

Non-Small Cell Lung Cancer Treatment (PDQ®) – Patient Version

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General Information About Non-Small Cell Lung Cancer

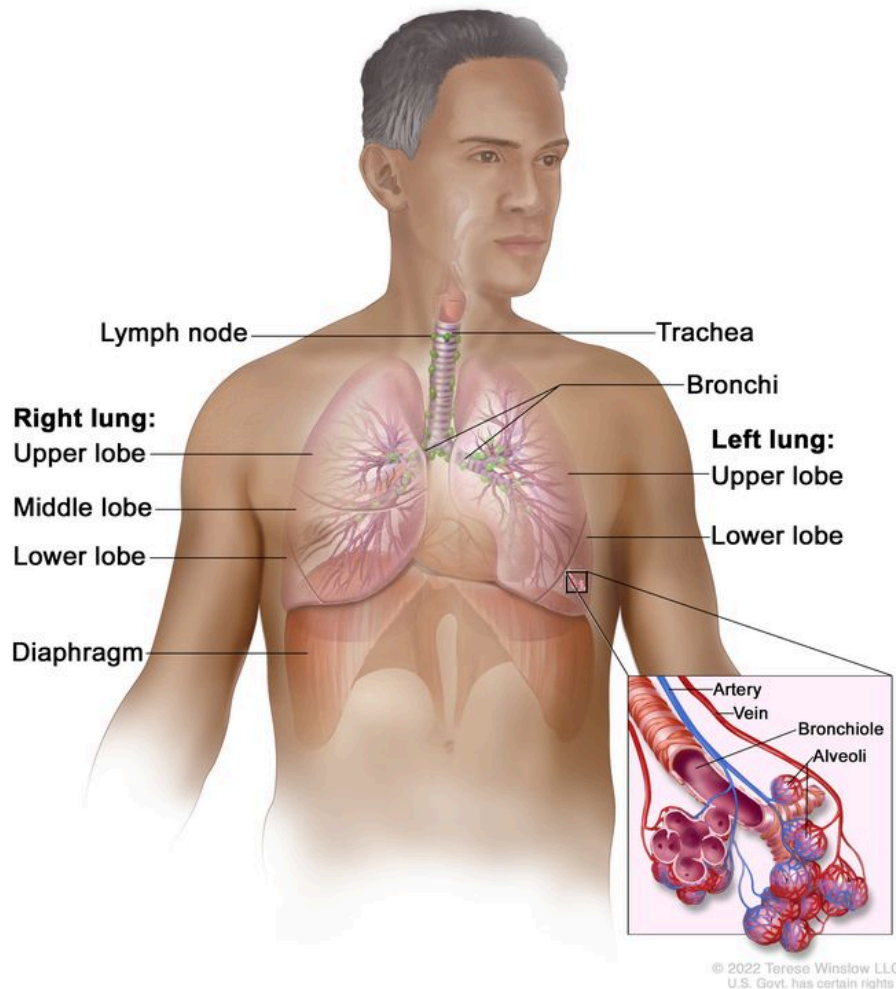
KEY POINTS

- Non-small cell lung cancer is a type of cancer that forms in the tissues of the lung.
- There are several types of non-small cell lung cancer.
- Smoking is the major risk factor for non-small cell lung cancer.
- Signs and symptoms of non-small cell lung cancer include coughing and shortness breath.
- Tests that examine the lungs are used to diagnose and stage non-small cell lung cancer.
- If lung cancer is suspected, you will have a biopsy.
- After non-small cell lung cancer has been diagnosed, tests are done to find out if cancer cells have spread within the chest or to other parts of the body.
- Some people decide to get a second opinion.
- Certain factors affect prognosis (chance of recovery) and treatment options.

Questions?

Non-small cell lung cancer is a type of cancer that forms in the tissues of the lung.

The lungs are a pair of cone-shaped breathing organs in the chest. The lungs bring oxygen into the body as you breathe in. They release carbon dioxide, a waste product of the body's cells, as you breathe out. Each lung has sections called lobes. The left lung has two lobes. The right lung is slightly larger and has three lobes. Two tubes called bronchi lead from the trachea (windpipe) to the right and left lungs. Lung cancer may also form in the bronchi. Tiny air sacs called alveoli and small tubes called bronchioles make up the inside of the lungs.



Anatomy of the respiratory system showing the trachea, the right and left lungs and their lobes, and the bronchi. The lymph nodes and the diaphragm are also shown. Oxygen is inhaled into the lungs and passes through the alveoli (the tiny air sacs at the end of the bronchioles) and into the bloodstream (see inset), where it travels to the tissues throughout the body.

A thin membrane called the pleura covers the outside of each lung and lines the inside wall of the chest cavity. This creates a sac called the pleural cavity. The pleural cavity normally contains a small amount of fluid that helps the lungs move smoothly in the chest when you breathe.

There are two main types of lung cancer: non-small cell lung cancer and small cell lung cancer. Non-small cell lung cancer is more common than small cell lung cancer.

There are several types of non-small cell lung cancer.

Each type of non-small cell lung cancer has different kinds of cancer cells. The cancer cells of each type grow and spread in different ways. The types of non-small cell lung cancer are named for the kinds of cells found in the cancer and how the cells look under a microscope:

- Squamous cell carcinoma is a type of lung cancer that forms in the thin, flat cells lining the inside of the lungs. This is also called epidermoid carcinoma.
- Large cell carcinoma is a type of lung cancer that may begin in several types of large cells.
- Adenocarcinoma is a type of lung cancer that begins in the cells that line the alveoli and make substances such as mucus.

Less common types of non-small cell lung cancer include adenosquamous carcinoma, sarcomatoid carcinoma, salivary gland carcinoma, carcinoid tumor, and unclassified carcinoma.

Smoking is the major risk factor for non-small cell lung cancer.

Lung cancer is caused by certain changes to the way lung cells function, especially how they grow and divide into new cells. There are many risk factors for lung cancer, but many do not directly cause cancer. Instead, they increase the chance of DNA damage in cells that may lead to lung cancer. Learn more about how cancer develops at [What Is Cancer?](#)

A risk factor is anything that increases the chance of getting a disease. Some risk factors for lung cancer, like smoking, can be changed. However, risk factors also include things you cannot change, like your genetics, age, and family history. Learning about risk factors for lung cancer can help you make changes that might lower your risk of getting it.

Smoking tobacco now or in the past is the most important risk factor for lung cancer. Smoking cigarettes, pipes, or cigars increases the risk of lung cancer. The earlier in life a person starts smoking, the more often a person smokes, and the more years a person smokes, the greater the risk of lung cancer.

Other risk factors for lung cancer include:

- being exposed to secondhand smoke
- being exposed to asbestos, arsenic, chromium, beryllium, nickel, soot, or tar in the workplace
- being exposed to radiation from:
 - radiation therapy to the breast or chest
 - radon in the home or workplace
 - imaging tests such as CT scans
 - atomic bomb radiation
- living where there is air pollution
- having a family history of lung cancer

- being infected with HIV
- taking beta carotene supplements and being a heavy smoker

Older age is the main risk factor for most cancers. The chance of getting cancer increases as you get older.

Having one or more of these risk factors does not necessarily mean you will get lung cancer. Many people with risk factors never develop lung cancer, whereas others with no known risk factors do. Talk with your doctor if you think you might be at increased risk.

When smoking is combined with other risk factors, the risk of lung cancer is increased.

Signs and symptoms of non-small cell lung cancer include coughing and shortness of breath.

Sometimes lung cancer does not cause any signs or symptoms. It may be found during a chest x-ray done for another condition. Signs and symptoms may be caused by lung cancer or by other conditions. Check with your doctor if you have:

- chest discomfort or pain
- a cough that doesn't go away or gets worse over time
- trouble breathing
- wheezing
- blood in sputum (mucus coughed up from the lungs)
- hoarseness
- loss of appetite
- weight loss for no known reason
- fatigue
- trouble swallowing
- swelling in the face and/or veins in the neck

Tests that examine the lungs are used to diagnose and stage non-small cell lung cancer.

Non-small cell lung cancer is usually diagnosed with tests and procedures that make pictures of the lung and the area around it. The process used to find out if cancer cells have spread within and around the lung is called staging. Tests and procedures to detect, diagnose, and stage non-small cell lung cancer are usually done at the same time. To plan treatment, it is important to know the stage of the disease and whether the cancer can be removed by surgery.

In addition to asking about your personal and family health history and doing a physical exam, your doctor may perform the following tests and procedures:

- **Laboratory tests** are medical procedures that test samples of tissue, blood, urine, or other substances in the body. These tests help to diagnose disease, plan and check treatment, or monitor the disease over time.
- **Chest x-ray** is a type of radiation that can go through the body and make pictures of the organs and bones inside the chest.



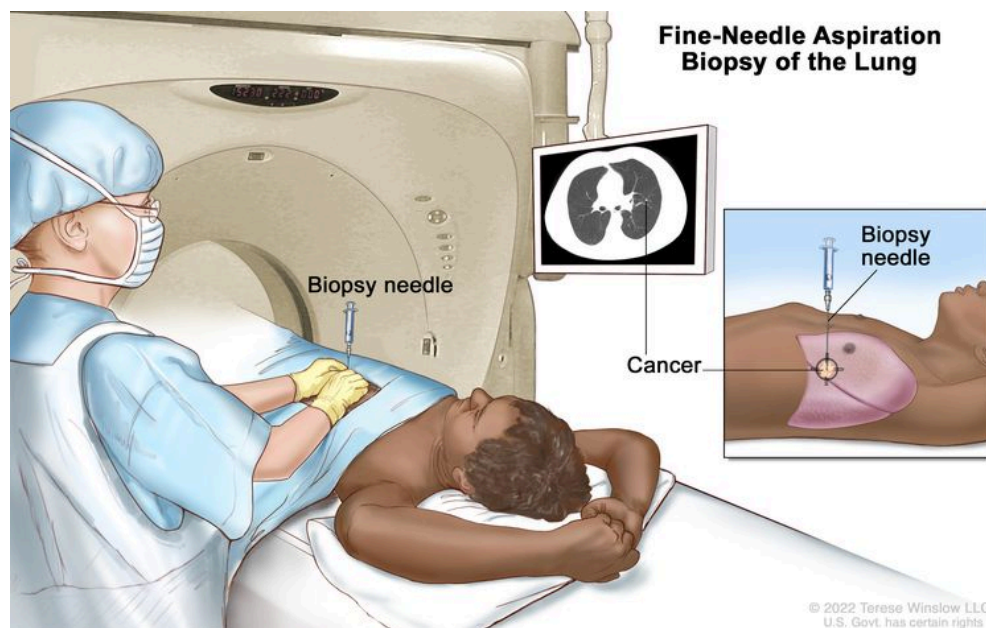
A chest x-ray is used to take pictures of the structures and organs inside the chest. X-rays pass through the patient's body onto film or a computer.

- **CT scan (CAT scan) of the brain, chest, and abdomen** uses a computer linked to an x-ray machine to make a series of detailed pictures of areas inside the body. The pictures are taken from different angles and are used to create 3-D views of tissues and organs. A dye may be injected into a vein or swallowed to help the organs or tissues show up more clearly. This procedure is also called computed tomography, computerized tomography, or computerized axial tomography.

If lung cancer is suspected, you will have a biopsy.

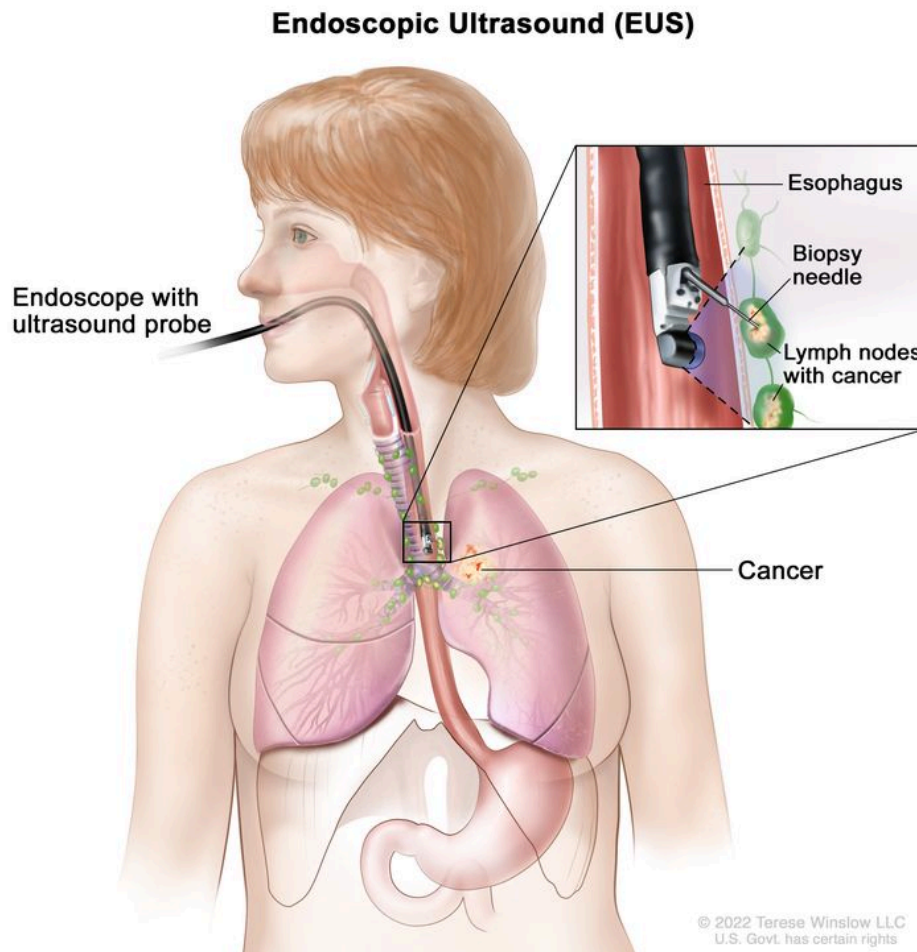
You may have one of the following types of biopsies:

- **Fine-needle aspiration (FNA) biopsy of the lung** is the removal of tissue or fluid from the lung using a thin needle. A CT scan, ultrasound, or other imaging procedure is used to locate the abnormal tissue or fluid in the lung. A small incision may be made in the skin where the biopsy needle is inserted into the abnormal tissue or fluid. A sample is removed with the needle and sent to the laboratory. A pathologist then views the sample under a microscope to look for cancer cells. A chest x-ray is done after the procedure to make sure no air is leaking from the lung into the chest.



Fine-needle aspiration biopsy of the lung. The patient lies on a table that slides through the computed tomography (CT) machine, which takes x-ray pictures of the inside of the body. The x-ray pictures help the doctor see where the abnormal tissue is in the lung. A biopsy needle is inserted through the chest wall and into the area of abnormal lung tissue. A small piece of tissue is removed through the needle and checked under the microscope for signs of cancer.

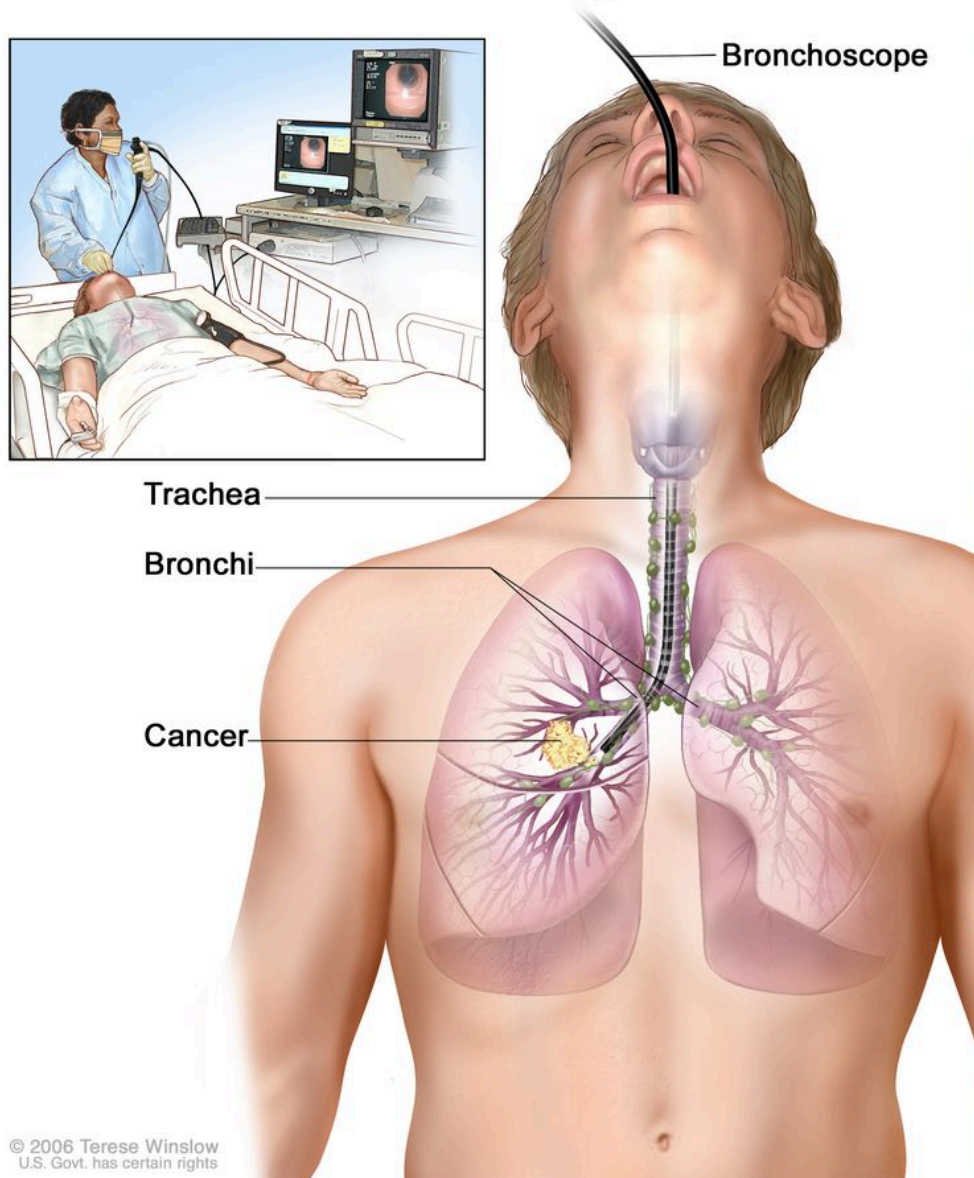
An endoscopic ultrasound (EUS) is a type of ultrasound that may be used to guide an FNA biopsy of the lung, lymph nodes, or other areas. EUS is a procedure in which an endoscope is inserted into the body. An endoscope is a thin, tube-like instrument with a light and a lens for viewing. A probe at the end of the endoscope is used to bounce high-energy sound waves (ultrasound) off internal tissues or organs and make echoes. The echoes form a picture of body tissues called a sonogram.



Endoscopic ultrasound-guided fine-needle aspiration biopsy. An endoscope that has an ultrasound probe and a biopsy needle is inserted through the mouth and into the esophagus. The probe bounces sound waves off body tissues to make echoes that form a sonogram (computer picture) of the lymph nodes near the esophagus. The sonogram helps the doctor see where to place the biopsy needle to remove tissue from the lymph nodes. This tissue is checked under a microscope for signs of cancer.

- **Bronchoscopy** is a procedure to look inside the trachea and large airways in the lung for abnormal areas. A bronchoscope is inserted through the nose or mouth into the trachea and lungs. A bronchoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue samples, which are checked under a microscope for signs of cancer.

Bronchoscopy



Bronchoscopy. A bronchoscope is inserted through the mouth, trachea, and major bronchi into the lung, to look for abnormal areas. A bronchoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a cutting tool. Tissue samples may be taken to be checked under a microscope for signs of disease.

