Thymus Cancer

What is cancer?

The body is made up of trillions of living cells. Normal body cells grow, divide into new cells, and die in an orderly way. During the early years of a person's life, normal cells divide faster to allow the person to grow. After the person becomes an adult, most cells divide only to replace worn-out or dying cells or to repair injuries.

Cancer begins when cells in a part of the body start to grow out of control. There are many kinds of cancer, but they all start because of out-of-control growth of abnormal cells.

Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. Cancer cells can also invade (grow into) other tissues, something that normal cells cannot do. Growing out of control and invading other tissues are what makes a cell a cancer cell.

Cells become cancer cells because of damage to DNA. DNA is in every cell and directs all its actions. In a normal cell, when DNA gets damaged the cell either repairs the damage or the cell dies. In cancer cells, the damaged DNA is not repaired, but the cell doesn't die like it should. Instead, this cell goes on making new cells that the body does not need. These new cells will all have the same damaged DNA as the first cell does.

People can inherit damaged DNA, but most DNA damage is caused by mistakes that happen while the normal cell is reproducing or by something in our environment. Sometimes the cause of the DNA damage is something obvious, like cigarette smoking. But often no clear cause is found.

In most cases the cancer cells form a tumor. Some cancers, like leukemia, rarely form tumors. Instead, these cancer cells involve the blood and blood-forming organs and circulate through other tissues where they grow.

Cancer cells often travel to other parts of the body, where they begin to grow and form new tumors that replace normal tissue. This process is called *metastasis*. It happens when the cancer cells get into the bloodstream or lymph vessels of our body.

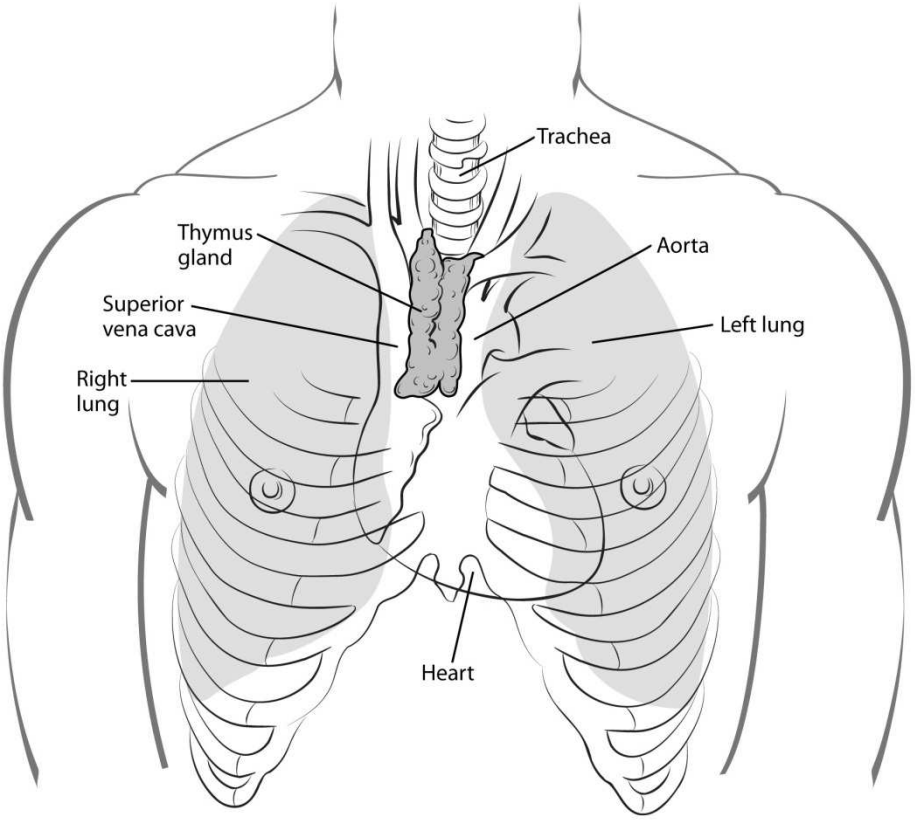
No matter where a cancer may spread, it is always named (and treated) based on the place where it started. For example, breast cancer that has spread to the liver is still called breast cancer, not liver cancer. Likewise, prostate cancer that has spread to the bone is still prostate cancer, not bone cancer.

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.

Not all tumors are cancerous. Tumors that aren't cancer are called *benign*. Benign tumors can cause problems -- they can grow very large and press on healthy organs and tissues. But they cannot grow into (invade) other tissues. Because they can't invade, they also can't spread to other parts of the body (metastasize). These tumors are almost never life threatening.

What is thymus cancer?

Thymus cancers are uncommon. The thymus is a small organ located just behind the breast bone (sternum) in the front part of the chest. The thymus is in a part of the chest known as the *mediastinum*, the space in the chest between the lungs that also contains the heart, part of the aorta, the esophagus (the tube that connects the throat to the stomach), part of the trachea (windpipe), and many lymph nodes. The thymus sits just in front of and above the heart.



The thymus is divided into 2 halves, called *lobes*. It has an irregular shape and a surface that is made up of many small bumps called *lobules*. The thymus has 3 main layers:

- The **medulla** is the innermost part of the thymus.
- The **cortex** is the layer surrounding the medulla.
- The **capsule** is the thin covering over the outside of the thymus.

The thymus reaches its maximum weight of about 1 ounce during puberty, then slowly decreases in size during adulthood as it is gradually replaced by fat tissue.

The thymus is an important part of the body's immune system. During fetal development and childhood, the thymus is involved in the production and maturation of T lymphocytes (also known as *T cells*), a type of white blood cell. T lymphocytes develop in the thymus and then travel to lymph nodes (bean-sized collections of immune system cells) throughout the body.

There they help the immune system protect the body from viruses, fungus, and other types of infections.

