI)
Toll-free number: 1-800-422-6237 (1-800-4-CANCER)
TTY: 1-800-332-8615
Website: www.cancer.gov

> Their "Cancer Information Service" offers a wide variety of free, accurate, up-to-date information about cancer to patients, their families, and the general public; also can help people find clinical trials in their area.

National Coalition for Cancer Survivorship (NCCS)
Toll-free number: 1-888-650-9127
Toll-free number for some publications and Cancer Survivor Toolbox® orders: 1-877-622-7937 (1-877-NCCS-YES)
Website: www.canceradvocacy.org

> Provides tools and education materials on many topics, including employment and health insurance, as it relates to cancer; materials are also offered in Spanish.

Also offers the Cancer Survival Toolbox – a free program that teaches skills that can help people with cancer meet the challenges of their illness.

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

No matter who you are, we can help. Contact us anytime, day or night, for information and support. Call us at **1-800-227-2345** or visit www.cancer.org.

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