- **Thoracoscopy** is a surgical procedure to look at the organs inside the chest to check for abnormal areas. An incision (cut) is made between two ribs, and a thoracoscope is inserted into the chest. A thoracoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue or lymph node samples, which are checked under a microscope for signs of cancer. In some cases, this procedure is used to remove part of the esophagus or lung. If certain tissues, organs, or lymph nodes can't be reached, a thoracotomy may be done. In this procedure, a larger incision is made between the ribs and the chest is opened.
- **Thoracentesis** is the removal of fluid from the space between the lining of the chest and the lung using a needle. A pathologist views the fluid under a microscope to look for

cancer cells.

- **Mediastinoscopy** is a surgical procedure to look at the organs, tissues, and lymph nodes between the lungs for abnormal areas. An incision (cut) is made at the top of the breastbone and a mediastinoscope is inserted into the chest. A mediastinoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue or lymph node samples, which are checked under a microscope for signs of cancer.
- **Anterior mediastinotomy** is a surgical procedure to look at the organs and tissues between the lungs and between the breastbone and heart for abnormal areas. An incision (cut) is made next to the breastbone and a mediastinoscope is inserted into the chest. A mediastinoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue or lymph node samples, which are checked under a microscope for signs of cancer. This is also called the Chamberlain procedure.
- **Lymph node biopsy** is the removal of all or part of a lymph node. A pathologist views the lymph node tissue under a microscope to check for cancer cells. A lymph node biopsy may be done at the same time as other types of biopsies.

One or more of the following laboratory tests may be done to study the tissue from the biopsy:

- **Molecular tests** check for certain genes, proteins, or other molecules in a sample of tissue, blood, or other body fluid. Molecular tests check for certain gene or chromosome changes that occur in non-small cell lung cancer.
- **Immunohistochemistry** uses antibodies to check for certain antigens (markers) in a sample of a patient's tissue. The antibodies are usually linked to an enzyme or a fluorescent dye. After the antibodies bind to a specific antigen in the tissue sample, the enzyme or dye is activated, and the antigen can then be seen under a microscope. This type of test is used to help diagnose cancer and to help tell one type of cancer from another type of cancer.

After non-small cell lung cancer has been diagnosed, tests are done to find out if cancer cells have spread within the chest or to other parts of the body.

The process used to find out if cancer has spread within the chest or to other parts of the body is called staging. The information gathered from the staging process determines the stage of the disease. It is important to know the stage in order to plan treatment. Some of the tests used to diagnose non-small cell lung cancer are also used to stage the disease.

Imaging tests that may be used in the staging process include:

- **MRI (magnetic resonance imaging) of the brain** uses a magnet, radio waves, and a computer to make a series of detailed pictures of areas inside the brain. This procedure is also called nuclear magnetic resonance imaging (NMRI).
- **PET scan (positron emission tomography scan)** uses a small amount of radioactive sugar (also called glucose) that is injected into a vein. Then a scanner rotates around the body to make detailed, computerized pictures of areas inside the body where the glucose is taken up. Because cancer cells often take up more glucose than normal cells, the pictures can be used to find cancer cells in the body. A PET scan and CT scan may be done at the same time. This is called a PET-CT.
- **Bone scan** checks for cancer cells in the bone. A very small amount of radioactive material is injected into a vein and travels through the bloodstream. The radioactive material collects in the bones with cancer and is detected by a scanner.
- **Pulmonary function test (PFT)** checks how well the lungs are working. It measures how much air the lungs can hold and how quickly air moves into and out of the lungs. It also measures how much oxygen is used and how much carbon dioxide is given off during breathing. This is also called lung function test.
- **Bone marrow aspiration and biopsy** is the removal of bone marrow, blood, and a small piece of bone by inserting a hollow needle into the hipbone or breastbone. A pathologist views the bone marrow, blood, and bone under a microscope to look for signs of cancer.

Some people decide to get a second opinion.

You may want to get a second opinion to confirm your non-small cell lung cancer diagnosis and treatment plan. If you seek a second opinion, you will need to get medical test results and reports from the first doctor to share with the second doctor. The second doctor will review the pathology report, slides, and scans. They may agree with the first doctor, suggest changes or another treatment approach, or provide more information about your cancer.

To learn more about choosing a doctor and getting a second opinion, see [Finding Cancer Care](#). You can contact [NCI's Cancer Information Service](#) via chat, email, or phone (both in English and Spanish) for help finding a doctor, hospital, or getting a second opinion. For questions you might want to ask at your appointments, see [Questions to Ask Your Doctor About Cancer](#).

Certain factors affect prognosis (chance of recovery) and treatment options.

The prognosis and treatment options depend on:

- the stage of the cancer (the size of the tumor and whether it is in the lung only or has spread to other places in the body)
- the type of lung cancer

- whether the cancer has mutations (changes) in certain genes, such as the epidermal growth factor receptor (EGFR) gene or the anaplastic lymphoma kinase (ALK) gene
- whether there are signs and symptoms such as coughing or trouble breathing
- your general health

For most people with non-small cell lung cancer, current treatments do not cure the cancer. If lung cancer is found, you may want to think about taking part in one of the many clinical trials being done to improve treatment or quality of life. Clinical trials are taking place in most parts of the country for people with all stages of non-small cell lung cancer. Information about ongoing clinical trials is available at [Clinical Trials Information for Patients and Caregivers](#).

Stages of Non-Small Cell Lung Cancer

KEY POINTS

- The following stages are used for non-small cell lung cancer:
 - Occult (hidden) stage non-small cell lung cancer
 - Stage 0
 - Stage I (also called stage 1) non-small cell lung cancer
 - Stage II (also called stage 2) non-small cell lung cancer
 - Stage III (also called stage 3) non-small cell lung cancer
 - Stage IV (also called stage 4) non-small cell lung cancer
- Non-small cell lung cancer can recur (come back) after it has been treated.

Cancer stage describes the extent of cancer in the body, such as the size of the tumor, whether it has spread, and how far it has spread from where it first formed. It is important to know the stage of non-small cell lung cancer to plan the best treatment.

There are several staging systems for cancer that describe the extent of the cancer. Non-small cell lung cancer staging usually uses the TNM staging system. The cancer may be described by this staging system in your pathology report. Based on the TNM results, a stage (I, II, III, or IV, also written as 1, 2, 3, or 4) is assigned to your cancer. When talking to you about your diagnosis, your doctor may describe the cancer as one of these stages.

Learn about [tests to stage non-small lung cell cancer](#). Learn more about [Cancer Staging](#).

The following stages are used for non-small cell lung cancer:

Occult (hidden) stage non-small cell lung cancer

In the occult (hidden) stage, cancer cannot be seen by imaging or bronchoscopy. Cancer cells are found in sputum or bronchial washings (a sample of cells taken from inside the airways that lead to the lungs). Cancer may have spread to other parts of the body.

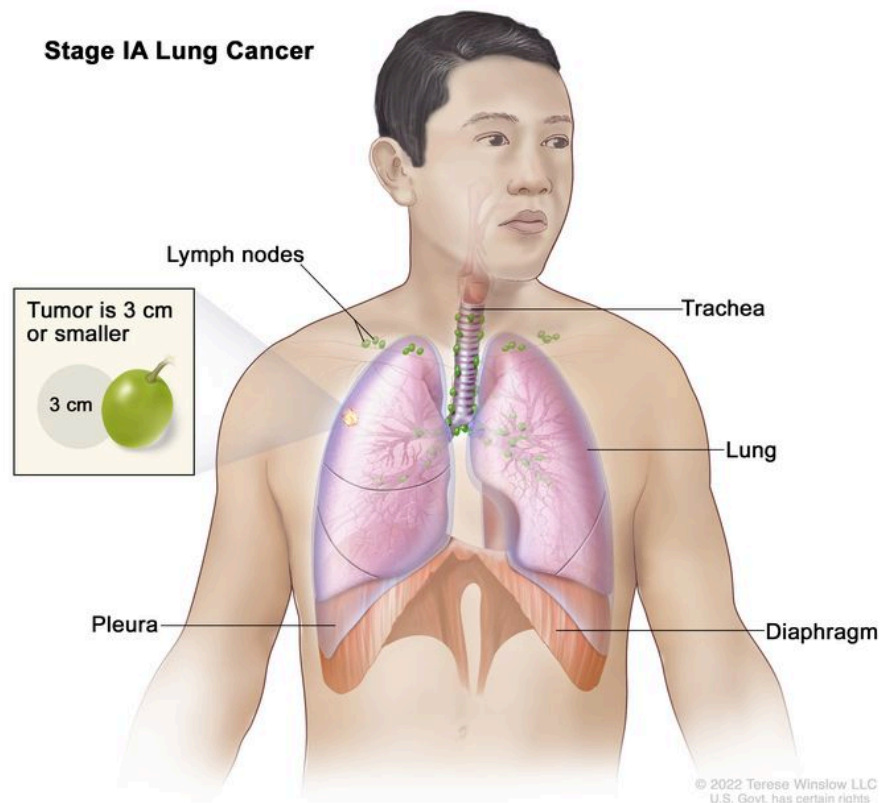
Stage 0

In stage 0, abnormal cells are found in the lining of the airways. These abnormal cells may become cancer and spread into nearby normal tissue. Stage 0 may be adenocarcinoma in situ (AIS) or squamous cell carcinoma in situ (SCIS).

Stage I (also called stage 1) non-small cell lung cancer

In stage I, cancer has formed. Stage I is divided into stages IA and IB.

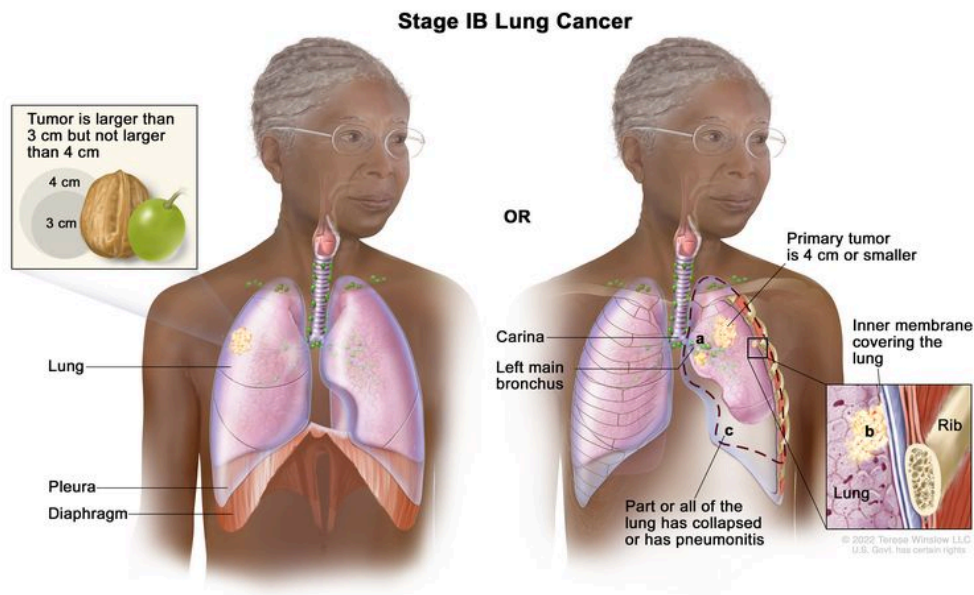
- Stage IA:



Stage IA lung cancer. The tumor is in the lung only and is 3 centimeters or smaller. Cancer has not spread to the lymph nodes.

The tumor is in the lung only and is 3 centimeters or smaller. Cancer has not spread to the lymph nodes.

- Stage IB:



Stage IB lung cancer. The tumor is larger than 3 centimeters but not larger than 4 centimeters. Cancer has not spread to the lymph nodes; OR the tumor is 4 centimeters or smaller. Cancer has not spread to the lymph nodes and one or more of the following is found: (a) cancer has spread to the main bronchus, but has not spread to the carina; and/or (b) cancer has spread to the inner membrane that covers the lung; and/or (c) part of the lung or the whole lung has collapsed or has pneumonitis (inflammation of the lung).

The tumor is larger than 3 centimeters but not larger than 4 centimeters. Cancer has not spread to the lymph nodes.

or

The tumor is 4 centimeters or smaller and one or more of the following is found:

- Cancer has spread to the main bronchus, but has not spread to the carina.
- Cancer has spread to the innermost layer of the membrane that covers the lung.
- Part of the lung or the whole lung has collapsed or has developed pneumonitis.

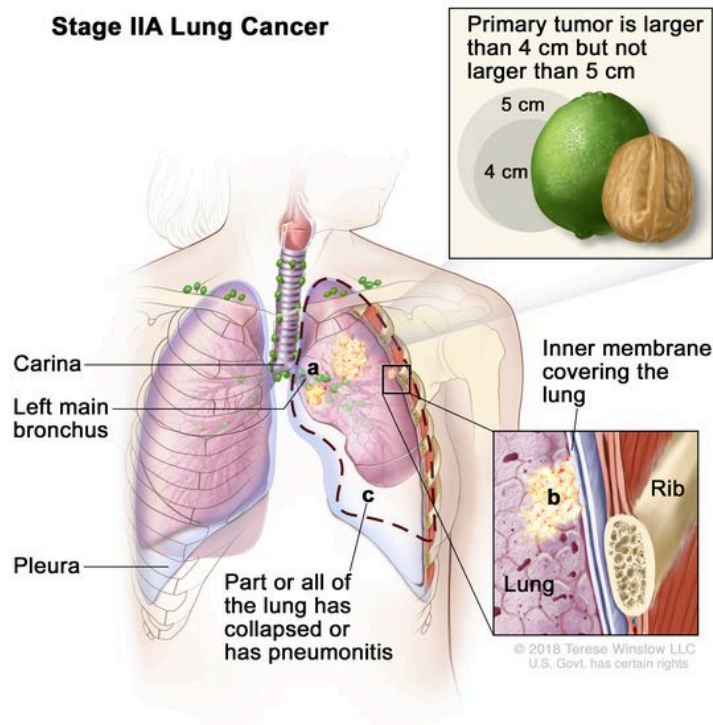
Cancer has not spread to the lymph nodes.

Stage II (also called stage 2) non-small cell lung cancer

Stage II is divided into stages IIA and IIB.

- Stage IIA:

Stage IIA Lung Cancer

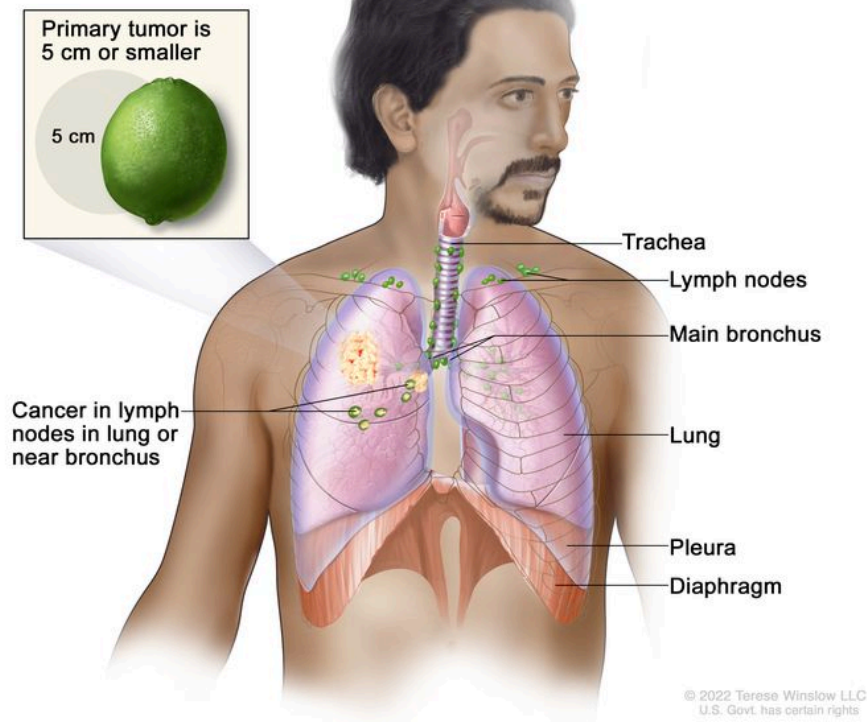


Stage IIA lung cancer. The tumor is larger than 4 centimeters but not larger than 5 centimeters. Cancer has not spread to the lymph nodes and one or more of the following may be found: (a) cancer has spread to the main bronchus, but has not spread to the carina; and/or (b) cancer has spread to the inner membrane that covers the lung; and/or (c) part of the lung or the whole lung has collapsed or has pneumonitis (inflammation of the lung).

The tumor is larger than 4 centimeters but not larger than 5 centimeters. Cancer has not spread to the lymph nodes and one or more of the following may be found:

- Cancer has spread to the main bronchus, but has not spread to the carina.
- Cancer has spread to the innermost layer of the membrane that covers the lung.
- Part of the lung or the whole lung has collapsed or has developed pneumonitis.
- Stage IIB:

Stage IIB Lung Cancer (1)



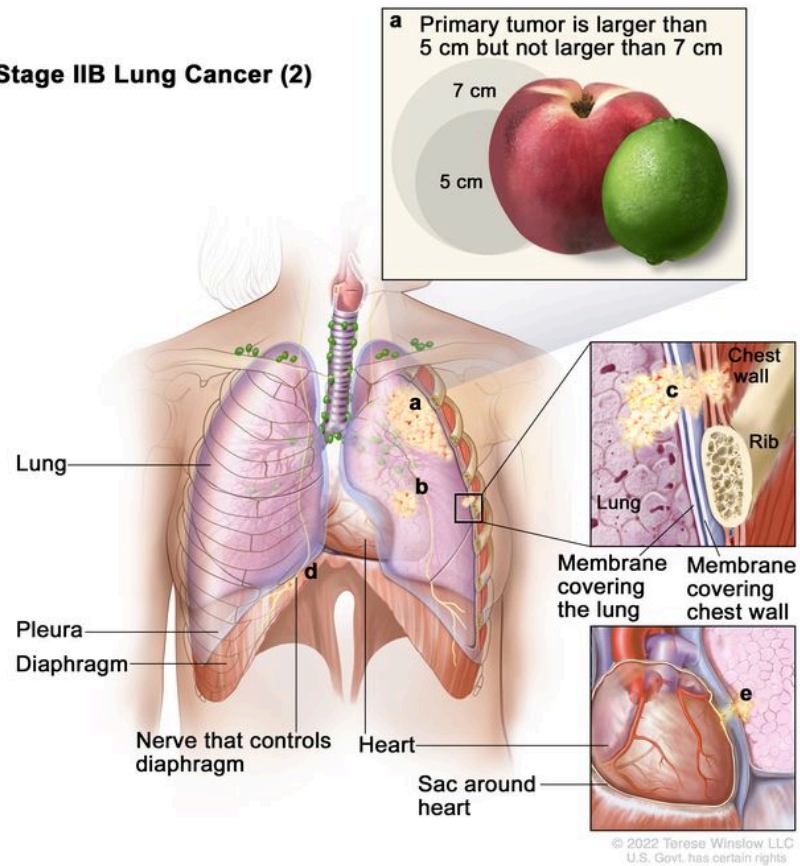
Stage IIB lung cancer (1). The primary tumor is 5 centimeters or smaller and cancer has spread to the lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are in the lung or near the bronchus.

The tumor is 5 centimeters or smaller and cancer has spread to lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are in the lung or near the bronchus. Also, one or more of the following may be found:

- Cancer has spread to the main bronchus, but has not spread to the carina.
- Cancer has spread to the innermost layer of the membrane that covers the lung.
- Part of the lung or the whole lung has collapsed or has developed pneumonitis.

or

Stage IIB Lung Cancer (2)



Stage IIB lung cancer (2). Cancer has not spread to lymph nodes and one or more of the following is found: (a) the primary tumor is larger than 5 centimeters but not larger than 7 centimeters; and/or (b) there are one or more separate tumors in the same lobe of the lung as the primary tumor; and/or cancer has spread to any of the following: (c) the chest wall and/or the membrane that lines the inside of the chest wall, (d) the nerve that controls the diaphragm, and/or (e) the outer layer of tissue of the sac around the heart.