The thymus has different types of cells, each of which can develop into different types of cancer:

- Epithelial cells give the thymus its structure and shape. Thymomas and thymic carcinomas, which are the main focus of the rest of this document, develop from these cells.
- Lymphocytes make up most of the rest of the thymus. Whether in the thymus or in other parts of the body, these immune system cells can develop into cancers called *Hodgkin disease* and *non-Hodgkin lymphoma*, which are described in other American Cancer Society documents.
- Kulchitsky cells, or neuroendocrine cells, are much less common cells that normally release certain hormones. These cells can give rise to cancers called *carcinoid tumors*. This document does not discuss carcinoid tumors of the thymus. Much of the information in the documents *Lung Carcinoid Tumor* and *Gastrointestinal Carcinoid Tumors* also applies to carcinoids of the thymus.

Thymomas and thymic carcinomas

Thymomas and thymic carcinomas are tumors that start from thymic epithelial cells. Not all doctors agree about the best way to describe and classify these tumors. In the past, thymomas were sometimes divided into benign (non-cancerous) thymomas and malignant (cancerous) thymomas, based on whether they had grown beyond the thymus into other tissues or organs. Now, most doctors think all thymomas are potentially cancerous, and the best way to predict how likely they are to come back after treatment is to describe whether they have grown into tissues beyond the thymus (and if so, how far). This is done by the surgeon who notes whether or not the tumor appears attached to nearby organs and by the pathologist who looks at samples from the margins (edges) of the tumor under the microscope. The system used to describe the stage (extent) of thymomas is discussed in the section “How is thymus cancer staged?”

WHO classification system for thymomas

Most doctors also classify thymomas by how they look under a microscope and by tests done on the tissue samples. This is called the *histologic type*. The system used for this classification, which was developed by the World Health Organization (WHO), assigns letters to the different types of thymomas.

Type A: The cells in these tumors are spindle-shaped or oval epithelial cells that appear to be fairly normal looking. This is the rarest type of thymoma, but it seems to have the best prognosis (outlook).

Type AB: This type, also known as a *mixed thymoma*, looks like type A except that there are also areas of lymphocytes mixed in the tumor.

Type B1: This type looks a lot like the normal structure of the thymus. It has a lot of lymphocytes along with normal-appearing thymus cells.

Type B2: This type also has a lot of lymphocytes, but the thymus epithelial cells are larger with abnormal nuclei (the DNA-containing part of the cell).

Type B3: This type has few lymphocytes and mostly consists of thymus epithelial cells that look pretty close to normal.

Type C: This is the most dangerous form and is also known as *thymic carcinoma*. It contains cells that have a very abnormal appearance under the microscope. The cells may no longer even look like thymus cells. These tumors have often grown into (invaded) nearby tissues and/or metastasized (spread to distant tissues and organs) at the time they are found. This type of thymoma has the worst prognosis (outlook).

Type AB and type B2 are the most common types of thymoma, and type A is the least common. As you go from A to C, the outlook for survival tends to get worse, with type A having the best outlook, and type C having the worst. Still, for most types of thymoma, the stage (extent of growth and spread) is a better predictor of a person's outcome. Staging of thymus cancer is discussed in the section "How is thymus cancer staged?"

Other cancers in the mediastinum

Other cancers and tumors can occur in the mediastinum. Cancers can start in the esophagus (esophageal cancer), in the heart (and the tissue surrounding it), in the trachea, and in the lymph nodes (lymphoma).

Rarely, cancers and tumors known as *germ cell tumors* can also start in the mediastinum. These come from cells like those found in the testicles and ovaries.

Sometimes the thyroid gland, which is normally in the neck, is misplaced into the mediastinum. This can become enlarged, called a *goiter*. A thyroid tumor or cancer can also develop in the mediastinum.

More often, cancer spreads there from other areas, especially the lungs.

What are the key statistics about thymus cancers?

Although thymic tumors are the most common tumors in the anterior mediastinum (the front part of the chest cavity), overall they are rare. They occur at a rate of only 1.5 cases for every

million people each year in the US. This works out to about 400 cases per year (the exact number diagnosed each year is not known).

Survival statistics for thymomas are discussed in the section “Survival rates for thymus cancer.”

What are the risk factors for thymus cancer?

A risk factor is anything that affects your chance of getting a disease such as cancer. Different cancers have different risk factors. For example, exposing the skin to strong sunlight is a risk factor for skin cancer. Smoking is a risk factor for lung cancer and many others.

But risk factors don’t tell us everything. Having a known risk factor, or even several risk factors, does not mean that you will get the disease. And many people who get the disease may not have had any known risk factors.

No specific inherited, environmental, or lifestyle risk factors have been strongly linked to thymoma or thymic carcinoma. Some studies have suggested a possible link with exposure to radiation to the upper chest area, but this has not been confirmed. The only known risk factors are age and ethnicity.

Age

The risk of this type of cancer goes up with age. This type of cancer is rare in children and young adults, is seen more often in middle-aged adults, and is most common in those in their 70s.

Ethnicity

In the US, this cancer most common in Asians and Pacific Islanders and least common in Whites and Latinos. It is more common in African Americans than in Whites.

Do we know what causes thymus cancer?

Not much is known about why thymus cancers develop in some people but not in others. Researchers have found some DNA changes that occur more often in thymus cancer cells than in normal cells. (DNA is the chemical in each of our cells that makes up our genes — the instructions for how our cells function.) However, they are still not certain why these changes occur in some people, exactly how the changes occur, and how the changes might cause cancer to form.

Can thymus cancer be prevented?

Because we do not know what causes most thymic cancers, it is not yet possible to know how to prevent them.

Can thymus cancer be found early?

Screening is testing for a disease like cancer in people without any symptoms. Thymus cancers are uncommon, and there are no widely recommended screening tests for them. Still, these cancers can sometimes be found early.

About 4 out of 10 people with thymomas have no symptoms when their tumor is found. In most of these cases the tumor is seen by chance on a test (like a chest x-ray or CT scan) that is done for some other reason.

Thymomas are often associated with symptoms that are not directly caused by the tumor mass itself. These are called *paraneoplastic syndromes* (tumor-related conditions). Some of these paraneoplastic syndromes, such as myasthenia gravis, red cell aplasia, and hypogammaglobulinemia, are described in the section “How is thymus cancer diagnosed?” These conditions can be very important in diagnosing some thymomas early because they may be present while the tumor is still at an early stage.

Signs and symptoms of thymus cancers

Many thymic tumors are found on an x-ray or scan done for some other reason, before the patient has symptoms. The rest are brought to the attention of a doctor after a person starts to have symptoms. These may be related to the tumor itself, or they may be part of a paraneoplastic syndrome.