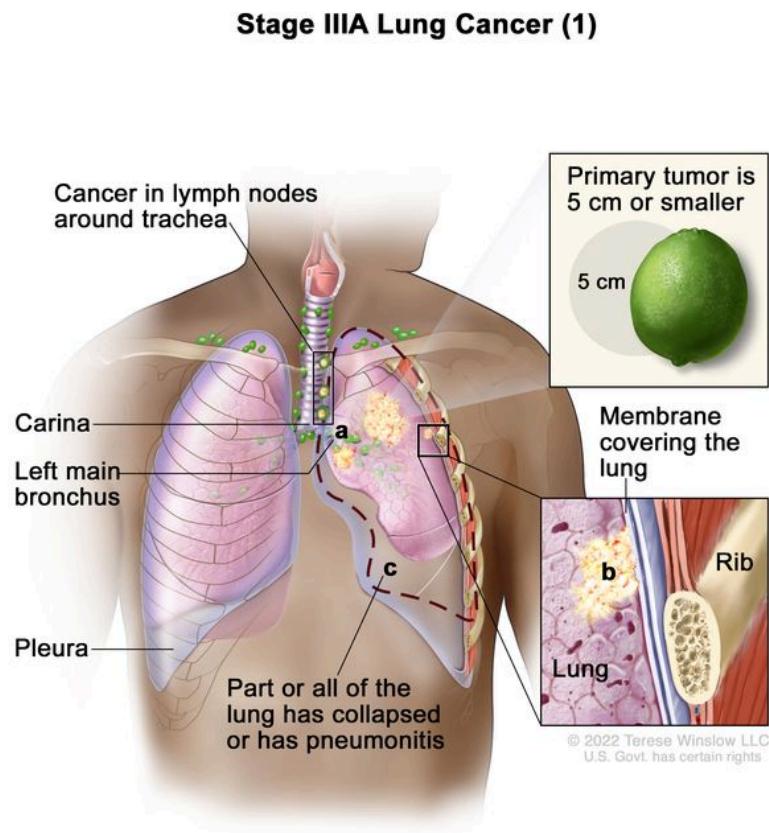
Cancer has not spread to the lymph nodes and one or more of the following is found:

- The tumor is larger than 5 centimeters but not larger than 7 centimeters.
- There are one or more separate tumors in the same lobe of the lung as the primary tumor.
- Cancer has spread to any of the following:
 - the membrane that lines the inside of the chest wall
 - the chest wall
 - the nerve that controls the diaphragm
 - the outer layer of tissue of the sac around the heart

Stage III (also called stage 3) non-small cell lung cancer

Stage III is divided into stages IIIA, IIIB, and IIIC.

- Stage IIIA:

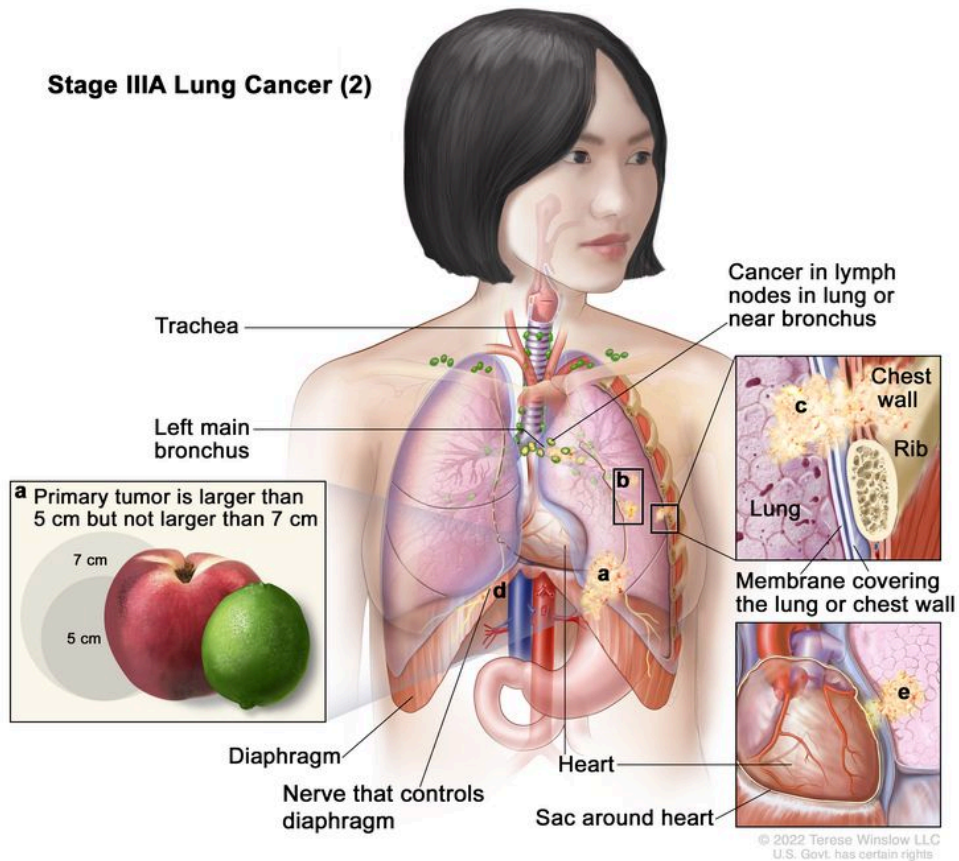


Stage IIIA lung cancer (1). The tumor is 5 centimeters or smaller and cancer has spread to lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are around the trachea or aorta (not shown), or where the trachea divides into the bronchi. Also, one or more of the following may be found: (a) cancer has spread to the main bronchus, but has not spread to the carina; and/or (b) cancer has spread to the inner membrane that covers the lung; and/or (c) part of the lung or the whole lung has collapsed or has pneumonitis (inflammation of the lung).

The tumor is 5 centimeters or smaller and cancer has spread to lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are around the trachea or aorta, or where the trachea divides into the bronchi. Also, one or more of the following may be found:

- Cancer has spread to the main bronchus, but has not spread to the carina.
- Cancer has spread to the innermost layer of the membrane that covers the lung.
- Part of the lung or the whole lung has collapsed or has developed pneumonitis.

or



Stage IIIA lung cancer (2). Cancer has spread to lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are in the lung or near the bronchus. Also, one or more of the following is found: (a) the tumor is larger than 5 centimeters but not larger than 7 centimeters; and/or (b) there are one or more separate tumors in the same lobe of the lung as the primary tumor; and/or cancer has spread to any of the following: (c) the chest wall and/or the membrane that lines the inside of the chest wall, (d) the nerve that controls the diaphragm, and/or (e) the outer layer of tissue of the sac around the heart.

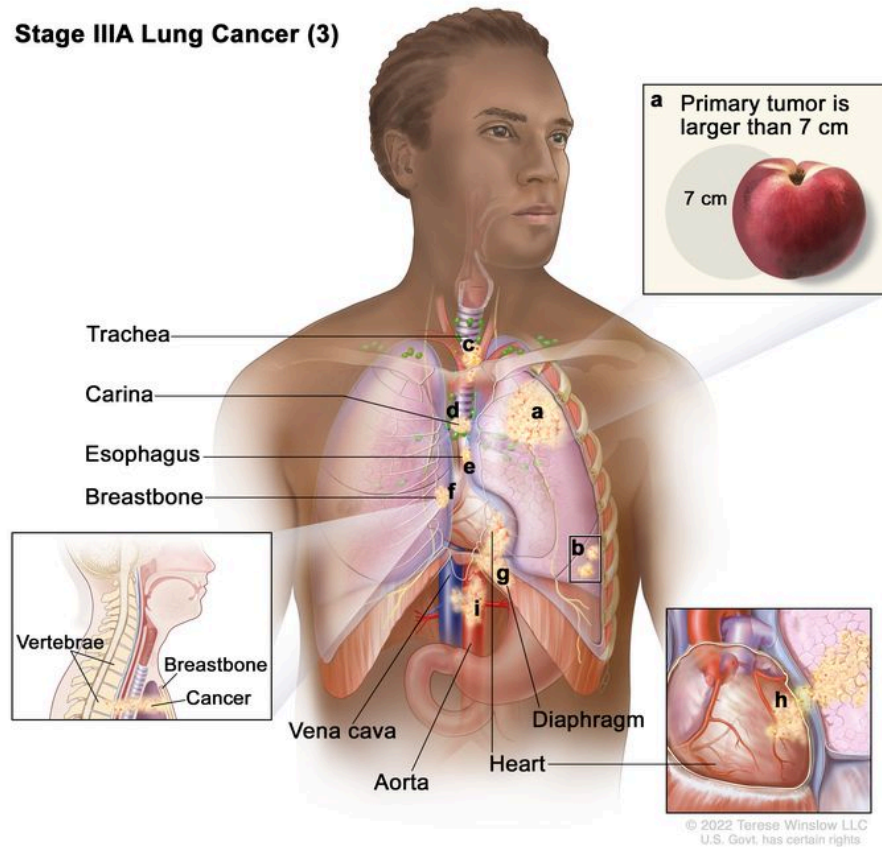
Cancer has spread to lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are in the lung or near the bronchus. Also, one or more of the following is found:

- The tumor is larger than 5 centimeters but not larger than 7 centimeters.
- There are one or more separate tumors in the same lobe of the lung as the primary tumor.
- Cancer has spread to any of the following:
 - the membrane that lines the inside of the chest wall

- the chest wall
- the nerve that controls the diaphragm
- the outer layer of tissue of the sac around the heart

or

Stage IIIA Lung Cancer (3)

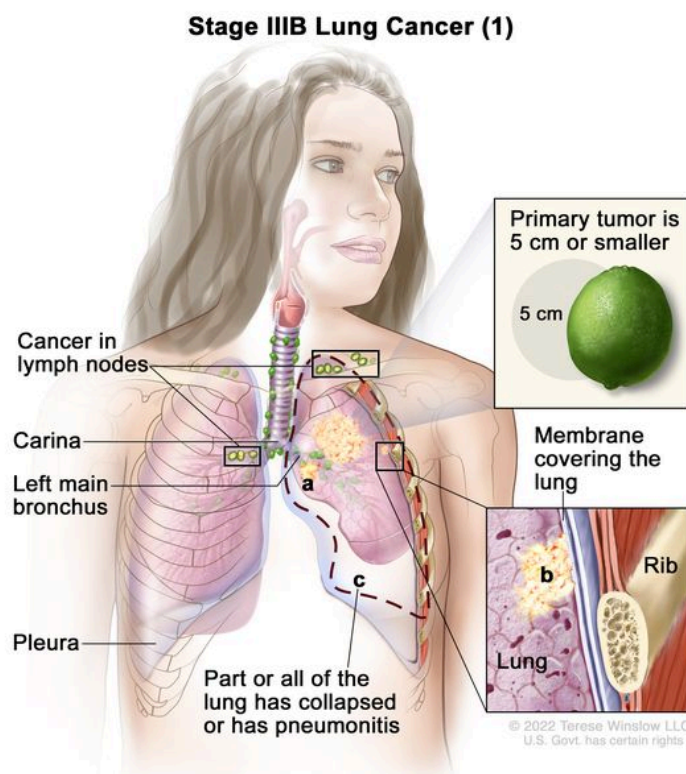


Stage IIIA lung cancer (3). Cancer may have spread to lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are in the lung or near the bronchus. Also, one or more of the following is found: (a) the primary tumor is larger than 7 centimeters; and/or (b) there are one or more separate tumors in a different lobe of the lung with the primary tumor; and/or the tumor is any size and cancer has spread to any of the following: (c) trachea, (d) carina, (e) esophagus, (f) breastbone or backbone, (g) diaphragm, (h) heart, (i) major blood vessels that lead to or from the heart (aorta or vena cava), or the nerve that controls the larynx (not shown).

Cancer may have spread to lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are in the lung or near the bronchus. Also, one or more of the following is found:

- The tumor is larger than 7 centimeters.

- There are one or more separate tumors in a different lobe of the lung with the primary tumor.
- The tumor is any size and cancer has spread to any of the following:
 - the trachea
 - the carina
 - the esophagus
 - the breastbone or backbone
 - the diaphragm
 - the heart
 - the major blood vessels that lead to or from the heart (aorta or vena cava)
 - the nerve that controls the larynx (voice box)
- Stage IIIB:



Stage IIIB lung cancer (1). The primary tumor is 5 centimeters or smaller and cancer has spread to lymph nodes above the collarbone on the same side of the chest as the primary tumor or to any lymph nodes on the opposite side of the chest as the primary tumor. Also, one or more of the following may be found: (a) cancer has spread to the main bronchus, but has not spread to the carina; and/or (b) cancer has spread to the inner membrane that covers the lung; and/or (c) part of the lung or the whole lung has collapsed or has pneumonitis (inflammation of the lung).

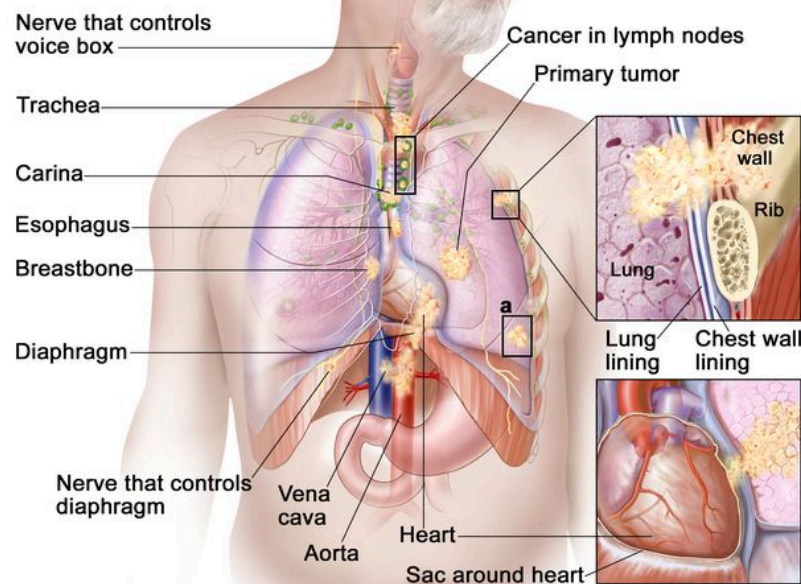
The tumor is 5 centimeters or smaller and cancer has spread to lymph nodes above the collarbone on the same side of the chest as the primary tumor or to any lymph nodes on the opposite side of the chest as the primary tumor. Also, one or more of the following may be found:

- Cancer has spread to the main bronchus, but has not spread to the carina.
- Cancer has spread to the innermost layer of the membrane that covers the lung.
- Part of the lung or the whole lung has collapsed or has developed pneumonitis.

or

Stage IIIB Lung Cancer (2)

b) Cancer has spread to one or more of these organs or tissues:



Stage IIIB lung cancer (2). The tumor may be any size and cancer has spread to lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are around the trachea or aorta (not shown), or where the trachea divides into the bronchi. Also, one or more of the following is found: (a) there are one or more separate tumors in the same lobe or a different lobe of the lung with the primary tumor; and/or (b) cancer has spread to any of the following: the chest wall or the membrane that lines the inside of the chest wall, the nerve that controls the voice box, the trachea, the carina, the esophagus, the breastbone or backbone (not shown), the diaphragm, the nerve that controls the diaphragm, the heart, the major blood vessels that lead to or from

the heart (aorta or vena cava), or the outer layer of tissue of the sac around the heart.

The tumor may be any size and cancer has spread to lymph nodes on the same side of the chest as the primary tumor. The lymph nodes with cancer are around the trachea or aorta, or where the trachea divides into the bronchi. Also, one or more of the following is found:

- There are one or more separate tumors in the same lobe or a different lobe of the lung with the primary tumor.
- Cancer has spread to any of the following:
 - the membrane that lines the inside of the chest wall
 - the chest wall
 - the nerve that controls the diaphragm
 - the outer layer of tissue of the sac around the heart
 - the trachea
 - the carina
 - the esophagus
 - the breastbone or backbone
 - the diaphragm
 - the heart
 - the major blood vessels that lead to or from the heart (aorta or vena cava)
 - the nerve that controls the larynx (voice box)
- Stage IIIC:

Stage IIIC Lung Cancer

b) Cancer has spread to one or more of these organs or tissues:

Nerve that controls voice box

Trachea

Carina

Esophagus

Breastbone

Diaphragm

Nerve that controls diaphragm

Vena cava

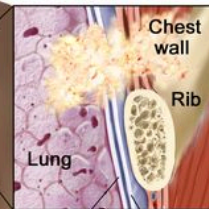
Aorta

Heart

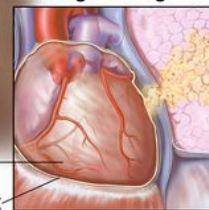
Sac around heart

Cancer in lymph nodes

Primary tumor



Chest wall
Rib
Lung
Lung lining
Chest wall lining



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Stage IIIC lung cancer. The tumor may be any size and cancer has spread to lymph nodes above the collarbone on the same side of the chest as the primary tumor or to any lymph nodes on the opposite side of the chest as the primary tumor. Also, one or more of the following is found: (a) there are one or more separate tumors in the same lobe or a different lobe of the lung with the primary tumor; and/or (b) cancer has spread to any of the following: the chest wall or the membrane that lines the inside of the chest wall, the nerve that controls the voice box, the trachea, the carina, the esophagus, the breastbone or backbone (not shown), the diaphragm, the nerve that controls the diaphragm, the heart, the major blood vessels that lead to or from the heart (aorta or vena cava), or the outer layer of tissue of the sac around the heart.

The tumor may be any size and cancer has spread to lymph nodes above the collarbone on the same side of the chest as the primary tumor or to any lymph nodes on the opposite side of the chest as the primary tumor. Also, one or more of the following is found:

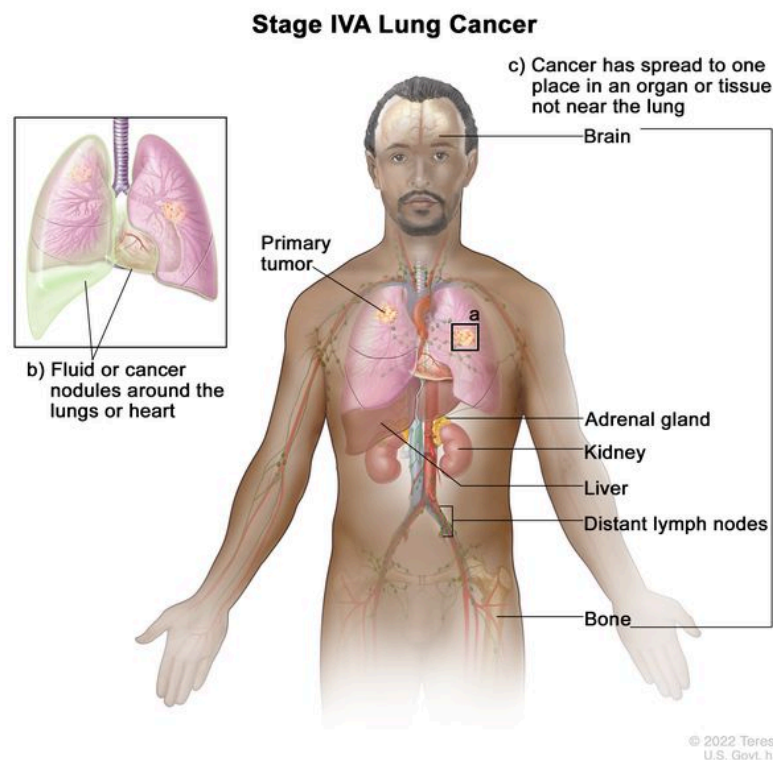
- There are one or more separate tumors in the same lobe or a different lobe of the lung with the primary tumor.
- Cancer has spread to any of the following:
 - the membrane that lines the inside of the chest wall

- the chest wall
- the nerve that controls the diaphragm
- the outer layer of tissue of the sac around the heart
- the trachea
- the carina
- the esophagus
- the breastbone or backbone
- the diaphragm
- the heart
- the major blood vessels that lead to or from the heart (aorta or vena cava)
- the nerve that controls the larynx (voice box)

Stage IV (also called stage 4) non-small cell lung cancer

Stage IV is divided into stages IVA and IVB.

- Stage IVA:

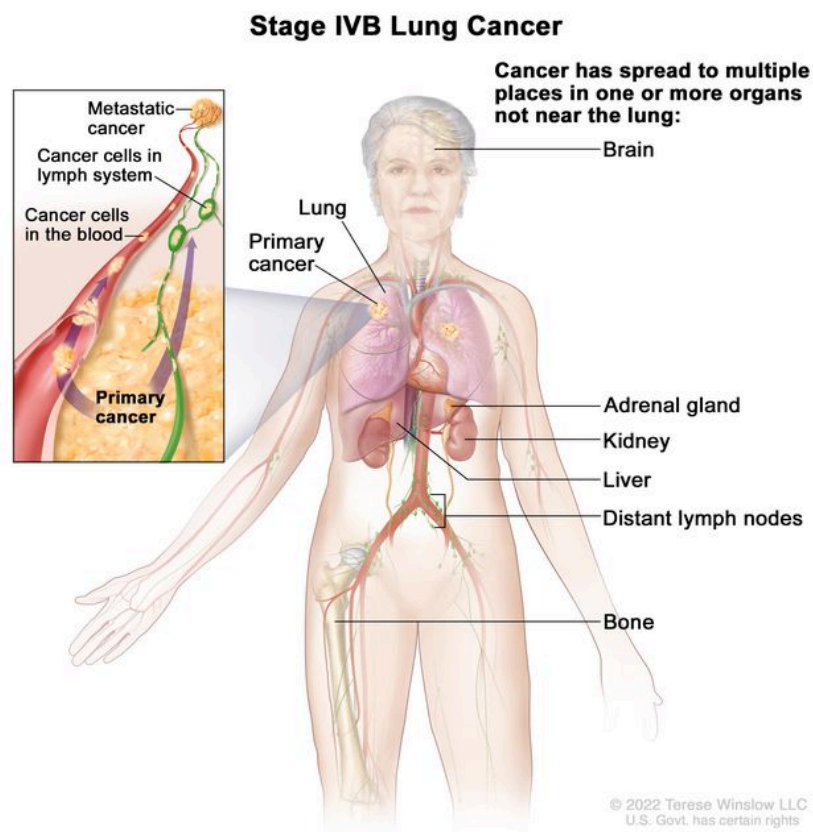


Stage IVA lung cancer. The tumor may be any size and cancer may have spread to the lymph nodes. One or more of the following is found: (a) there are one or more tumors in the lung that does not have the primary tumor; and/or (b) cancer is found in fluid around the lungs or heart or there are cancer nodules in the lining around the lungs or the sac around the heart; and/or (c) cancer

has spread to one place in an organ or tissue not near the lung, such as the brain, adrenal gland, kidney, liver, or bone, or to a lymph node that is not near the lung.

The tumor may be any size and cancer may have spread to the lymph nodes. One or more of the following is found:

- There are one or more tumors in the lung that does not have the primary tumor.
 - Cancer is found in the lining around the lungs or the sac around the heart.
 - Cancer is found in fluid around the lungs or the heart.
 - Cancer has spread to one place in an organ not near the lung, such as the brain, liver, adrenal gland, kidney, bone, or to a lymph node that is not near the lung.
- Stage IVB:



Stage IVB lung cancer. The cancer has spread to multiple places in one or more organs that are not near the lung, such as the brain, adrenal gland, kidney, liver, distant lymph nodes, or bone.

Cancer has spread to multiple places in one or more organs that are not near the lung.

Non-small cell lung cancer can recur (come back) after it has been treated.

Recurrent non-small cell lung cancer is cancer that has come back after it has been treated. If non-small cell lung cancer comes back, it may come back in the brain, lung, chest, or in other parts of the body. Tests will be done to help determine where the cancer has returned. The type of treatment for non-small cell lung cancer will depend on where it has come back.

Learn more in [Recurrent Cancer: When Cancer Comes Back](#). Information to help you cope and talk with your health care team can be found in the booklet [When Cancer Returns](#).

Treatment Option Overview

KEY POINTS

- There are different types of treatment for people with non-small cell lung cancer.
- The following types of treatment are used:
 - Surgery
 - Radiation therapy
 - Chemotherapy
 - Targeted therapy
 - Immunotherapy
 - Laser therapy
 - Photodynamic therapy (PDT)
 - Cryosurgery
 - Electrocautery
- New types of treatment are being tested in clinical trials.
 - Radiosensitizers
- Treatment for non-small cell lung cancer may cause side effects.
- Follow-up care may be needed.

There are different types of treatment for people with non-small cell lung cancer.

Different types of treatments are available for people with non-small cell lung cancer. You and your cancer care team will work together to decide your treatment plan, which may

include more than one type of treatment. Many factors will be considered, such as the stage of the cancer, your overall health, and your preferences. Your plan will include information about your cancer, the goals of treatment, your treatment options and the possible side effects, and the expected length of treatment.

Talking with your cancer care team before treatment begins about what to expect will be helpful. You'll want to learn what you need to do before treatment begins, how you'll feel while going through it, and what kind of help you will need. To learn more, see [Questions to Ask Your Doctor About Treatment](#).

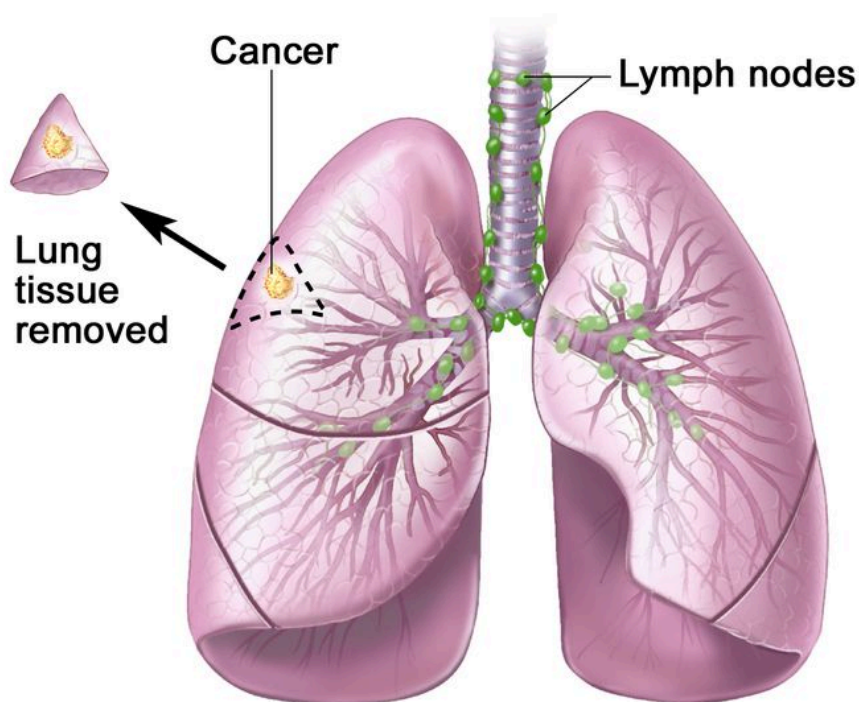
The following types of treatment are used:

Surgery

Four types of surgery are used to treat lung cancer:

- Wedge resection is surgery to remove a tumor and some of the normal tissue around it. When a slightly larger amount of tissue is taken, it is called a segmental resection.

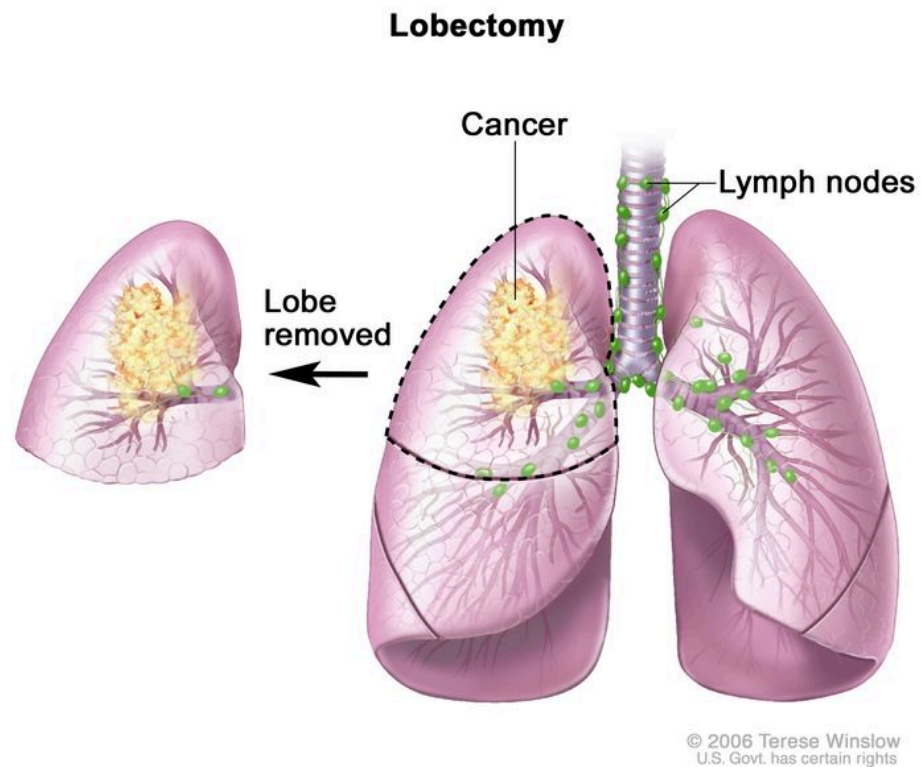
Wedge Resection of the Lung



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Wedge resection of the lung. Part of the lung lobe containing the cancer and a small amount of healthy tissue around it is removed.

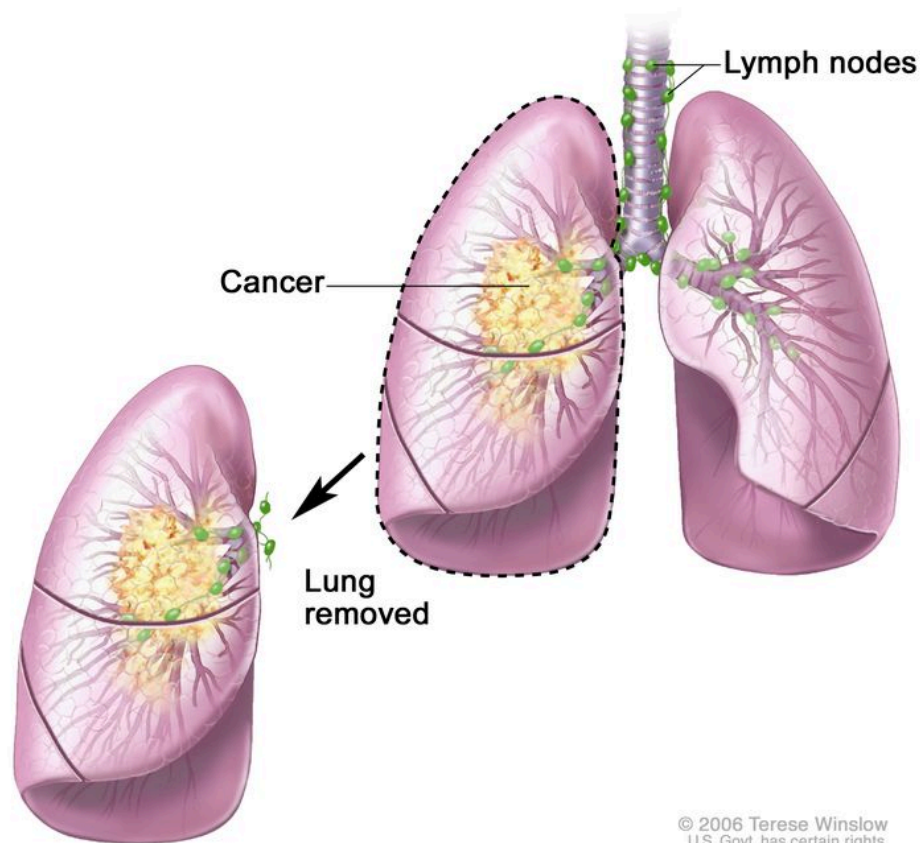
- Lobectomy is surgery to remove a whole lobe (section) of the lung.



Lobectomy. A lobe of the lung is removed.

- Pneumonectomy is surgery to remove one whole lung.

Pneumonectomy



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Pneumonectomy. The whole lung is removed.

- Sleeve resection is surgery to remove part of the bronchus.

After the doctor removes all the cancer that can be seen at the time of the surgery, some people may be given chemotherapy or radiation therapy after surgery to kill any cancer cells that are left. Treatment given after the surgery to lower the risk that the cancer will come back is called adjuvant therapy.

Radiation therapy

Radiation therapy is a cancer treatment that uses high-energy x-rays or other types of radiation to kill cancer cells or keep them from growing. There are two types of radiation therapy:

- External radiation therapy uses a machine outside the body to send radiation toward the area of the body with cancer.
- Internal radiation therapy uses a radioactive substance sealed in needles, seeds, wires, or catheters that are placed directly into or near the cancer.

Stereotactic body radiation therapy is a type of external radiation therapy. Special equipment is used to ensure you are in the same position for each radiation treatment. Once a day for several days, a radiation machine aims a larger than usual dose of radiation

directly at the tumor. By having you in the same position for each treatment, there is less damage to nearby healthy tissue. This procedure is also called stereotactic external beam radiation therapy and stereotaxic radiation therapy.

Stereotactic radiosurgery is a type of external radiation therapy used to treat lung cancer that has spread to the brain. A rigid head frame is attached to the skull to keep the head still during the radiation treatment. A machine aims a single large dose of radiation directly at the tumor in the brain. This procedure does not involve surgery. It is also called stereotaxic radiosurgery, radiosurgery, and radiation surgery.

For tumors in the airways, radiation is given directly to the tumor through an endoscope.

The way the radiation therapy is given depends on the type and stage of the cancer being treated. It also depends on where the cancer is found. External and internal radiation therapy are used to treat non-small cell lung cancer.

Chemotherapy

Chemotherapy (also called chemo) uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing.

Chemotherapy for non-small cell lung cancer is usually systemic, meaning it is injected into a vein or given by mouth. When given this way, the drugs enter the bloodstream to reach cancer cells throughout the body.

Chemotherapy drugs used to treat non-small cell lung cancer may include:

- [carboplatin](#)
- [cisplatin](#)
- [docetaxel](#)
- [doxorubicin](#)
- [etoposide](#)
- [gemcitabine](#)
- [paclitaxel](#)
- [pemetrexed](#)
- [vinorelbine](#)

Combinations of these chemotherapy drugs may be used. Other chemotherapy drugs not listed here may also be used.

Chemotherapy may also be combined with other kinds of treatment. For example, it may be combined with radiation therapy or immunotherapy drugs.

Learn more about how chemotherapy works, how it is given, common side effects, and more at [Chemotherapy to Treat Cancer](#) and [Chemotherapy and You: Support for People With Cancer](#).

Targeted therapy

Targeted therapy uses drugs or other substances to identify and attack specific cancer cells. Your doctor may suggest biomarker tests to help predict your response to certain targeted therapy drugs. Learn more about [Biomarker Testing for Cancer Treatment](#).

Targeted therapies used to treat non-small cell lung cancer include:

- [adagrasib](#)
- [afatinib](#)
- [alectinib](#)
- [amivantamab](#)
- [bevacizumab](#)
- [brigatinib](#)
- [capmatinib](#)
- [ceritinib](#)
- [cetuximab](#)
- [crizotinib](#)
- [dabrafenib](#)
- [dacomitinib](#)
- [entrectinib](#)
- [erlotinib](#)
- [everolimus](#)
- [gefitinib](#)
- [larotrectinib](#)
- [lorlatinib](#)
- [necitumumab](#)
- [osimertinib](#)
- [pralsetinib](#)
- [ramucirumab](#)
- [selpercatinib](#)
- [sotorasib](#)

- [tepotinib](#)
- [trametinib](#)

Learn more about [Targeted Therapy to Treat Cancer](#).

Immunotherapy

Immunotherapy helps a person's immune system fight cancer. Your doctor may suggest biomarker tests to help predict your response to certain immunotherapy drugs. Learn more about [Biomarker Testing for Cancer Treatment](#).

Immunotherapy drugs used to treat non-small cell lung cancer include:

- [atezolizumab](#)
- [cemiplimab-rwlc](#)
- [durvalumab](#)
- [ipilimumab](#)
- [nivolumab](#)
- [pembrolizumab](#)
- [tremelimumab](#)

Learn more about [Immunotherapy to Treat Cancer](#).

Laser therapy

Laser therapy is a cancer treatment that uses a laser beam (a narrow beam of intense light) to kill cancer cells.

Learn more about [Lasers to Treat Cancer](#).

Photodynamic therapy (PDT)

Photodynamic therapy (PDT) is a cancer treatment that uses a drug and a certain type of laser light to kill cancer cells. A drug that is not active until it is exposed to light is injected into a vein. The drug collects more in cancer cells than in normal cells. Fiberoptic tubes are then used to carry the laser light to the cancer cells, where the drug becomes active and kills the cells. Photodynamic therapy causes little damage to healthy tissue. It is used mainly to treat tumors on or just under the skin or in the lining of internal organs. When the tumor is in the airways, PDT is given directly to the tumor through an endoscope.

Learn more about [Photodynamic Therapy to Treat Cancer](#).

Cryosurgery

Cryosurgery is a treatment that uses an instrument to freeze and destroy abnormal tissue, such as carcinoma in situ. This type of treatment is also called cryotherapy. For tumors in the airways, cryosurgery is done through an endoscope.

Learn more about [Cryosurgery to Treat Cancer](#).

Electrocautery

Electrocautery is a treatment that uses a probe or needle heated by an electric current to destroy abnormal tissue. For tumors in the airways, electrocautery is done through an endoscope.

New types of treatment are being tested in clinical trials.

For some people, joining a clinical trial may be an option. There are different types of clinical trials for people with cancer. For example, a treatment trial tests new treatments or new ways of using current treatments. Supportive care and palliative care trials look at ways to improve quality of life, especially for those who have side effects from cancer and its treatment.

You can use the [clinical trial search](#) to find NCI-supported cancer clinical trials accepting participants. The search allows you to filter trials based on the type of cancer, your age, and where the trials are being done. Clinical trials supported by other organizations can be found on the [ClinicalTrials.gov](#) website.

Learn more about clinical trials, including how to find and join one, at [Clinical Trials Information for Patients and Caregivers](#).

Radiosensitizers

Radiosensitizers are substances that make tumor cells easier to kill with radiation therapy. The combination of chemotherapy and radiation therapy given with a radiosensitizer is being studied in the treatment of non-small cell lung cancer.

Treatment for non-small cell lung cancer may cause side effects.

For information about side effects caused by treatment for cancer, visit our [Side Effects](#) page.

Follow-up care may be needed.

As you go through treatment, you will have follow-up tests or check-ups. Some tests that were done to diagnose or stage the cancer may be repeated to see how well the treatment is working. Decisions about whether to continue, change, or stop treatment may be based on the results of these tests.

Some of the tests will continue to be done from time to time after treatment has ended. The results of these tests can show if your condition has changed or if the cancer has recurred

(come back).

Treatment of Occult Non-Small Cell Lung Cancer

Treatment of occult non-small cell lung cancer depends on the stage of the disease. Occult tumors are often found at an early stage (the tumor is in the lung only) and sometimes can be cured by surgery.