Although these signs and symptoms might be caused by thymus tumors, they can also be caused by other conditions. Still, if you have any of these problems, it’s important to see your doctor right away so the cause can be found and treated, if needed.

Symptoms caused by the tumor

The thymus is in the middle of the chest, near the airways and certain blood vessels. Tumors in the thymus can press on nearby structures, causing symptoms such as:

- Shortness of breath
- Cough (which may bring up bloody sputum)
- Chest pain

- Trouble swallowing
- Loss of appetite
- Weight loss

The thymus is near the superior vena cava, the main blood vessel bringing blood from the head and upper body to the heart. Tumors that press on this vessel can cause symptoms of *superior vena cava syndrome*, which can include:

- Swelling in the face, neck, and upper chest, sometimes with a bluish color
- Swelling of the visible veins in this part of the body
- Headaches
- Feeling dizzy or light-headed

Paraneoplastic syndromes

These are conditions that are related to the cancer but that are not caused directly by the tumor mass. For example, people with thymomas may develop autoimmune diseases, where the immune system starts to attack the body itself. Part of the normal function of the thymus is to help keep the immune system in check, which may help explain why this happens.

Myasthenia gravis: About 30% to 65% of people with thymomas also have myasthenia gravis (MG). This is by far the most common autoimmune disease associated with thymomas. In this disease, the immune system forms antibodies that block the chemical signals that signal the muscles to move. This causes severe muscle weakness. People with MG tire easily. They may notice problems climbing stairs or walking long distances.

Although patients have decreased muscle strength throughout the body, symptoms caused by weakness of the muscles of the eyes, neck, and chest may be the most troublesome. Weakness of the eye muscles can cause blurred or double vision and drooping eyelids, while weak neck muscles can lead to problems with swallowing. Weakness of the chest muscles and diaphragm can cause problems breathing and shortness of breath.

Many people with thymomas have MG, but most people with MG don’t have thymomas. Many people with MG have other, noncancerous abnormalities of the thymus gland. Myasthenia gravis can be treated by removing the thymus (whether or not a thymoma is present) or with medicines that either strengthen the chemical signals to muscles or weaken the immune attack on the muscles.

Red cell aplasia: Red cell aplasia, in which the body’s ability to make new red blood cells is severely reduced, occurs in about 5% of thymoma patients. Red blood cells carry oxygen from the lungs to other tissues of the body. Reduced red blood cell production causes anemia

(low red blood cell counts). Symptoms of anemia can include weakness, dizziness, shortness of breath, and tiring easily. The usual treatment is to remove the thymus gland.

Hypogammaglobulinemia: Hypogammaglobulinemia is a disorder in which the body makes low amounts of infection-fighting antibodies (also known as *gamma globulins*). This leaves the person susceptible to infections. About 5% to 10% of thymoma patients develop hypogammaglobulinemia. About 10% of patients with hypogammaglobulinemia have a thymoma. Removing the thymus does not help correct this disease.

Other autoimmune diseases: Many other autoimmune diseases have also been linked to thymoma. However, they are much less common than myasthenia gravis, pure red cell aplasia, or hypogammaglobulinemia. Some examples include:

- Systemic lupus erythematosus
- Polymyositis
- Ulcerative colitis
- Rheumatoid arthritis
- Sjogren (Sjögren) syndrome
- Sarcoidosis
- Scleroderma

Most people who have these autoimmune diseases do not have a thymoma.

How is thymus cancer diagnosed?

If there is a reason to think you might have a tumor of the thymus, your doctor will ask you about symptoms and use one or more exams or tests to find out if the disease is really present. Certain signs and symptoms might suggest that a person may have a thymus tumor, but tests are needed to confirm the diagnosis.

Medical history and physical exam

If you have signs or symptoms that suggest you might have a thymus tumor, your doctor will want to take a complete medical history to check for symptoms. You will also be asked about your general health.

A physical exam provides information about possible signs of thymic cancer and other health problems. Patients with thymic cancer will sometimes have a fullness that the doctor can feel in the lower neck area.

Thymomas are often suspected because the patient has signs and symptoms associated with myasthenia gravis, hypogammaglobulinemia, or red cell aplasia.

If symptoms and/or the results of the physical exam suggest a thymus tumor might be present, more tests probably will be done. These might include imaging tests, lab tests, and other procedures.

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 a suspicious area that might be cancerous, to learn how far cancer may have spread, and to help determine if treatment has been effective.

Chest x-ray

A chest x-ray may be the first imaging test a doctor orders if he or she suspects a problem in the middle of the chest. It may be able to show if there is a tumor in the chest. In some cases, a chest x-ray may find tumors in people before they cause any symptoms (when the person is having the x-ray done for another reason). However, some thymomas are small or are in certain places that may not show up on a chest x-ray. If your doctor is still suspicious or if an abnormality appears on the chest x-ray, a CT scan may be ordered.

Computed tomography (CT) scan

The computed tomography (CT) scan is an x-ray procedure 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 are lying on a narrow platform. A computer then combines these into images of slices of the part of your body that is being studied.

Before the test, you may be asked to drink 1 to 2 pints of a liquid called *oral contrast*. This helps outline abnormal areas in the body. 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 warm feeling 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.

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.

CT scans can have several uses:

- CT scans of the chest can spot very small tumors and help determine the exact location and extent of the tumors.
- CT scans can be helpful in staging a cancer (determining the extent of its spread). For example, they can show whether the cancer has spread to nearby lymph nodes or to the liver, kidneys, brain, or other organs.
- CT scans can also be used to guide a biopsy needle precisely into a suspected tumor or metastasis. For this procedure, called a *CT-guided needle biopsy*, the patient remains on the CT scanning table while a radiologist advances a biopsy needle through the skin and toward the location of the mass. CT scans are repeated until the needle is within the mass. A biopsy sample is then removed and looked at under a microscope.
- During or after treatment, CT scans may be used to see whether tumors are shrinking or have recurred (come back) in other parts of the body.

Magnetic resonance imaging (MRI) scan

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 very detailed images 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 may be a little more uncomfortable than CT scans. They take longer — often up to an hour. You may be placed inside a large cylindrical tube, which is confining and can upset people with a fear of enclosed spaces (*claustrophobia*). For people who cannot tolerate a regular MRI machine, there are special, more open MRI machines that can be used instead in some cases. The MRI machine makes buzzing and clicking noises that you might find disturbing. Some places will provide earplugs to help block this out.

MRI of the chest may be done to look more closely at thymus tumors. They are most often used when the patient can’t have a CT scan for medical reasons (like problems with the IV contrast). MRI images are also particularly useful in looking for cancer that may have spread to the brain or spinal cord.

Positron emission tomography (PET) scan

For a PET scan, you receive an injection of a substance that contains a radioactive atom. This is usually glucose (a type of sugar), but other substances that are attracted to thymoma cells

may also be used. The amount of radioactivity is very low. The cancer cells in the body absorb large amounts of the radioactive substance. A special camera can then be used to create a picture of areas of radioactivity in the body. The picture is not finely detailed like a CT or MRI scan, but it can provide helpful information about your whole body.

A PET scan can help give the doctor a better idea of whether an abnormal area seen on another imaging test is a tumor or not. If you have already been diagnosed with cancer, your doctor may use this test to see if the cancer has spread to lymph nodes or other parts of the body. A PET scan can also be useful if your doctor thinks the cancer may have spread but doesn't know where.

Certain machines are able to perform both a PET and CT scan at the same time (PET/CT scan). This lets the doctor compare areas of higher radioactivity on the PET scan with the more detailed appearance of that area on the CT. Combined PET/CT is used more often than PET (alone) in looking at thymomas.

Blood tests

Blood tests can't be used to diagnose thymomas directly, but they may still be helpful in some situations. For example, tests may be done to look for certain antibodies in the blood of people who may have myasthenia gravis or other autoimmune disorders. Other blood tests may be done to make sure a mass in the middle of the chest isn't a germ cell tumor or part of the thyroid gland.

If a thymoma is diagnosed, blood cell counts and blood chemistry tests are done to get an idea of a person's overall health, especially if surgery is planned. Also, tests for myasthenia gravis (MG) will be done before any surgery. This is because MG is very common in patients with a thymoma, and, if left untreated, it can cause problems with anesthesia during surgery. People getting chemotherapy also have regular blood tests to make sure the drugs aren't having unwanted effects on the bone marrow, kidneys, or other organs.

Types of biopsy procedures

Although signs, symptoms, and imaging tests can suggest that a thymic tumor is likely to be present, doctors can't be certain of the diagnosis without looking at the tumor under a microscope.

For most cancers, removal of a small sample of the tumor (known as a *biopsy*) is needed to confirm whether a tumor is present and, if so, to determine its type. For thymomas, this is rarely done because doctors can usually tell that the tumor is very likely a thymoma based on how it looks on imaging tests. Because of this, doctors often remove the entire tumor rather than do a biopsy. If the doctor suspects a different type of tumor, a biopsy may be done before surgery. Most often, a needle biopsy is done. A biopsy may also be done to confirm the diagnosis if the tumor can't be removed completely with surgery. This can allow the cancer to be treated with things other than surgery.

Needle biopsy

Tumors in the chest are sometimes sampled by needle biopsy. A long, hollow needle is passed through the skin in the chest. Imaging tests such as CT scans are used to guide the needle into the tumor so that a small sample can be removed to be looked at under the microscope. This procedure is done without a surgical incision or overnight hospital stay.

A possible downside of this test is that it might not always get enough of a sample to make an accurate diagnosis or allow the doctor to get a good sense of the extent of the tumor.

Surgical biopsy

In most cases, if the doctor believes that the patient has thymoma (based on CT findings and lab tests, especially in a patient with a paraneoplastic syndrome) and it can be removed with surgery, the doctor may operate without any biopsy. This can both provide enough of a sample for a diagnosis and treat the tumor at the same time. The specimen is sent to the lab after surgery to confirm the diagnosis. See the section on “Surgery for thymus cancer” for more information.

How is thymus cancer staged?

Staging is the process of finding out if and 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.

Masaoka staging system

There is no single staging system for thymomas that all doctors agree on, perhaps because these tumors are so uncommon. The system most often used to stage thymomas is the Masaoka system, although other systems exist. Staging in the Masaoka system is based on:

- The extent of disease as seen on imaging tests such as CT or MRI scans
- Whether the surgeon finds the tumor hard to separate from nearby tissues (indicating the tumor is invasive)
- Whether the doctor sees tumor cells beyond the thymus when looking at the tumor sample under the microscope

The Masaoka system has 4 main stages.

Stage I

The thymoma is non-invasive. That is, it has not spread into the capsule (outer layer) of the thymus.

Stage II, which is divided into IIA and IIB

- Stage IIA: The thymoma is growing into the capsule (the outer layer of tissue of the thymus).
- Stage IIB: The tumor has grown through the capsule into the nearby fatty tissue, and may be stuck to the mediastinal pleura (the thin layer covering the space between the 2 lungs) or the pericardium (the tissue sac containing the heart).

Stage III

The thymoma is growing into nearby tissues or organs of the lower neck or upper chest area, including the pericardium (the tissue sac containing the heart), the lungs, or the main blood vessels going into or exiting from the heart (the superior vena cava and aorta).

Stage IV, which is divided into IVA and IVB

- Stage IVA: The thymoma has spread widely throughout the pleura (lining of the lungs and chest wall) and/or pericardium.
- Stage IVB: The thymoma has spread to distant organs. The most common sites of spread are bone, the liver, and the lungs.

Resectable versus unresectable cancer

The Masaoka staging system divides thymomas into different groups that help give doctors an idea about a person's prognosis (outlook). But for treatment purposes, doctors often use a simpler system based on whether these cancers are likely to be resectable (where all visible tumor can be removed by surgery) or unresectable.

In general terms, almost all stage I and II thymomas, most stage III thymomas, and even some stage IV thymomas are potentially resectable, but there are exceptions. Resectability is based on whether the tumor appears to have grown into nearby tissues or spread to distant sites, as well as on whether or not a person is healthy enough to have surgery.

Surgery is typically part of the treatment plan whenever possible. In some cases, other forms of treatment such as radiation therapy or chemotherapy may be recommended as well.