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

Treatment of Stage 0 (Carcinoma in Situ)

Treatment of stage 0 may include:

- surgery (wedge resection or segmental resection)
- photodynamic therapy, electrocautery, cryosurgery, or laser surgery for tumors in or near the bronchus

Learn more about these treatments in the [Treatment Option Overview](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

Treatment of Stage I Non-Small Cell Lung Cancer

Treatment of stage IA non-small cell lung cancer and stage IB non-small cell lung cancer may include:

- surgery (wedge resection, segmental resection, sleeve resection, or lobectomy)
- surgery followed by targeted therapy, such as [osimertinib](#)
- surgery followed by chemotherapy and immunotherapy, such as [pembrolizumab](#)
- external radiation therapy, including stereotactic body radiation therapy for people who cannot have surgery or choose not to have surgery

Learn more about these treatments in the [Treatment Option Overview](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

Treatment of Stage II Non-Small Cell Lung Cancer

Treatment of stage IIA non-small cell lung cancer and stage IIB non-small cell lung cancer may include:

- surgery (wedge resection, segmental resection, sleeve resection, lobectomy, or pneumonectomy)
- surgery followed by chemotherapy
- surgery followed by targeted therapy, such as [osimertinib](#)
- surgery followed by chemotherapy and immunotherapy, such as [pembrolizumab](#)
- surgery followed by immunotherapy, such as [atezolizumab](#)
- surgery followed by radiation therapy
- chemotherapy followed by surgery
- immunotherapy, such as [nivolumab](#), and chemotherapy followed by surgery
- immunotherapy, such as [pembrolizumab](#), [durvalumab](#), [nivolumab](#), or [toripalimab](#), and chemotherapy followed by surgery and more immunotherapy
- external radiation therapy for people who cannot have surgery

Learn more about these treatments in the [Treatment Option Overview](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

Treatment of Stage IIIA Non-Small Cell Lung Cancer

Treatment of stage IIIA non-small cell lung cancer that can be removed with surgery may include:

- chemotherapy followed by surgery
- chemotherapy and radiation therapy followed by surgery

- immunotherapy, such as [nivolumab](#), and chemotherapy followed by surgery
- immunotherapy, such as [pembrolizumab](#), [durvalumab](#), nivolumab, or [toripalimab](#), and chemotherapy followed by surgery and more immunotherapy
- surgery followed by chemotherapy
- surgery followed by targeted therapy, such as [osimertinib](#)
- surgery followed by chemotherapy and immunotherapy, such as pembrolizumab or [atezolizumab](#)
- surgery followed by immunotherapy, such as atezolizumab
- surgery followed by chemotherapy and radiation therapy
- surgery followed by radiation therapy

Treatment of stage IIIA non-small cell lung cancer that cannot be removed with surgery may include:

- chemotherapy and radiation therapy
- chemotherapy and radiation therapy, followed by immunotherapy, such as durvalumab
- external radiation therapy alone
- internal radiation therapy or laser surgery as palliative treatment to relieve symptoms and improve quality of life

Learn more about supportive care for signs and symptoms including cough, shortness of breath, and chest pain at [Cardiopulmonary Syndromes](#) and [Cancer Pain](#).

Non-small cell lung cancer of the superior sulcus, often called Pancoast tumor, begins in the upper part of the lung and spreads to nearby tissues such as the chest wall, large blood vessels, and spine. Treatment of Pancoast tumors may include:

- surgery
- chemotherapy and radiation therapy followed by surgery
- radiation therapy alone

Some stage IIIA non-small cell lung tumors that have grown into the chest wall may be completely removed. Treatment of chest wall tumors may include:

- surgery
- surgery and radiation therapy
- radiation therapy alone
- chemotherapy combined with radiation therapy and/or surgery

Learn more about these treatments in the [Treatment Option Overview](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

Treatment of Stage IIIB and Stage IIIC Non-Small Cell Lung Cancer

Treatment of stage IIIB non-small cell lung cancer and stage IIIC non-small cell lung cancer may include:

- chemotherapy followed by external radiation therapy
- chemotherapy with radiation therapy
- immunotherapy, such as [durvalumab](#), before or after chemotherapy and radiation therapy
- targeted therapy, such as [osimertinib](#) before or after chemotherapy and radiation therapy
- external radiation therapy alone for people who cannot have chemotherapy
- external radiation therapy as palliative therapy to relieve symptoms and improve quality of life
- laser therapy and/or internal radiation therapy to relieve symptoms and improve quality of life

Learn more about these treatments in the [Treatment Option Overview](#).

Learn more about supportive care for signs and symptoms such as cough, shortness of breath, and chest pain at [Cardiopulmonary Syndromes](#) and [Cancer Pain](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

Treatment of Newly Diagnosed Stage IV, Relapsed, and Recurrent Non-Small Cell Lung Cancer

Treatment of newly stage IV, relapsed, and recurrent non-small cell lung cancer may include:

- one or more chemotherapy drugs with or without targeted therapy

- combination chemotherapy followed by more chemotherapy as maintenance therapy to help keep cancer from progressing
- targeted therapy
- one or more immunotherapy drugs

Learn more about these treatments and find a list of chemotherapy, targeted therapy, and immunotherapy drugs for lung cancer in the [Treatment Option Overview](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

Treatment of Progressive Stage IV, Relapsed, and Recurrent Non-Small Cell Lung Cancer

Treatment of progressive stage IV, relapsed, and recurrent non-small cell lung cancer may include:

- chemotherapy
- targeted therapy with or without chemotherapy
- immunotherapy

Learn more about these treatments and find a list of chemotherapy, targeted therapy, and immunotherapy drugs for lung cancer in the [Treatment Option Overview](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

To Learn More About Non-Small Cell Lung Cancer

For more information from the National Cancer Institute about non-small cell lung cancer:

- [Lung Cancer Home Page](#)
- [Lung Cancer Prevention](#)
- [Lung Cancer Screening](#)
- [Drugs Approved for Non-Small Cell Lung Cancer](#)
- [Tobacco](#) (includes help with quitting)

Small Cell Lung Cancer Treatment (PDQ®)– Patient Version

[Go to Health Professional Version](#)

General Information About Small Cell Lung Cancer

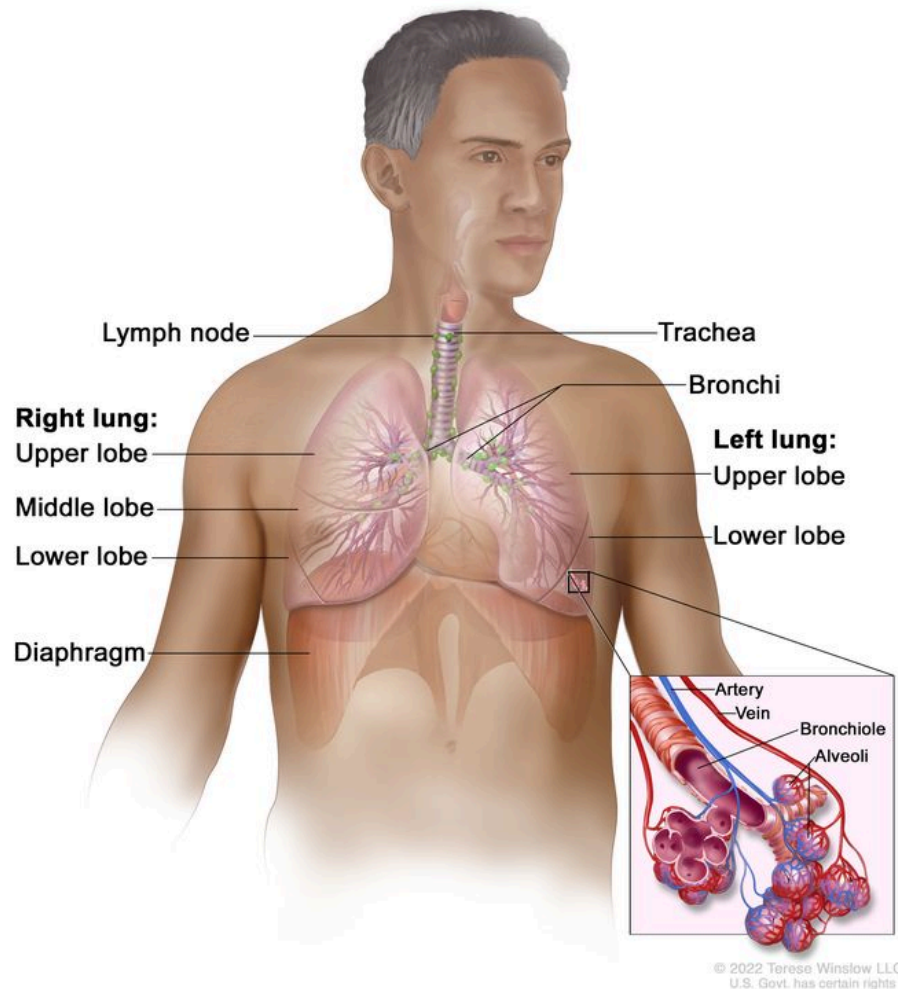
KEY POINTS

- Small cell lung cancer is a type of fast-growing cancer that forms in the tissues of the lung.
- There are two main types of small cell lung cancer.
- Smoking is the major risk factor for small cell lung cancer.
- Signs and symptoms of small cell lung cancer include coughing and shortness of breath.
- Tests and procedures that examine the lungs are used to diagnose and stage small cell lung cancer.
- After small cell lung cancer has been diagnosed, tests are done to find out if cancer cells have spread within the chest or to other parts of the body.
- Some people decide to get a second opinion.
- Certain factors affect prognosis (chance of recovery) and treatment options.

Questions?

Small cell lung cancer is a type of fast-growing cancer that forms in the tissues of the lung.

The lungs are a pair of cone-shaped breathing organs in the chest. The lungs bring oxygen into the body as you breathe in. They release carbon dioxide, a waste product of the body's cells, as you breathe out. Each lung has sections called lobes. The left lung has two lobes. The right lung is slightly larger and has three lobes. A thin membrane called the pleura surrounds the lungs. Two tubes called bronchi lead from the trachea (windpipe) to the right and left lungs. Lung cancer may also form in the bronchi. Small tubes called bronchioles and tiny air sacs called alveoli make up the inside of the lungs.



Anatomy of the respiratory system showing the trachea, the right and left lungs and their lobes, and the bronchi. The lymph nodes and the diaphragm are also shown. Oxygen is inhaled into the lungs and passes through the alveoli (the tiny air sacs at the end of the bronchioles) and into the bloodstream (see inset), where it travels to the tissues throughout the body.

There are two types of lung cancer: small cell lung cancer and non-small cell lung cancer. Small cell lung cancer is less common than non-small cell lung cancer.

There are two main types of small cell lung cancer.

The cancer cells of each type grow and spread in different ways. The types of small cell lung cancer are named for the kinds of cells found in the cancer and how the cells look when viewed under a microscope. The cancer cells of each type grow and spread in different ways:

- Small cell carcinoma (also called oat cell cancer) is a type of lung cancer that can grow and spread quickly, often leading to the cancer spreading to other parts of the body early in the disease process. This is the most common type of small cell lung cancer.

- Combined small cell carcinoma is a rare subtype of lung cancer that has characteristics of small cell lung cancer and non-small cell lung cancer in the same tumor.

Smoking is the major risk factor for small cell lung cancer.

Lung cancer is caused by certain changes to the way lung cells function, especially how they grow and divide into new cells. There are many risk factors for lung cancer, but many do not directly cause cancer. Instead, they increase the chance of DNA damage in cells that may lead to lung cancer. Learn more about how cancer develops at [What Is Cancer?](#)

A risk factor is anything that increases the chance of getting a disease. Some risk factors for lung cancer, like smoking, can be changed. However, risk factors also include things you cannot change, like your genetics, age, and family history. Learning about risk factors for lung cancer can help you make changes that might lower your risk of getting it.

Smoking tobacco now or in the past is the most important risk factor for lung cancer. Smoking cigarettes, pipes, or cigars increases the risk of lung cancer. The earlier in life a person starts smoking, the more often a person smokes, and the more years a person smokes, the greater the risk of lung cancer.

Other risk factors for lung cancer include:

- being exposed to secondhand smoke
- being exposed to asbestos, arsenic, chromium, beryllium, nickel, soot, or tar in the workplace
- being exposed to radiation from:
 - radiation therapy to the breast or chest
 - radon in the home or workplace
 - imaging tests such as CT scans
 - atomic bomb radiation
- living where there is air pollution
- having a family history of lung cancer
- being infected with HIV
- taking beta carotene supplements and being a heavy smoker

Older age is the main risk factor for most cancers. The chance of getting cancer increases as you get older.

Having one or more of these risk factors does not necessarily mean you will get lung cancer. Many people with risk factors never develop lung cancer, whereas others with no known risk factors do. Talk with your doctor if you think you might be at increased risk.

When smoking is combined with other risk factors, the risk of lung cancer is increased.

Signs and symptoms of small cell lung cancer include coughing and shortness of breath.

These and other signs and symptoms may be caused by small cell lung cancer or by other conditions. Check with your doctor if you have:

- chest discomfort or pain
- a cough that doesn't go away or gets worse over time
- trouble breathing
- wheezing
- blood in sputum (mucus coughed up from the lungs)
- hoarseness
- trouble swallowing
- loss of appetite
- weight loss for no known reason
- feeling very tired
- swelling in the face and/or veins in the neck

Tests and procedures that examine the lungs are used to diagnose and stage small cell lung cancer.

In addition to asking about your personal and family health history and doing a physical exam, your doctor may perform the following tests and procedures:

- **Laboratory tests** are medical procedures that test samples of tissue, blood, urine, or other substances in the body. These tests help to diagnose disease, plan and check treatment, or monitor the disease over time.
- **Chest x-ray** is a type of radiation that can go through the body and make pictures of the organs and bones inside the chest.

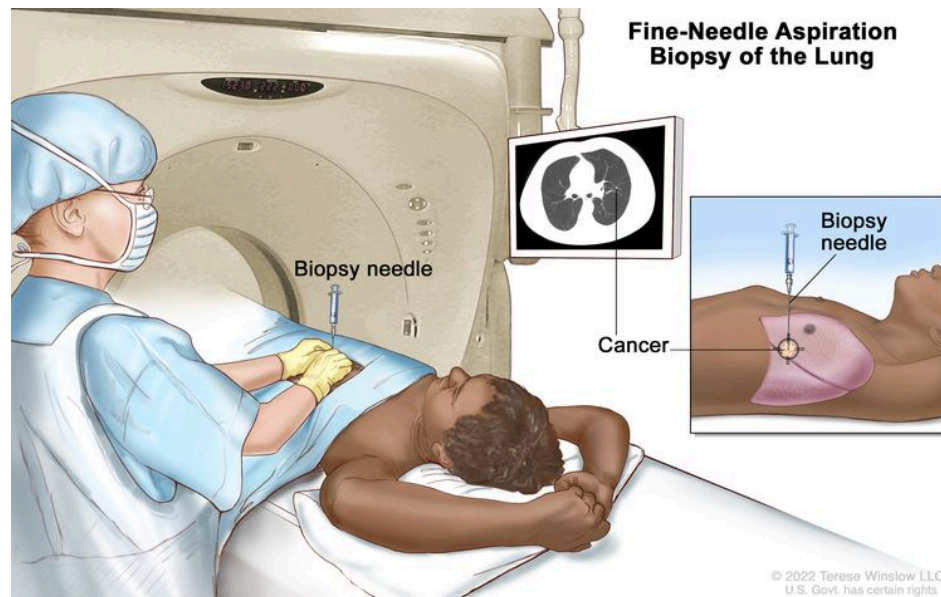


A chest x-ray is used to take pictures of the structures and organs inside the chest. X-rays pass through the patient's body onto film or a computer.

- **CT scan (CAT scan) of the brain, chest, and abdomen** uses a computer linked to an x-ray machine to make a series of detailed pictures of areas inside the body. The pictures are taken from different angles and are used to create 3-D views of tissues and organs. A dye may be injected into a vein or swallowed to help the organs or tissues show up more clearly. This procedure is also called computed tomography, computerized tomography, or computerized axial tomography.
- **Sputum cytology** uses a microscope to check for cancer cells in the sputum (mucus coughed up from the lungs).
- **Biopsy** is the removal of cells or tissues so they can be viewed under a microscope by a pathologist to check for signs of cancer. The different ways a biopsy can be done include

the following:

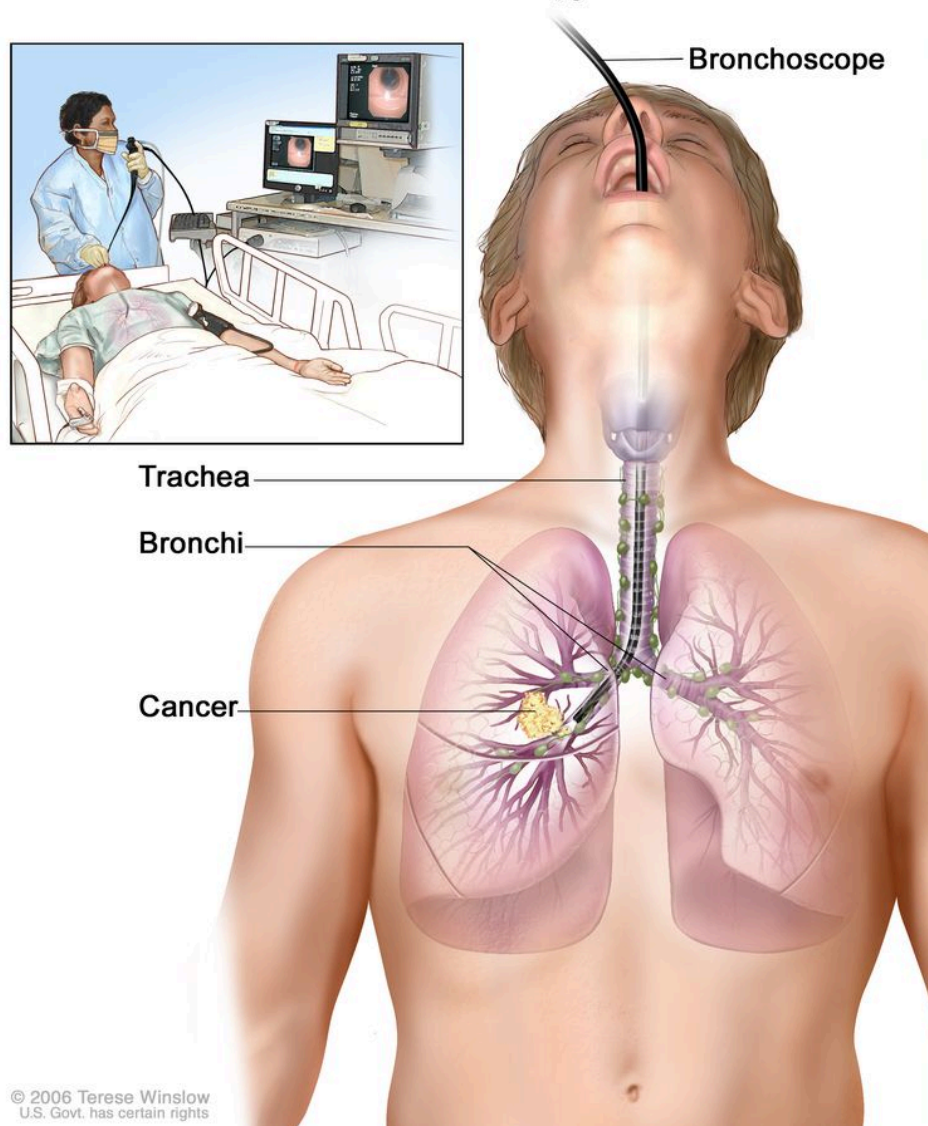
- **Fine-needle aspiration (FNA) biopsy of the lung** is the removal of tissue or fluid from the lung, using a thin needle. A CT scan, ultrasound, or other imaging procedure is used to find the abnormal tissue or fluid in the lung. A small incision may be made in the skin where the biopsy needle is inserted into the abnormal tissue or fluid. A sample is removed with the needle and sent to the laboratory. A pathologist then views the sample under a microscope to look for cancer cells. A chest x-ray is done after the procedure to make sure no air is leaking from the lung into the chest.



Fine-needle aspiration biopsy of the lung. The patient lies on a table that slides through the computed tomography (CT) machine, which takes x-ray pictures of the inside of the body. The x-ray pictures help the doctor see where the abnormal tissue is in the lung. A biopsy needle is inserted through the chest wall and into the area of abnormal lung tissue. A small piece of tissue is removed through the needle and checked under the microscope for signs of cancer.