Other prognostic factors

The prognosis (the outlook for chances of survival) after treatment of a thymoma depends to a large extent on its stage. But other features are important as well, such as its cellular classification (described in the section "What is thymus cancer?") and whether the surgeon is able to remove the entire tumor.

Survival rates for thymus 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 may not find the numbers helpful, or may even not want to know them. If you do not want to read about the survival statistics for thymoma given in the next few paragraphs, 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). Although many patients live much longer than this, it isn't always an indication that the cancer has been cured, as some thymus tumors are very slow growing, and others may return in some people several years after treatment.

To get 5-year survival rates, doctors have to look at people who were treated at least 5 years ago. Treatment may have improved since then which could result in a more favorable outlook for people now being diagnosed with thymus 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 may affect a person's outlook, such as the histologic type of thymus cancer, the treatment received, whether it was completely removed with surgery, and the patient's age. Your doctor can tell you how the numbers below may apply to you, as he or she is familiar with your particular situation.

Because thymus cancers are not common, it is hard to find accurate survival rates based on the stage of the cancer. The numbers below come from a large series of patients treated in Japan between 1990 and 1994. They look separately at patients with thymoma (types A, AB, and B) and thymic carcinoma (type C thymoma). Also, these are observed survival rates. People with thymus cancer can die of other things, and these numbers don't take that into account.

Stage of thymoma	**5-year observed survival rate**
I	74%
II	73%
III	64%
IV	45%

Stage of thymic	**5-year observed survival rate**

carcinoma	
I and II	74%
III	33%
IV	24%

How is thymus cancer 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.

Making treatment decisions

After a thymic tumor is found and tests have been done to get a sense of its likely stage, your cancer care team will discuss your treatment options with you. Factors important in choosing a treatment include the type and stage of the cancer, whether or not it is resectable (able to be completely removed with surgery), and whether you have any other serious medical problems. Because thymic cancer is rare, it has been hard to do large studies looking at treatments and comparing one against another. That's why in many cases the best way to treat this cancer is not always clear

Your health care team may include: a thoracic surgeon, radiation oncologist, medical oncologist, pulmonologist, a neurologist, as well as nurse practitioners, nurses, psychologists, social workers, rehabilitation specialists, and other health professionals.

Selecting a treatment plan is an important decision, and you should take the time to think about all of your choices. If time permits, it is often a good idea to seek a second opinion. A second opinion can provide more information and help you feel more confident about the treatment plan chosen.

The main treatments for thymus cancer are:

- Surgery
- Radiation

- Chemotherapy

For information about some of the most common approaches used based on the extent of the disease, see the section “Treatment of thymus cancers by extent and type of tumor.”

Surgery for thymus cancer

Whenever possible, surgery is used to treat thymus cancers. If you have thymus cancer, one of the first things your doctor will do is to try to determine whether or not the cancer is completely resectable (removable) with surgery.

The most common surgery for thymus tumors is complete removal of the thymus (including any tumor). This is called a *thymectomy*. In most cases the surgery is done through a median sternotomy, an incision down the middle of the chest that splits the sternum (breast bone), permitting thorough removal of the thymus and tumor.

The surgeon will also try to remove any areas of tumor spread outside of the thymus. That means that if the tumor has grown into nearby structures, the surgeon may also need to remove parts of those structures, as well. This could mean removing parts of the pleura (tissue coating the lung), pericardium (the sac containing the heart), nerves, the superior vena cava (a large vein leading to the heart), and/or lung.

Some doctors might suggest surgery even if the tumor is not completely resectable, as is the case with many stage III thymomas and with most stage IV thymomas. In these cases, the doctor might remove as much tumor as possible (called *debulking*), and then recommend further treatment with radiation therapy and/or chemotherapy. But not all doctors agree that surgery that doesn’t remove all of the cancer helps people live longer. In some cases, chemotherapy or radiation therapy may be given before surgery to try to shrink the tumor so that it can be more easily removed completely.

Possible side effects of surgery for thymus cancer

Possible complications depend on the extent of the surgery and your health beforehand. Serious complications can include excessive bleeding, wound infections, and pneumonia.

You will need to stay in the hospital for several days after the surgery. Because the surgeon usually will have to open your chest for the operation, the incision will hurt for some time after surgery. Your activity will be limited for at least a month or two.

Some people may need to have part or all of a lung removed. If your lungs are in good condition (other than the presence of the cancer) you can usually return to normal activities after a lobe or even an entire lung has been removed. If you already have lung problems such as emphysema or chronic bronchitis (which are common among heavy smokers), you may become short of breath with activities after surgery.

For more general information about surgery, see *A Guide to Cancer Surgery*.

Radiation therapy for thymus cancer

Radiation therapy is the use of high-energy radiation in the form of x-rays or radioactive particles to kill cancer cells.

Radiation therapy can be used in several situations. After surgery, radiation therapy is sometimes given to try to kill any small deposits of cancer that may have been left behind because they were too small to see. This, called *adjuvant therapy*, is done for nearly all stage III and IV thymomas and for most thymic carcinomas, even when no visible tumor was left behind.

Radiation may also be used after surgery if the doctor thinks that some cancer was left behind.

Some doctors may use radiation therapy to try to shrink larger tumors before surgery, especially if the tumor isn't completely resectable. But not all doctors agree this is useful. Some patients who can't have surgery are treated with radiation therapy alone, although this is not as effective as surgery. Sometimes chemotherapy is given with radiation to help it work better.

In people with advanced disease, radiation therapy can be used to help ease (palliate) symptoms from the cancer such as shortness of breath, pain, bleeding, or trouble swallowing.

The type of radiation therapy used most often to treat thymic cancer is **external beam radiation therapy (EBRT)**. This type of radiation therapy uses x-rays from a machine outside the patient's body to kill cancer cells. The treatment is much like getting an x-ray, but the radiation is more intense. The procedure itself is painless, but it does cause side effects (discussed later on). Before your treatments start, the medical team will take careful measurements to determine the correct angles for aiming the radiation beams and the proper dose of radiation. They may also do special CT scans to help plan your treatments. Each treatment lasts only a few minutes, although the setup time — getting you into place for treatment — usually takes longer. Most often, radiation treatments are given 5 days a week for several weeks.