- **Bronchoscopy** is a procedure to look inside the trachea and large airways in the lung for abnormal areas. A bronchoscope is inserted through the nose or mouth into the trachea and lungs. A bronchoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue samples, which are checked under a microscope for signs of cancer.

Bronchoscopy



Bronchoscopy. A bronchoscope is inserted through the mouth, trachea, and major bronchi into the lung, to look for abnormal areas. A bronchoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a cutting tool. Tissue samples may be taken to be checked under a microscope for signs of disease.

- **Thoracoscopy** is a surgical procedure to look at the organs inside the chest to check for abnormal areas. An incision (cut) is made between two ribs, and a thoracoscope is inserted into the chest. A thoracoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue or lymph node samples, which are checked under a microscope for signs of cancer. In some cases, this procedure is used to remove part of the esophagus or lung. If certain tissues, organs, or lymph nodes can't be reached, a thoracotomy may be done. In this procedure, a larger incision is made between the ribs and the chest is opened.
- **Thoracentesis** is the removal of fluid from the space between the lining of the chest and the lung, using a needle. A pathologist views the fluid under a microscope to look for cancer cells.

- **Mediastinoscopy** is a surgical procedure to look at the organs, tissues, and lymph nodes between the lungs for abnormal areas. An incision (cut) is made at the top of the breastbone and a mediastinoscope is inserted into the chest. A mediastinoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue or lymph node samples, which are checked under a microscope for signs of cancer.
- **Light and electron microscopy** is a laboratory test in which cells in a sample of tissue are viewed under regular and high-powered microscopes to look for certain changes in the cells.
- **Immunohistochemistry** is a laboratory test that uses antibodies to check for certain antigens (markers) in a sample of a patient's tissue. The antibodies are usually linked to an enzyme or a fluorescent dye. After the antibodies bind to a specific antigen in the tissue sample, the enzyme or dye is activated, and the antigen can then be seen under a microscope. This type of test is used to help diagnose cancer and to help tell one type of cancer from another type of cancer.

After small cell lung cancer has been diagnosed, tests are done to find out if cancer cells have spread within the chest or to other parts of the body.

The process used to find out if cancer has spread within the chest or to other parts of the body is called staging. The information gathered from the staging process determines the stage of the disease. It is important to know the stage in order to plan treatment. Some of the tests used to diagnose small cell lung cancer are also used to stage the disease.

Imaging tests that may be used in the staging process include:

- **MRI (magnetic resonance imaging) of the brain** uses a magnet, radio waves, and a computer to make a series of detailed pictures of areas inside the brain. This procedure is also called nuclear magnetic resonance imaging (NMRI).
- **PET scan (positron emission tomography scan)** uses a small amount of radioactive sugar (also called glucose) that is injected into a vein. Then a scanner rotates around the body to make detailed, computerized pictures of areas inside the body where the glucose is taken up. Because cancer cells often take up more glucose than normal cells, the pictures can be used to find cancer cells in the body. A PET scan and CT scan may be done at the same time. This is called a PET-CT.
- **Bone scan** checks for rapidly dividing cells, such as cancer cells, in the bone. A very small amount of radioactive material is injected into a vein and travels through the bloodstream. The radioactive material collects in the bones with cancer and is detected by a scanner.

Some people decide to get a second opinion.

You may want to get a second opinion to confirm your cancer diagnosis and treatment plan. If you seek a second opinion, you will need to get medical test results and reports from the first doctor to share with the second doctor. The second doctor will review the pathology report, slides, and scans. They may agree with the first doctor, suggest changes or another treatment approach, or provide more information about your cancer.

To learn more about choosing a doctor and getting a second opinion, see [Finding Cancer Care](#). You can contact [NCI's Cancer Information Service](#) via chat, email, or phone (both in English and Spanish) for help finding a doctor, hospital, or getting a second opinion. For questions you might want to ask at your appointments, see [Questions to Ask Your Doctor about Cancer](#).

Certain factors affect prognosis (chance of recovery) and treatment options.

The prognosis and treatment options depend on:

- the stage of the cancer (whether it is in the chest cavity only or has spread to other places in the body)
- the patient's age, gender, and general health

For certain patients, prognosis also depends on whether the patient is treated with both chemotherapy and radiation.

For most people with small cell lung cancer, current treatments do not cure the cancer. If lung cancer is found, you may want to think about taking part in one of the many clinical trials being done to improve treatment. Clinical trials are taking place in most parts of the country for patients with all stages of small cell lung cancer. Information about ongoing clinical trials is available from the [NCI website](#).

Stages of Small Cell Lung Cancer

KEY POINTS

- The following stages are used for small cell lung cancer:
 - Limited-stage small cell lung cancer
 - Extensive-stage small cell lung cancer
- Small cell lung cancer can recur (come back) after it has been treated.

Cancer stage describes the extent of cancer in the body, such as the size of the tumor, whether it has spread, and how far it has spread from where it first formed. It is important

to know the stage of small cell lung cancer to plan the best treatment.

Small cell lung cancer is usually classified into two stages due to its tendency to spread early.

The following stages are used for small cell lung cancer:

Limited-stage small cell lung cancer

In limited-stage, cancer is in the lung where it started and may have spread to the area between the lungs or to the lymph nodes above the collarbone.

Extensive-stage small cell lung cancer

In extensive-stage, cancer has spread beyond the lung or the area between the lungs or the lymph nodes above the collarbone to other places in the body.

Small cell lung cancer can recur (come back) after it has been treated.

Recurrent cancer is cancer that has recurred (come back) after it has been treated. If small cell lung cancer comes back, it may come back in the chest, central nervous system, or in other parts of the body. Tests will be done to help determine where the cancer has returned. The type of treatment for small cell lung cancer will depend on where it has come back.

Learn more in [Recurrent Cancer: When Cancer Comes Back](#). Information to help you cope and talk with your health care team can be found in the booklet [When Cancer Returns](#).

Treatment Option Overview

KEY POINTS

- There are different types of treatment for patients with small cell lung cancer.
- The following types of treatment are used:
 - Surgery
 - Chemotherapy
 - Radiation therapy
 - Immunotherapy
 - Laser therapy
 - Endoscopic stent placement
- New types of treatment are being tested in clinical trials.

- Treatment for small cell lung cancer may cause side effects.
- Follow-up care may be needed.

There are different types of treatment for patients with small cell lung cancer.

Different types of treatments are available for people with small cell lung cancer. You and your cancer care team will work together to decide your treatment plan, which may include more than one type of treatment. Many factors will be considered, such as the stage of the cancer, your overall health, and your preferences. Your plan will include information about your cancer, the goals of treatment, your treatment options and the possible side effects, and the expected length of treatment.

Talking with your cancer care team before treatment begins about what to expect will be helpful. You'll want to learn what you need to do before treatment begins, how you'll feel while going through it, and what kind of help you will need. To learn more, see [Questions to Ask Your Doctor about Treatment](#).

The following types of treatment are used:

Surgery

Surgery may be used if the cancer is found in one lung and in nearby lymph nodes only. Because this type of lung cancer is usually found in both lungs, surgery alone is not often used. During surgery, the doctor will also remove lymph nodes to find out if they have cancer in them. Sometimes, surgery may be used to remove a sample of lung tissue to find out the exact type of lung cancer.

After the doctor removes all the cancer that can be seen at the time of the surgery, some patients may be given chemotherapy or radiation therapy after surgery to kill any cancer cells that are left. Treatment given after the surgery, to lower the risk that the cancer will come back, is called adjuvant therapy.

Chemotherapy

Chemotherapy (also called chemo) uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing.

Chemotherapy for small cell lung cancer is usually systemic, meaning it is injected into a vein or given by mouth. When given this way, the drugs enter the bloodstream to reach cancer cells throughout the body.

Chemotherapy drugs used to treat small cell lung cancer may include:

- [carboplatin](#)

- [cisplatin](#)
- [cyclophosphamide](#)
- [doxorubicin](#)
- [etoposide](#)
- [ifosfamide](#)
- [irinotecan](#)
- [vincristine](#)

Combinations of these chemotherapy drugs may be used. Other chemotherapy drugs not listed here may also be used.

Chemotherapy may also be combined with other kinds of treatment. For example, it may be combined with radiation therapy or immunotherapy drugs.

To learn more about how chemotherapy works, how it is given, common side effects, and more, see [Chemotherapy to Treat Cancer](#) and [Chemotherapy and You: Support for People With Cancer](#).

Radiation therapy

Radiation therapy is a cancer treatment that uses high-energy x-rays or other types of radiation to kill cancer cells or keep them from growing. External radiation therapy uses a machine outside the body to send radiation toward the area of the body with cancer. External radiation therapy is used to treat small cell lung cancer, and may also be used as palliative therapy to relieve symptoms and improve quality of life. Radiation therapy to the brain to lessen the risk that cancer will spread to the brain may also be given.

Learn more about [External Beam Radiation Therapy for Cancer](#) and [Radiation Therapy Side Effects](#).

Immunotherapy

Immunotherapy helps a person's immune system fight cancer. Your doctor may suggest biomarker tests to help predict your response to certain immunotherapy drugs. Learn more about [Biomarker Testing for Cancer](#).

Immunotherapy drugs used to treat small cell lung cancer include:

- [atezolizumab](#)
- [durvalumab](#)
- [tarlatamab](#)

Learn more about [Immunotherapy to Treat Cancer](#).

Laser therapy

Laser therapy is a cancer treatment that uses a laser beam (a narrow beam of intense light) to kill cancer cells.

Endoscopic stent placement

An endoscope is a thin, tube-like instrument used to look at tissues inside the body. An endoscope has a light and a lens for viewing and may be used to place a stent in a body structure to keep the structure open. An endoscopic stent can be used to open an airway blocked by abnormal tissue.

New types of treatment are being tested in clinical trials.

For some people, joining a clinical trial may be an option. There are different types of clinical trials for people with cancer. For example, a treatment trial tests new treatments or new ways of using current treatments. Supportive care and palliative care trials look at ways to improve quality of life, especially for those who have side effects from cancer and its treatment.

You can use the [clinical trial search](#) to find NCI-supported cancer clinical trials accepting participants. The search allows you to filter trials based on the type of cancer, your age, and where the trials are being done. Clinical trials supported by other organizations can be found on the [ClinicalTrials.gov](#) website.

Learn more about clinical trials, including how to find and join one, at [Clinical Trials Information for Patients and Caregivers](#).

Treatment for small cell lung cancer may cause side effects.

For information about side effects caused by treatment for cancer, visit our [Side Effects](#) page.

Follow-up care may be needed.

As you go through treatment, you will have follow-up tests or check-ups. Some tests that were done to diagnose or stage the cancer may be repeated to see how well the treatment is working. Decisions about whether to continue, change, or stop treatment may be based on the results of these tests.

Some of the tests will continue to be done from time to time after treatment has ended. The results of these tests can show if your condition has changed or if the cancer has recurred (come back).

Treatment of Limited-Stage Small Cell Lung Cancer

Treatment of limited-stage small cell lung cancer may include the following:

- combination chemotherapy and radiation therapy to the chest, with radiation therapy to the brain given later to patients with complete responses
- combination chemotherapy alone for patients who cannot be given radiation therapy
- surgery followed by chemotherapy
- surgery followed by chemotherapy and radiation therapy
- radiation therapy to the brain may be given to patients who have had a complete response, to prevent the spread of cancer to the brain

Learn more about these treatments in the [Treatment Option Overview](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

Treatment of Extensive-Stage Small Cell Lung Cancer

Treatment of extensive-stage small cell lung cancer may include:

- immunotherapy ([atezolizumab](#) or [durvalumab](#)) and combination chemotherapy
- combination chemotherapy
- radiation therapy to the brain, spine, bone, or other parts of the body where the cancer has spread, as palliative therapy to relieve symptoms and improve quality of life
- radiation therapy to the chest if the cancer responded to chemotherapy
- radiation therapy to the brain after a complete response to chemotherapy, to prevent the spread of cancer to the brain

Learn more about these treatments in the [Treatment Option Overview](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

Treatment of Recurrent Small Cell Lung Cancer

Treatment of recurrent small cell lung cancer may include:

- chemotherapy
- immunotherapy
- radiation therapy as palliative therapy to relieve symptoms and improve quality of life
- laser therapy, stent placement to keep airways open, and/or internal radiation therapy as palliative therapy to relieve symptoms and improve quality of life

Learn more about these treatments in the [Treatment Option Overview](#).

Use our [clinical trial search](#) to find NCI-supported cancer clinical trials that are accepting patients. You can search for trials based on the type of cancer, the age of the patient, and where the trials are being done. [General information](#) about clinical trials is also available.

To Learn More About Small Cell Lung Cancer

For more information from the National Cancer Institute about small cell lung cancer:

- [Lung Cancer Home Page](#)
- [Lung Cancer Prevention](#)
- [Lung Cancer Screening](#)
- [Drugs Approved for Small Cell Lung Cancer](#)
- [Tobacco](#) (includes help with quitting)
- [Cigarette Smoking: Health Risks and How to Quit](#)
- [Secondhand Smoke and Cancer](#)

For general cancer information and other resources from the National Cancer Institute, visit:

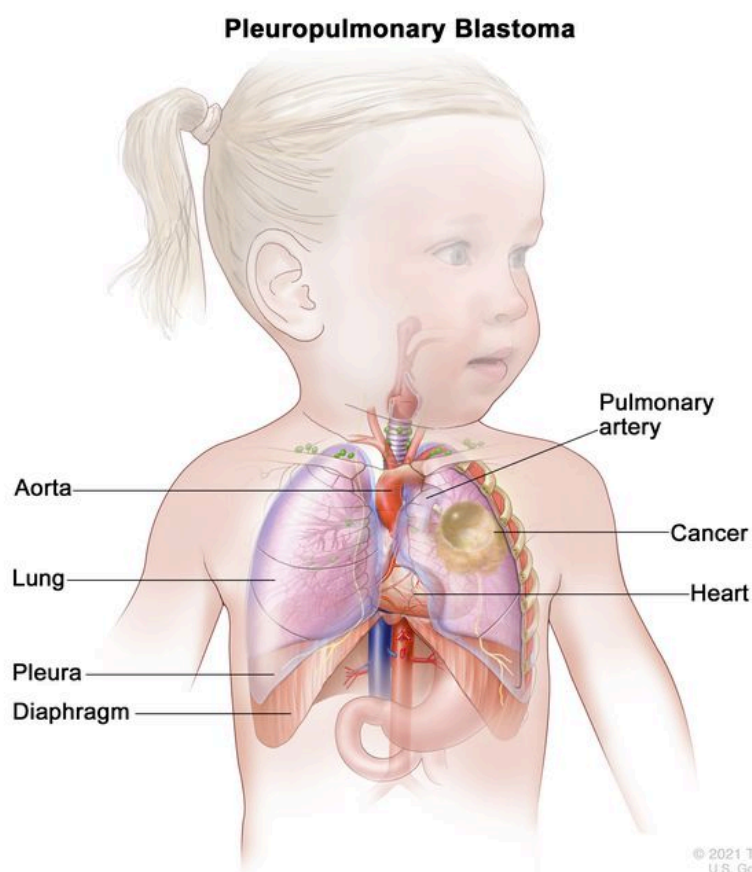
- [About Cancer](#)
- [Cancer Staging](#)
- [Chemotherapy and You: Support for People With Cancer](#)
- [Radiation Therapy and You: Support for People With Cancer](#)
- [Coping with Cancer](#)
- [Questions to Ask Your Doctor about Cancer](#)
- [For Survivors, Caregivers, and Advocates](#)

About This PDQ Summary

Pleuropulmonary Blastoma (PDQ®)–Patient Version

What is pleuropulmonary blastoma?

Pleuropulmonary blastoma is a rare and aggressive type of childhood cancer that forms in the lungs, the tissue that covers the lungs, and the inside wall of the chest cavity called the pleura. It can also form in the heart, aorta, pulmonary artery (the blood vessel that takes blood from the heart to the lungs), and the diaphragm (the main breathing muscle below the lungs). Pleuropulmonary blastoma mainly occurs in younger children, typically before the age of 5 years.



Pleuropulmonary blastoma is a rare, fast-growing cancer that forms in the tissues of the lung and pleura (the thin layer of tissue that covers the lungs and lines the inside of the chest). It may also form in the organs between the lungs, including the heart, aorta, and pulmonary artery, or in the diaphragm (the main breathing muscle

below the lungs). Pleuropulmonary blastoma usually occurs in infants and young children.

There are four types of pleuropulmonary blastoma:

- Type I tumors are cyst-like lung tumors. They are most common in children younger than 3 years and children have a good chance of recovery. After treatment, sometimes a Type I tumor may recur as a Type II or III tumor.
- Type Ir tumors are Type I tumors that have gotten smaller (regressed) or have not grown or spread.
- Type II tumors are cyst-like with some solid parts. They are found more often in children older than 2 years. Type II tumors sometimes spread to the brain or other parts of the body.
- Type III tumors are solid tumors. They are found more often in children older than 2 years. Type III tumors often spread to the brain or other parts of the body.

Causes and risk factors for pleuropulmonary blastoma

Pleuropulmonary blastoma is caused by certain changes to the way lung cells function, especially how they grow and divide into new cells. Often, the exact cause of these cell changes is unknown. Learn more about how cancer develops at [What Is Cancer?](#)

A risk factor is anything that increases the chance of getting a disease. Children with a change in the *DICER1* gene or a family history of DICER1 syndrome may be at an increased risk of pleuropulmonary blastoma. DICER1 syndrome is a rare genetic disorder that may cause a goiter, polyps in the colon, and tumors of the ovary, cervix, testicle, kidney, brain, eye, and lining of the lung. Not every child with these risk factors will develop a pleuropulmonary blastoma. And it will develop in some children who don't have a known risk factor.

Talk with your child's doctor if you think your child may be at risk.

Genetic counseling for children with pleuropulmonary blastoma

It may not be clear from the family medical history whether your child's pleuropulmonary blastoma is part of an inherited condition related to a change in the *DICER1* gene. Genetic counseling can assess the likelihood that your child's cancer is inherited and whether

genetic testing is needed. Genetic counselors and other specially trained health professionals can discuss your child's diagnosis and your family's medical history to help you understand:

- the options for testing for the *DICER1* gene
- the risk of other cancers for your child
- the risk of pleuropulmonary blastoma or other cancers for your child's siblings
- the risks and benefits of learning genetic information

Genetic counselors can also help you cope with your child's genetic testing results, including how to discuss the results with family members. They can also advise you about whether other members of your family should receive genetic testing.

Learn more about [Genetic Testing for Inherited Cancer Risk](#).

Symptoms of pleuropulmonary blastoma

Symptoms of pleuropulmonary blastoma are similar to respiratory tract infections. It's important to check with your child's doctor if your child has:

- a cough that doesn't go away
- fast breathing
- trouble breathing
- a fever
- lung infections, such as pneumonia
- pain in the chest or abdomen
- loss of appetite
- weight loss for no known reason

These symptoms may be caused by problems other than a pleuropulmonary blastoma. The only way to know is to see your child's doctor.

Tests to diagnose pleuropulmonary blastoma

If your child has symptoms that suggest a pleuropulmonary blastoma, the doctor will need to find out if these are due to cancer or another problem. The doctor will ask when the symptoms started and how often your child has been having them. They will also ask about

your child's personal and family medical history and do a physical exam. Depending on these results, they may recommend other tests. If your child is diagnosed with pleuropulmonary blastoma, the results of these tests will help you and your child's doctor plan treatment.

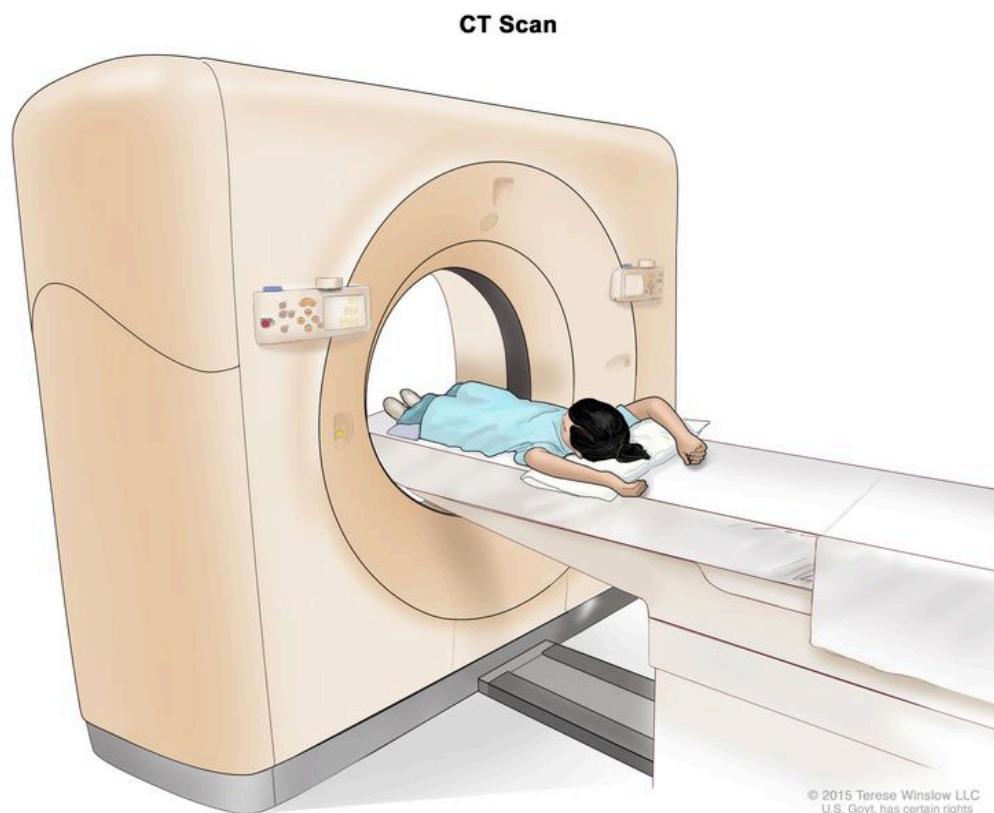
The tests used to diagnose pleuropulmonary blastoma may include:

Chest x-ray

An x-ray is a type of radiation that can go through the body and make pictures. A chest x-ray is one that makes pictures of the organs and bones inside the chest.

CT scan (CAT scan)

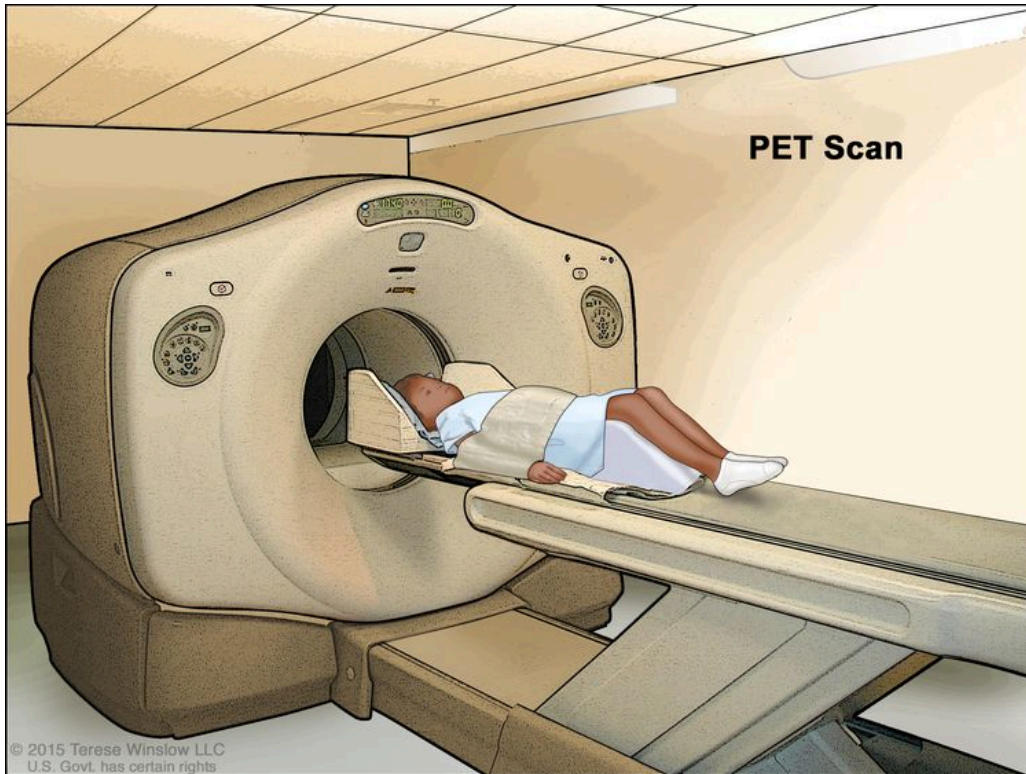
A CT scan uses a computer linked to an x-ray machine to make a series of detailed pictures of areas inside the body, such as the chest and abdomen. The pictures are taken from different angles and are used to create 3-D views of tissues and organs. A dye may be injected into a vein or swallowed to help the organs or tissues show up more clearly. This procedure is also called computed tomography, computerized tomography, or computerized axial tomography. Learn more about [Computed Tomography \(CT\) Scans and Cancer](#).



Computed tomography (CT) scan. The child lies on a table that slides through the CT scanner, which takes a series of detailed x-ray pictures of areas inside the body.

PET scan (positron emission tomography scan)

A PET scan uses a small amount of radioactive sugar (also called radioactive glucose) injected into a vein. Then the PET scanner rotates around the body to make detailed, computerized pictures of areas inside the body where the glucose is taken up. Because cancer cells often take up more glucose than normal cells, the pictures can be used to find cancer cells in the body.



Positron emission tomography (PET) scan. The child lies on a table that slides through the PET scanner. The head rest and white strap help the child lie still. A small amount of radioactive glucose (sugar) is injected into the child's vein, and a scanner makes a picture of where the glucose is being used in the body. Cancer cells show up brighter in the picture because they take up more glucose than normal cells do.

Magnetic resonance imaging (MRI)

MRI uses a magnet, radio waves, and a computer to make a series of detailed pictures of areas of the body, such as the head. This procedure is also called nuclear magnetic resonance imaging (NMRI).

Echocardiogram

Echocardiogram uses high-energy sound waves (ultrasound) that bounce off the heart and nearby tissues or organs and make echoes. A moving picture is made of the heart and heart

valves as blood is pumped through the heart.

Ultrasound exam

Ultrasound exam uses high-energy sound waves (ultrasound) that bounce off internal tissues or organs and make echoes. The echoes form a picture of body tissues called a sonogram.

Bronchoscopy

Bronchoscopy is a procedure to look inside the trachea and large airways in the lung for abnormal areas. A bronchoscope is inserted through the nose or mouth into the trachea and lungs. A bronchoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue samples, which are checked under a microscope for signs of cancer.

Thoracoscopy

Thoracoscopy is a type of surgery used to look inside the chest for abnormal areas. For this surgery, a thoracoscope is inserted into the chest through a cut made between two ribs. A thoracoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue or lymph node samples, which are checked under a microscope for signs of cancer. Sometimes part of the esophagus or lung is also removed. A thoracotomy may be done if the thoracoscope cannot reach certain tissues, organs, or lymph nodes. In this procedure, a larger incision is made between the ribs and the chest is opened.

***DICER1* genetic testing**

DICER1 genetic testing examines a sample of blood or saliva for changes in the *DICER1* gene.

Immunohistochemistry

An immunohistochemistry test uses antibodies to check for certain antigens (markers) in a sample of a patient's tissue. The antibodies are usually linked to an enzyme or a fluorescent dye. After the antibodies bind to the antigen in the sample of the patient's tissue, the enzyme or dye is activated, and the antigen can then be seen under a microscope. This test is used to help diagnose cancer and to help tell one type of cancer from another type.

Getting a second opinion

You may want to get a second opinion to confirm your child's cancer diagnosis and treatment plan. If you seek a second opinion, you will need to get medical test results and reports from the first doctor to share with the second doctor. The second doctor will review the genetic test report, pathology report, slides, and scans. This doctor may agree with the

first doctor, suggest changes to the treatment plan, or provide more information about your child's cancer.

To learn more about choosing a doctor and getting a second opinion, see [Finding Health Care Services](#). You can contact [NCI's Cancer Information Service](#) via chat, email, or phone (both in English and Spanish) for help finding a doctor or hospital that can provide a second opinion. For questions you might want to ask at your child's appointments, see [Questions to Ask Your Doctor](#).

Types of treatment for pleuropulmonary blastoma

Who treats children with pleuropulmonary blastoma?

A pediatric oncologist, a doctor who specializes in treating children with cancer, oversees treatment of pleuropulmonary blastoma. The pediatric oncologist works with other health care providers who are experts in treating children with cancer and also specialize in certain areas of medicine. Other specialists may include:

- pediatrician
- pediatric surgeon
- pathologist
- pediatric nurse specialist
- social worker
- rehabilitation specialist
- psychologist
- child-life specialist
- fertility specialist

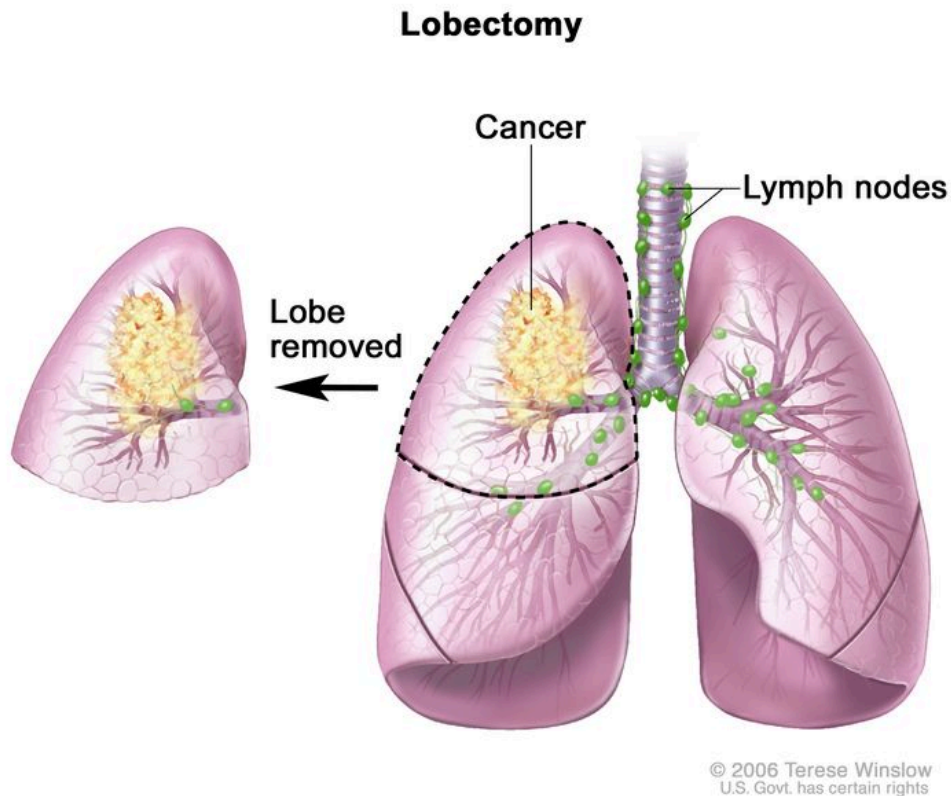
There are different types of treatment for children with pleuropulmonary blastoma. You and your child's care team will work together to decide treatment. Many factors will be considered, such as where the cancer is located and your child's age and overall health.

Your child's treatment plan will include information about the tumor, the goals of treatment, treatment options, and the possible side effects. It will be helpful to talk with your child's care team before treatment begins about what to expect. For help every step of the way, see our booklet, [Children with Cancer: A Guide for Parents](#).

Types of treatment your child might have include:

Surgery

For all types of pleuropulmonary blastoma, surgery is done to remove the whole lobe of the lung with cancer. Chemotherapy may be given to shrink the tumor before surgery for patients with Types II or III pleuropulmonary blastoma.



Lobectomy. A lobe of the lung is removed.

Chemotherapy

Chemotherapy (also called chemo) uses drugs to stop the growth of cancer cells. Chemotherapy either kills the cancer cells or stops them from dividing. Chemotherapy may be given alone or with other types of treatment. Chemotherapy for pleuropulmonary blastoma is injected into a vein. When given this way, the drugs enter the bloodstream and can reach cancer cells throughout the body.

Chemotherapy drugs used alone or in combination to treat pleuropulmonary blastoma include:

- dactinomycin
- doxorubicin
- ifosfamide
- vincristine

Other chemotherapy drugs not listed here may also be used.

Learn more about [Chemotherapy to Treat Cancer](#).

Clinical trials

For some children, joining a clinical trial may be an option. There are different types of clinical trials for childhood cancer. For example, a treatment trial tests new treatments or new ways of using current treatments. Supportive care and palliative care trials look at ways to improve quality of life, especially for those who have side effects from cancer and its treatment.

You can use the [clinical trial search](#) to find NCI-supported cancer clinical trials accepting participants. The search allows you to filter trials based on the type of cancer, your child's age, and where the trials are being done. Clinical trials supported by other organizations can be found on the [ClinicalTrials.gov](#) website.

Learn more about clinical trials, including how to find and join one, at [Clinical Trials Information for Patients and Caregivers](#).

Treatment of pleuropulmonary blastoma

Treatment of pleuropulmonary blastoma may include:

- For Type I and Type Ir pleuropulmonary blastoma, surgery is done to remove the whole lobe of the lung with cancer.
- For Type II and Type III pleuropulmonary blastoma, surgery is done to remove the whole lobe of the lung with cancer. Chemotherapy may be given before surgery to shrink the tumor.

If the cancer comes back after treatment, your child's doctor will talk with you about what to expect and possible next steps. There might be treatment options that may shrink the cancer or control its growth. If there are no treatments, your child can receive care to control symptoms from cancer so they can be as comfortable as possible.

Prognostic factors for pleuropulmonary blastoma

If your child has been diagnosed with pleuropulmonary blastoma, you likely have questions about how serious the cancer is and your child's chances of survival. The likely outcome or course of a disease is called prognosis. The prognosis can be affected by the type of pleuropulmonary blastoma, whether the cancer has spread to other parts of the body at the time of diagnosis, and whether the cancer was completely removed by surgery.

No two people are alike, and responses to treatment can vary greatly. Your child's cancer care team is in the best position to talk with you about your child's prognosis.

Side effects and late effects of treatment

Cancer treatments can cause side effects. Which side effects your child might have depends on the type of treatment they receive, the dose, and how their body reacts. Talk with your child's treatment team about which side effects to look for and ways to manage them.

To learn more about side effects that begin during treatment for cancer, visit [Side Effects](#).

Problems from cancer treatment that begin 6 months or later after treatment and continue for months or years are called late effects. Late effects of cancer treatment may include:

- physical problems
- changes in mood, feelings, thinking, learning, or memory
- second cancers (new types of cancer) or other conditions

Some late effects may be treated or controlled. It is important to talk with your child's doctors about the possible late effects caused by some treatments.

Follow-up care

As your child goes through treatment, they will have follow-up tests or check-ups. Some of the tests that were done to diagnose the cancer may be repeated to see how well the treatment is working. Decisions about whether to continue, change, or stop treatment may be based on the results of the tests.

Some of the tests will continue to be done from time to time after treatment has ended. The results of these tests can show if your child's condition has changed or if cancer has come back.

Coping with your child's cancer

When your child has cancer, every member of the family needs support. Taking care of yourself during this difficult time is important. Reach out to your child's treatment team and to people in your family and community for support. To learn more, see [Support for Families: Childhood Cancer](#) and the booklet [Children with Cancer: A Guide for Parents](#).

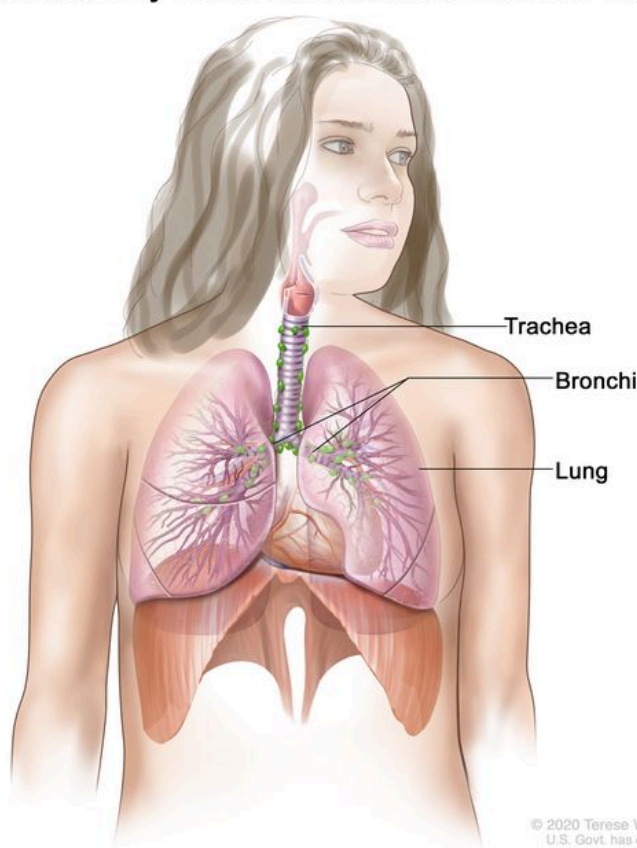
Related resources

Childhood Tracheobronchial Tumors (PDQ®)– Patient Version

What are childhood tracheobronchial tumors?

Tracheobronchial tumors are rare, abnormal growths that form in the windpipe (trachea) or the large airways in the lungs called the bronchi. They can be benign (not cancerous) or malignant (cancerous). Benign tumors are more common in children. If a child has a benign tumor, they may need treatment to prevent the tumor from growing and putting pressure on nearby tissue in the airway. If the tumor is cancerous, the treatment is aimed at killing the cancer cells and keeping them from spreading to other parts of the body.

Areas of the Body Where Tracheobronchial Tumors May Form



Questions?

Tracheobronchial tumors form in the inside lining of the trachea or bronchi (large airways of the lung). Tracheobronchial tumors are rare and can occur in both children and adults.

Several types of tracheobronchial tumors may affect children:

- Carcinoid tumor is the most common type of tracheobronchial tumor in children. This type of tumor is usually benign, but some may be cancerous and spread to other parts of the body.
- Mucoepidermoid carcinoma is a slow-growing cancer that affects the airway.
- Inflammatory myofibroblastic tumor is a slow-growing tumor that usually affects the upper trachea. These tumors rarely spread to other parts of the body.
- Rhabdomyosarcoma is a type of soft tissue sarcoma. Learn more at [Childhood Rhabdomyosarcoma Treatment](#).
- Granular cell tumor is usually benign, but can be cancerous and spread to nearby tissue.

Causes and risk factors for childhood tracheobronchial tumors

Tracheobronchial tumors in children are caused by certain changes to the way cells in the lining of the trachea or large bronchi function, especially how they grow and divide into new cells. Often, the exact cause of these cell changes is unknown. Learn more about how cancer develops at [What Is Cancer?](#)

A risk factor is anything that increases the chance of getting a disease. There are no known risk factors for childhood tracheobronchial tumors.

Symptoms of childhood tracheobronchial tumors

Symptoms of tracheobronchial tumors are a lot like symptoms of asthma, which can make it hard to diagnose the tumor. It's important to check with your child's doctor if your child has any symptoms, such as:

- dry cough
- wheezing
- trouble breathing
- coughing up blood
- frequent infections in the lung, such as pneumonia
- feeling very tired
- loss of appetite or weight loss for no known reason

These symptoms may be caused by problems other than a tracheobronchial tumor. The only way to know is to see your child's doctor.