A type of EBRT called *three-dimensional conformal radiation therapy* (3D-CRT) is often used to treat thymic cancers. This technique allows doctors to more accurately target the tumor while reducing the radiation exposure to nearby healthy tissues such as the lungs and the heart. This might offer a better chance of increasing the success rate and reducing side effects.

Sometimes, an advanced form of 3D-CRT, called *intensity-modulated radiation therapy* (IMRT) is used. It uses a computer-driven machine that moves around the patient as it delivers radiation. Along with shaping the radiation beams and aiming them at the tumor from several angles, the intensity (strength) of the beams can be adjusted to minimize the dose reaching the most sensitive normal tissues. Most major hospitals and cancer centers are now able to provide IMRT.

Possible side effects of radiation therapy for thymus cancer

Common side effects of radiation therapy include:

- Fatigue
- Skin changes where the radiation passes through, such as redness and blistering
- Nausea, and vomiting
- Irritation of the esophagus (the tube between the mouth and stomach), which could cause problems such as painful swallowing
- Poor appetite and weight loss
- Diarrhea (if the abdomen/belly or pelvis is treated).

Radiation can damage bone marrow leading to low blood counts. This can lead to anemia (low red blood cell counts) which can cause people to feel weak and tired. It can also lead to low white blood cell counts, which increases the risk of serious infections.

Chest radiation therapy can also damage lungs. This can lead to trouble breathing and shortness of breath. Although this usually gets better after radiation treatments stop, sometimes the damage is long-term (or even permanent).

Most side effects are temporary and improve after radiation treatment is done.

If radiation therapy is used together with chemotherapy, the side effects are often worse.

If you are having any side effects from radiation therapy, tell your doctor or nurse. In most cases there are ways to help control these symptoms.

For more general information about radiation therapy, see *Understanding Radiation Therapy: A Guide for Patients and Families*.

Chemotherapy for thymus cancer

Chemotherapy (chemo) uses anti-cancer drugs that are given intravenously (into a vein) or by mouth. These drugs enter the bloodstream and reach throughout the body, making this treatment especially useful for cancer that may have spread to organs beyond the thymus.

Chemo may be used in several situations:

- It may be given after surgery to try to kill any cancer cells that may have been left behind because they were too small to see. This is called as *adjuvant* treatment.
- It may be given before surgery to try to shrink tumors that are not otherwise resectable (able to be removed completely). This is known as *neoadjuvant* therapy.

- In people who have advanced cancer or are not healthy enough for surgery, chemo may be the main treatment.
- Chemo is sometimes combined with radiation to help it work better. This is known as *chemoradiation* or *chemoradiotherapy*.

Doctors give chemo in cycles, with each period of treatment followed by a rest period to allow the body time to recover. Chemo cycles generally last about 3 to 4 weeks, and initial treatment typically involves 4 to 6 cycles. Chemo is often not recommended for patients in poor health, but advanced age by itself is not a barrier to getting chemo.

Several chemo drugs may be used in the treatment of thymomas and thymic carcinomas, including:

- Doxorubicin (Adriamycin®)
- Epirubicin (Ellence®)
- Cisplatin
- Carboplatin
- Cyclophosphamide (Cytoxan®)
- Ifosfamide (Ifex®)
- Vincristine (Oncovin®)
- Etoposide (VP-16)
- Paclitaxel (Taxol®)
- Pemetrexed (Alimta®)
- 5-fluorouracil (5-FU)
- Gemcitabine (Gemzar®)

The corticosteroid drug prednisone is often given with chemo.

These drugs are usually given in combination to try to increase their effectiveness. For example, the combination of cisplatin, doxorubicin, and cyclophosphamide (called PAC) with or without prednisone is often used to treat thymoma. The combination of carboplatin and paclitaxel may be used to treat thymic carcinoma

Possible side effects of chemotherapy for thymus cancer

Chemo drugs work by attacking cells that are dividing quickly, which is why they 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 chemo, which can lead to certain side effects.

The side effects of chemo depend on the type and dose of drugs you are given and how long they are used. These side effects can include:

- Hair loss
- Mouth sores
- Loss of appetite
- Nausea and vomiting
- Fatigue and weakness

Chemo can also affect the blood forming cells of the bone marrow, leading to:

- Increased chance of infections (due to low white blood cell counts)
- Easy bruising or bleeding (due to low blood platelet counts)
- Fatigue and weakness (due to low red blood cell counts)

These side effects usually go away after treatment ends and there are often ways to lessen them. For example, drugs can be given to help prevent or reduce nausea and vomiting. If you do have side effects, be sure to ask your doctor or nurse about medicines to help reduce or manage them effectively.

Some drugs can have other side effects. For example, cisplatin and paclitaxel can damage nerves (called *neuropathy*). This can sometimes lead to pain, burning or tingling sensations, sensitivity to cold or heat, or weakness in the hands and feet. Cisplatin can also affect the nerves of the ear, leading to hearing loss. In most cases these problems improve or even go away once treatment is stopped, but they may last a long time in some people. You should report this, as well as any other side effects or changes you notice while getting chemotherapy, to your medical team so that you can get prompt treatment for them. In some cases, the doses of the chemotherapy drugs may need to be reduced or treatment may need to be delayed or stopped to prevent the effects from getting worse.

Octreotide

A drug called *octreotide* (Sandostatin® and Sandostatin LAR®) may also help some people with advanced thymoma. This is not a typical chemo drug. It is a man-made version of a hormone called *somatostatin*. The drug is effective in some cases because somatostatin attaches to the thymoma cells and causes them to stop growing or die. Side effects of this drug can include pain or burning at the injection site, stomach cramps, nausea, vomiting, headaches, dizziness, and fatigue. It is also linked to increased risk of gallstones.

For more general information about chemotherapy, see *A Guide to Chemotherapy*.

Clinical trials for thymus cancer

You may 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 choosing 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 carefully controlled research studies that are done with patients who volunteer for them. They are done to get a closer look at promising new treatments or procedures.

If you would like to take part in a clinical trial, you should start by asking your doctor if your clinic or hospital conducts clinical trials. You can also call our clinical trials matching service for a list of clinical trials that meet your medical needs. You can reach this service at 1-800-303-5691 or on our website at www.cancer.org/clinicaltrials. 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 website at www.cancer.gov/clinicaltrials.

There are requirements you must meet to take part in any clinical trial. If you do qualify for a clinical trial, it is up to you whether or not to enter (enroll in) it.

Clinical trials are one way to get state-of-the art cancer treatment. In some cases, they are the only way for doctors to learn better methods to treat cancer. Still, they are not right for everyone.

You can get a lot more information on clinical trials in our document called *Clinical Trials: What You Need to Know*.

Complementary and alternative therapies for thymus cancer

When you have cancer you are likely to hear about ways to treat your cancer or relieve symptoms that your doctor hasn't mentioned. Everyone from friends and family to Internet groups and websites may offer ideas for what might help you. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

What exactly are complementary and alternative therapies?

Not everyone uses these terms the same way, and they are used to refer to many different methods, so it can be confusing. We use *complementary* to refer to treatments that are used *along with* your regular medical care. *Alternative* treatments are used *instead of* a doctor's medical treatment.

Complementary methods: Most complementary treatment methods are not offered as cures for cancer. Mainly, they are used to help you feel better. Some methods that are used along with regular treatment are meditation to reduce stress, acupuncture to help relieve pain, or peppermint tea to relieve nausea. Some complementary methods are known to help, while others have not been tested. Some have been proven not be helpful, and a few have even been found harmful.

Alternative treatments: Alternative treatments may be offered as cancer cures. These treatments have not been proven safe and effective in clinical trials. Some of these methods may pose danger, or have life-threatening side effects. But the biggest danger in most cases is that you may lose the chance to be helped by standard medical treatment. Delays or interruptions in your medical treatments may give the cancer more time to grow and make it less likely that treatment will help.

Finding out more

It's easy to see why people with cancer think about alternative methods. You want to do all you can to fight the cancer, and the idea of a treatment with no side effects sounds great. Sometimes medical treatments like chemotherapy can be hard to take, or they may no longer be working. But the truth is that most of these alternative methods have not been tested and proven to work in treating cancer.

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

- Look for "red flags" that suggest fraud. Does the method promise to cure all or most cancers? Are you told not to have regular medical treatments? Is the treatment a "secret" that requires you to visit certain providers or travel to another country?
- Talk to your doctor or nurse about any method you are thinking about using.
- Contact us at 1-800-227-2345 to learn more about complementary and alternative methods.

The choice is yours

Decisions about how to treat or manage your cancer are always yours to make. If you want to use a non-standard treatment, learn all you can about the method and talk to your doctor about it. With good 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 of thymus cancers by extent and type of tumor

Whether or not a thymus cancer is considered resectable (removable by surgery) is one of the most important factors in determining treatment options. The type of tumor is also important.

Thymic carcinomas are more likely to grow and spread quickly than thymomas and often require more aggressive treatment.

Resectable cancers

For patients with resectable cancers (almost all stage I and II thymus cancers, most stage III cancers, and small number of stage IV cancers), surgery offers the best chance for long-term survival if it can be tolerated. This typically includes removal of the entire thymus and, depending on the extent of the disease, maybe parts of nearby organs or blood vessels as well.

Early stage thymomas (such as stage I and II) do not usually require further treatment after surgery as long as the tumor was removed completely. For early thymomas, radiation therapy may be considered if there is concern that any tumor was left behind.

Patients with more advanced stage thymomas (such as stages III and IV) may be treated with radiation after surgery, even if all of the tumor was removed. If the tumor couldn't be removed completely, radiation therapy is usually given after surgery. Depending on how much cancer was left behind, chemotherapy (chemo) may be added as well.

Thymic carcinomas are more likely to come back after treatment. Patients with stage I tumors may not need further treatment if the tumor was removed completely. If the tumor is more advanced, or some might have been left behind, patients are typically treated with radiation after surgery. The radiation may be given with chemo as well, especially if some of the cancer is left behind after surgery.

Unresectable cancers

Unresectable cancers are those that cannot be removed with surgery. This group includes cancers that are too close to vital structures or that have spread too far to be removed completely (which includes many stage III and most stage IV cancers), as well as cancers in people who are too ill for surgery.

In some cases, doctors may advise giving chemo, radiation therapy, or both first to try to make the tumor resectable. If it shrinks enough, surgery is done. This is then followed by further treatment with chemo or radiation therapy.

Surgery may be the first treatment for some unresectable cancers, to try to remove as much of the tumor as possible. This is known as *debulking*. Radiation therapy and/or chemo are then given. The hope is that the surgery may help the other treatments work better and may help people live longer, even if it doesn't cure the cancer. Studies of this approach have had mixed results.

For patients who can't have surgery, either because the cancer has spread too far or because they are too sick from other serious medical conditions, chemo and radiation therapy are the main treatment options.

Because unresectable cancers can be hard to treat, taking part in a clinical trial of a newer form of treatment may be a reasonable option.

Recurrent thymus cancer

When cancer comes back after treatment it is called *recurrent*. Recurrence can be local (in or near the same place it started) or distant (spread to organs such as the liver or bone).

Thymomas most often come back locally. Thymic carcinomas can also come back locally and in nearby lymph nodes, but they may also spread to liver, lungs, and bone.

Treatment for thymus cancer that has recurred (come back) after initial treatment depends on the location of the recurrence and on what the original treatment was. If the recurrence is not too widespread, surgery may be an option and would offer the best chance for long-term survival. But in most cases, the treatment options may be limited to radiation therapy and/or chemo. These treatments can often be effective in controlling the cancer for a time, although they are very unlikely to result in a cure.

Because recurrent cancers can often be hard to treat, clinical trials of new types of treatment may be a good option.

More treatment information for thymus cancer

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 website (www.nccn.org).

The NCI provides treatment guidelines via its telephone information center (1-800-4-CANCER) and its website (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 thymus cancer?

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

- What kind of thymic tumor do I have?
- Has my cancer spread beyond the thymus?

- What is the stage (extent) of my cancer, and what does that mean in my case?
- Can the tumor be removed with surgery (is it likely to be resectable)?
- Are there other tests that need to be done before we can decide on treatment?
- How much experience do you have treating this type of cancer?
- Should I get a second opinion?
- What treatment choices do I have? What do you recommend? Why?
- What's the goal of treatment?
- What risks or side effects are there to the treatments you suggest?
- What should I do to be ready for treatment?
- How long will treatment last? What will it involve? Where will it be done?
- How will treatment affect my daily activities?
- What are the chances my cancer will recur (come back) with these treatment plans?
- What would we do if the treatment doesn't work or if the cancer recurs?
- What type of follow-up might I need after treatment?

In addition to these questions, be sure to write down some of your own. For instance, you might want more information about recovery times so you can plan your work schedule. Or you may want to ask about clinical trials for which you may qualify.

Keep in mind, too, that doctors are not the only ones who can give you information. Other health care professionals, such as nurses and social workers, may have the answers to your questions. You can find more information about communicating with your health care team in our document *Talking With Your Doctor*.

What happens after treatment for thymus cancer?

For most people with thymus 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 is 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.

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.

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 may have and may 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.

There is no widely agreed upon follow-up schedule for people with thymus cancer. Your doctor will most likely want to see you fairly frequently (every couple of months or so) at first. The time between visits may be extended if there are no problems. Most patients get a chest CT scan every six months for a couple of years, then yearly for 5 to 10 years.

It's important to keep your 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.

Another concern is the possibility of developing a second type of cancer later on. Several studies have found that a person who has had thymoma is more prone than the average person to develop other cancers, particularly lymphomas and sarcomas. The reasons for this are not clear.

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's 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 were in the hospital, a copy of the discharge summary that doctors prepare when patients are sent home
- If you had radiation therapy, a copy of your treatment summary
- If you were treated with chemotherapy or other medicines, a list of your drugs, drug doses, and when you took them
- Copies of your CT scans (or other imaging tests) – these can often be stored digitally on a DVD, etc.

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

Can I get another cancer after having thymus 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 thymus cancer can get any type of second cancer, but they have an increased risk of:

- Non-Hodgkin lymphoma
- Salivary gland cancer
- Liver cancer
- Soft-tissue sarcoma

Follow-up after treatment

After completing treatment for thymus cancer, you should still see your doctor regularly. You may have tests to look for signs 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 thymus 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.

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 having thymus 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 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 put healthy eating habits into place. 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 a person 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 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, you will need to balance activity with rest. It is 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 this topic, see

Fatigue in People With Cancer and *Anemia in People With Cancer*. The "Additional resources for thymus cancer" section lists other documents to help you deal with side effects)

Keep in mind exercise 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 does having thymus cancer affect your emotional health?

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 thymus 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 curative treatment stops working, and about planning ahead for yourself and your family, in our documents Nearing the End of Life and Advance Directives.

At some point, you might 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 research and treatment for thymus cancer?

There is always research going on in the area of thymic tumors. Scientists are looking for causes of thymic tumors, and doctors are working to improve treatments.

Because thymic tumors are relatively rare, more information from clinical trials is needed to decide which treatments are best for each type and stage. For example, the role of chemotherapy in treating thymomas is still being explored. In addition, new treatments are being developed and tested.

Researchers are looking for more accurate ways of predicting the aggressiveness of each tumor so that treatment can be more appropriately selected for each patient.

Some studies are looking to see if giving treatment with chemotherapy (chemo) and/or radiation before surgery can help patients with thymus cancer.

Removing or destroying all of the cancer cells is not the only consideration in treating patients with thymomas. Some paraneoplastic syndromes may persist even after the tumor has been treated. Researchers are studying the causes of these syndromes and the best ways to treat them.

While chemotherapy can often help shrink thymus cancers, it is not always effective and can have serious side effects. Chemo drugs work by attacking rapidly growing cells, which is the main cause of their side effects. As researchers have learned more about what makes cancer cells different from normal cells, they have begun to develop drugs that target these differences. Studies are now testing targeted therapies against cancers of the thymus. These targeted therapies include anti-angiogenesis drugs (which affect tumors by limiting their blood supply) and anti-growth factor drugs (which interfere with substances some cancer

cells make to stimulate their own growth). Some of these drugs are already being used to treat other cancers, and are being studied for use against thymus cancers. These include cetuximab, erlotinib, and bevacizumab. Others being studied, such as cixutumumab, milciclib and saracatinib are not yet approved to treat any type of cancer.

Octreotide is a non-chemo drug that can sometimes be helpful in treating thymus cancers. Pasireotide is a similar drug that is now being studied to see if it may be helpful, too.

Additional resources for thymus cancer

More information from your American Cancer Society

Here is more information you might find helpful. You can order free copies of our documents from our toll-free number, 1-800-227-2345, or read them on our website, www.cancer.org.

Dealing with diagnosis and treatment

Health Professionals Associated With Cancer Care

Talking With Your Doctor (also in Spanish)

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

Nutrition for the Person With Cancer During Treatment: A Guide for Patients and Families (also in Spanish)

Coping With Cancer in Everyday Life (also in Spanish)

Family and caregiver concerns

Talking With Friends and Relatives About Your Cancer (also in Spanish)

Helping Children When A Family Member Has Cancer: Dealing With Diagnosis (also in Spanish)

What It Takes to Be a Caregiver

Insurance and financial issues

In Treatment: Financial Guidance for Cancer Survivors and Their Families (also in Spanish)

Health Insurance and Financial Assistance for the Cancer Patient (also in Spanish)

More on cancer treatments

A Guide to Cancer Surgery (also in Spanish)

Understanding Radiation Therapy: A Guide for Patients and Families (also in Spanish)

A Guide to Chemotherapy (also in Spanish)

Cancer treatment side effects

Caring for the Patient With Cancer at Home: A Guide for Patients and Families (also in Spanish)

Distress in People With Cancer

Anxiety, Fear, and Depression

Nausea and Vomiting

Guide to Controlling Cancer Pain (also in Spanish)

Get Relief From Cancer Pain

Pain Diary

Anemia in People With Cancer

Fatigue in People With Cancer

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: 1-800-4-CANCER (1-800-422-6237)
TYY: 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.

**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 cancer-related information and support. Call us at **1-800-227-2345** or visit www.cancer.org.

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