Tests to diagnose childhood tracheobronchial tumors

If your child has symptoms that suggest a tracheobronchial tumor, the doctor will need to find out if these are due to cancer or to another problem. The doctor will ask when the symptoms started and how often your child has been having them. They will also ask about your child's personal and family medical history and do a physical exam. Depending on these results, they may recommend other tests. If your child is diagnosed with a tracheobronchial tumor, the results of these tests will help you and your child's doctor plan treatment.

The tests used to diagnose tracheobronchial tumors in children may include:

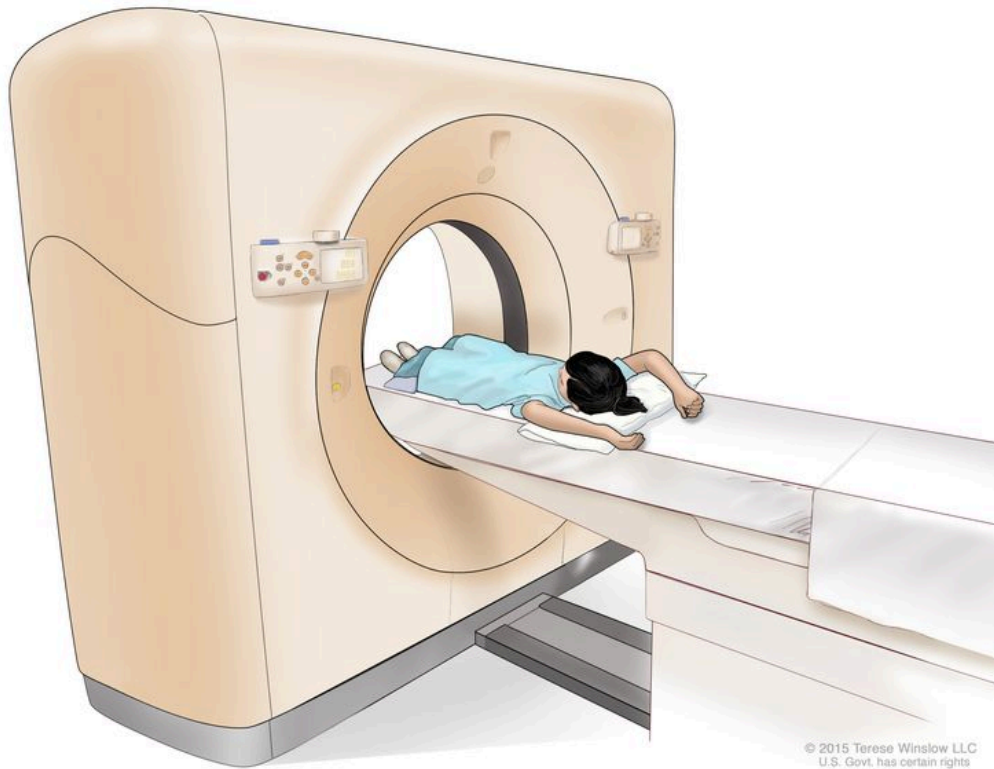
Chest x-ray

An x-ray is a type of radiation that can go through the body and make pictures. A chest x-ray makes pictures of the organs and bones inside the chest.

CT scan (CAT scan)

A CT scan uses a computer linked to an x-ray machine to make a series of detailed pictures of areas inside the body, such as the neck and chest. The pictures are taken from different angles and are used to create 3-D views of tissues and organs. A dye may be injected into a vein or swallowed to help the organs or tissues show up more clearly. This procedure is also called computed tomography, computerized tomography, or computerized axial tomography. Learn more about [Computed Tomography \(CT\) Scans and Cancer](#).

CT Scan



Computed tomography (CT) scan. The child lies on a table that slides through the CT scanner, which takes a series of detailed x-ray pictures of areas inside the body.

Bronchoscopy

Bronchoscopy is a procedure to look for abnormal areas inside the trachea and large airways in the lung. A bronchoscope is inserted through the nose or mouth into the trachea and lungs. A bronchoscope is a thin, tube-like instrument with a light and a lens for viewing. It may also have a tool to remove tissue samples, which are checked under a microscope for signs of cancer.

Bronchography

Bronchography is a procedure to look for abnormal areas in the larynx, trachea, and bronchi and to check whether the airways are wider below the level of the tumor. A contrast dye is given through a bronchoscope to coat the airways and make them show up more clearly on x-ray film.

Octreotide scan

An octreotide scan is a type of radionuclide scan used to find tracheobronchial tumors or cancer that has spread to the lymph nodes. A very small amount of radioactive octreotide (a hormone that attaches to carcinoid tumors) is injected into a vein and travels through the bloodstream. The radioactive octreotide attaches to the tumor and a special camera that detects radioactivity is used to show where the tumors are in the body.

Getting a second opinion

You may want to get a second opinion to confirm your child's diagnosis and treatment plan. If you seek a second opinion, you will need to get medical test results and reports from the first doctor to share with the second doctor. The second doctor will review the pathology report, slides, and scans. This doctor may agree with the first doctor, suggest changes to the treatment plan, or provide more information about your child's tumor.

To learn more about choosing a doctor and getting a second opinion, see [Finding Cancer Care](#). You can contact [NCI's Cancer Information Service](#) via chat, email, or phone (both in English and Spanish) for help finding a doctor, hospital, or getting a second opinion. For questions you might want to ask at your child's appointments, see [Questions to Ask Your Doctor about Cancer](#).

Who treats children with tracheobronchial tumors?

A pediatric oncologist, a doctor who specializes in treating children with cancer, oversees treatment of tracheobronchial tumors. The pediatric oncologist works with other health care providers who are experts in treating children with cancer and who specialize in certain areas of medicine. Other specialists may include:

- pediatrician
- pediatric surgeon
- radiation oncologist
- pathologist
- pediatric nurse specialist
- social worker
- rehabilitation specialist
- psychologist
- child-life specialist
- fertility specialist

Treatment of childhood tracheobronchial tumors

There are different types of treatment for children and adolescents with tracheobronchial tumors. You and your child's care team will work together to decide treatment. Many factors

will be considered, such as your child's overall health and whether the tumor is newly diagnosed or has come back after treatment.

Your child's treatment plan will include information about the tumor, the goals of treatment, treatment options, and the possible side effects. It will be helpful to talk with your child's care team before treatment begins about what to expect. For help every step of the way, see our booklet, [Children with Cancer: A Guide for Parents](#).

For all tracheobronchial tumors except rhabdomyosarcoma, treatment might include surgery to remove the tumor. The lymph nodes and vessels where cancer has spread are also removed. Sometimes a surgery called a sleeve resection is done.

For rhabdomyosarcoma in the trachea or bronchi, treatment might include:

- Chemotherapy (also called chemo) uses drugs to stop the growth of cancer cells. Chemotherapy either kills the cancer cells or stops them from dividing. Chemotherapy may be given alone or with other types of treatment.
- Radiation therapy uses high-energy x-rays or other types of radiation to kill cancer cells or keep them from growing. External beam radiation therapy uses a machine outside the body to send radiation toward the area of the body with cancer.

Learn more about [Childhood Rhabdomyosarcoma Treatment](#).

For inflammatory myofibroblastic tumors in the trachea or bronchi, in addition to surgery, treatment may include targeted therapy. Targeted therapy uses drugs or other substances to identify and attack specific cancer cells. [Crizotinib](#) may be used if the tumor has a certain change in the *ALK* gene. Learn more about [Targeted Therapy to Treat Cancer](#).

If the cancer comes back after treatment, your child's doctor will talk with you about what to expect and possible next steps. There might be treatment options that may shrink the cancer or control its growth. If there are no treatments, your child can receive care to control symptoms from cancer so they can be as comfortable as possible.

Clinical trials

For some children, joining a clinical trial may be an option. There are different types of clinical trials for childhood cancer. For example, a treatment trial tests new treatments or new ways of using current treatments. Supportive care and palliative care trials look at ways to improve quality of life, especially for those who have side effects from cancer and its treatment.

You can use the [clinical trial search](#) to find NCI-supported cancer clinical trials accepting participants. The search allows you to filter trials based on the type of cancer, your child's age, and where the trials are being done. Clinical trials supported by other organizations can be found on the [ClinicalTrials.gov](https://clinicaltrials.gov) website.

Learn more about clinical trials, including how to find and join one, at [Clinical Trials Information for Patients and Caregivers](#).

Prognosis and prognostic factors for childhood tracheobronchial tumors

If your child has been diagnosed with a tracheobronchial tumor, you likely have questions about how serious the cancer is and about your child's chances of survival. The likely outcome or course of a disease is called prognosis.

The prognosis depends on many factors, including:

- the type of tracheobronchial tumor
- whether the tumor is or has become cancer and spread to other parts of the body
- whether the tumor was completely removed by surgery
- whether the tumor is newly diagnosed or has come back after treatment

The prognosis for children with tracheobronchial tumors that can be removed by surgery is very good. This is the case for most tracheobronchial tumors except rhabdomyosarcoma, which requires more aggressive treatment.

No two people are alike, and responses to treatment can vary greatly. Your child's cancer care team is in the best position to talk with you about your child's prognosis.

Side effects and late effects of treatment

Cancer treatments can cause side effects. Which side effects your child might have depends on the type of treatment they receive, the dose, and how their body reacts. Talk with your child's treatment team about which side effects to look for and ways to manage them.

To learn more about side effects that begin during treatment for cancer, visit [Side Effects](#).

Problems from cancer treatment that begin 6 months or later after treatment and continue for months or years are called late effects. Late effects of cancer treatment may include:

- physical problems
- changes in mood, feelings, thinking, learning, or memory
- second cancers (new types of cancer) or other conditions

Some late effects may be treated or controlled. It is important to talk with your child's doctors about the possible late effects caused by some treatments.

Follow-up care

As your child goes through treatment, they will have follow-up tests or check-ups. Some of the tests that were done to diagnose the cancer may be repeated to see how well the treatment is working. Decisions about whether to continue, change, or stop treatment may be based on the results of these tests.

Some of the tests will continue to be done from time to time after treatment has ended. The results of these tests can show if your child's condition has changed or if the cancer has recurred (come back).

Coping with your child's cancer

When your child has a tumor, every member of the family needs support. Taking care of yourself during this difficult time is important. Reach out to your child's treatment team and to people in your family and community for support. To learn more, see [Support for Families: Childhood Cancer](#) and the booklet [Children with Cancer: A Guide for Parents](#).

Related resources

For more childhood cancer information and other general cancer resources, see:

- [Lung Cancer Home Page](#)
- [About Cancer](#)
- [Childhood Cancers](#)
- [CureSearch for Children's Cancer](#)
- [Late Effects of Treatment for Childhood Cancer](#)
- [Adolescents and Young Adults with Cancer](#)

Lung Cancer Prevention (PDQ®)–Patient Version

[Go to Health Professional Version](#)

What Is Prevention?

Cancer prevention is action taken to lower the chance of getting cancer. By preventing cancer, the number of new cases of cancer in a group or population is lowered. Hopefully, this will lower the number of deaths caused by cancer.

To prevent new cancers from starting, scientists look at risk factors and protective factors. Anything that increases your chance of developing cancer is called a cancer risk factor; anything that decreases your chance of developing cancer is called a cancer protective factor.

Some risk factors for cancer can be avoided, but many cannot. For example, both smoking and inheriting certain genes are risk factors for some types of cancer, but only smoking can be avoided. Regular exercise and a healthy diet may be protective factors for some types of cancer. Avoiding risk factors and increasing protective factors may lower your risk, but it does not mean that you will not get cancer.

Different ways to prevent cancer are being studied, including:

- changing lifestyle or eating habits
- avoiding things known to cause cancer
- taking medicines to treat a precancerous condition or to keep cancer from starting

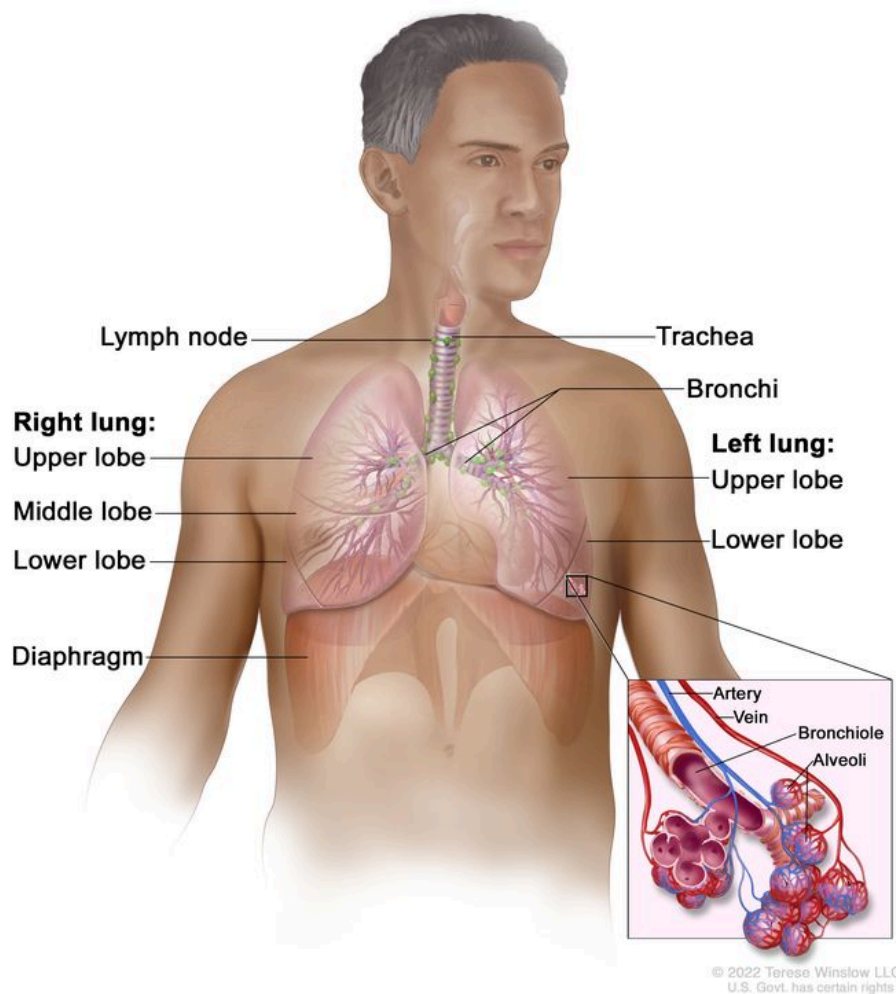
General Information About Lung Cancer

KEY POINTS

- Lung cancer is a disease in which malignant (cancer) cells form in the tissues of the lung.
- Lung cancer is the leading cause of cancer death in both men and women.

Lung cancer is a disease in which malignant (cancer) cells form in the tissues of the lung.

The lungs are a pair of cone-shaped breathing organs in the chest. The lungs bring oxygen into the body as you breathe in. They release carbon dioxide, a waste product of the body's cells, as you breathe out. Each lung has sections called lobes. The left lung has two lobes. The right lung is slightly larger, and has three lobes. A thin membrane called the pleura surrounds the lungs. Two tubes called bronchi lead from the trachea (windpipe) to the right and left lungs. The bronchi are sometimes also involved in lung cancer. Tiny air sacs called alveoli and small tubes called bronchioles make up the inside of the lungs.



Anatomy of the respiratory system showing the trachea, the right and left lungs and their lobes, and the bronchi. The lymph nodes and the diaphragm are also shown. Oxygen is inhaled into the lungs and passes through the alveoli (the tiny air sacs at the end of the bronchioles) and into the bloodstream (see inset), where it travels to the tissues throughout the body.

There are two main types of lung cancer: small cell lung cancer and non-small cell lung cancer.

Other PDQ summaries containing information related to lung cancer include:

- [Lung Cancer Screening](#)
- [Non-Small Cell Lung Cancer Treatment](#)
- [Small Cell Lung Cancer Treatment](#)
- [Cigarette Smoking: Health Risks and How to Quit](#)

Lung cancer is the leading cause of cancer death in both men and women.

Lung cancer rates and deaths are higher in Black men than in other racial and ethnic group in the United States.

Lung Cancer Prevention

KEY POINTS

- Avoiding risk factors and increasing protective factors may help prevent lung cancer.
- The following are *risk* factors for lung cancer:
 - Cigarette, cigar, and pipe smoking
 - Secondhand smoke
 - Family history
 - HIV infection
 - Environmental risk factors
 - Beta carotene supplements in heavy smokers
- The following are *protective* factors for lung cancer:
 - Not smoking
 - Quitting smoking
 - Lower exposure to workplace risk factors
 - Lower exposure to radon
- It is not clear if the following decrease the risk of lung cancer:
 - Diet
 - Physical activity
- The following do not decrease the risk of lung cancer:
 - Beta carotene supplements in nonsmokers

- Vitamin E supplements
- Cancer prevention clinical trials are used to study ways to prevent cancer.
- New ways to prevent lung cancer are being studied in clinical trials.

Avoiding risk factors and increasing protective factors may help prevent lung cancer.

Avoiding cancer risk factors may help prevent certain cancers. Risk factors include smoking, having overweight, and not getting enough exercise. Increasing protective factors such as quitting smoking and exercising may also help prevent some cancers. Talk to your doctor or other health care professional about how you might lower your risk of cancer.

The following are *risk* factors for lung cancer:

Cigarette, cigar, and pipe smoking

Tobacco smoking is the most important risk factor for lung cancer. Cigarette, cigar, and pipe smoking all increase the risk of lung cancer. Tobacco smoking causes about 9 out of 10 cases of lung cancer in men and about 8 out of 10 cases of lung cancer in women.

Studies have shown that smoking low tar or low nicotine cigarettes does not lower the risk of lung cancer.

Studies also show that the risk of lung cancer from smoking cigarettes increases with the number of cigarettes smoked per day and the number of years smoked. People who smoke have about 20 times the risk of lung cancer compared to those who do not smoke.

Secondhand smoke

Being exposed to secondhand tobacco smoke is also a risk factor for lung cancer. Secondhand smoke is the smoke that comes from a burning cigarette or other tobacco product, or that is exhaled by smokers. People who inhale secondhand smoke are exposed to the same cancer-causing agents as smokers, although in smaller amounts. Inhaling secondhand smoke is called involuntary or passive smoking.

Family history

Having a family history of lung cancer is a risk factor for lung cancer. People with a relative who has had lung cancer may be twice as likely to have lung cancer as people who do not have a relative who has had lung cancer. Because cigarette smoking tends to run in families and family members are exposed to secondhand smoke, it is hard to know whether the increased risk of lung cancer is from the family history of lung cancer or from being exposed to cigarette smoke.

HIV infection

Being infected with the human immunodeficiency virus (HIV), the cause of acquired immunodeficiency syndrome (AIDS), is linked with a higher risk of lung cancer. People infected with HIV may have more than twice the risk of lung cancer than those who are not infected. Since smoking rates are higher in those infected with HIV than in those not infected, it is not clear whether the increased risk of lung cancer is from HIV infection or from being exposed to cigarette smoke.

Environmental risk factors

- **Radiation exposure:** Being exposed to radiation is a risk factor for lung cancer. Atomic bomb radiation, radiation therapy, imaging tests, and radon are sources of radiation exposure:
 - Atomic bomb radiation: Being exposed to radiation after an atomic bomb explosion increases the risk of lung cancer.
 - Radiation therapy: Radiation therapy to the chest may be used to treat certain cancers, including breast cancer and Hodgkin lymphoma. Radiation therapy uses x-rays, gamma rays, or other types of radiation that may increase the risk of lung cancer. The higher the dose of radiation received, the higher the risk. The risk of lung cancer following radiation therapy is higher in patients who smoke than in nonsmokers.
 - Imaging tests: Imaging tests, such as CT scans, expose patients to radiation. Low-dose spiral CT scans expose patients to less radiation than higher dose CT scans. In lung cancer screening, the use of low-dose spiral CT scans can lessen the harmful effects of radiation.
 - Radon: Radon is a radioactive gas that comes from the breakdown of uranium in rocks and soil. It seeps up through the ground, and leaks into the air or water supply. Radon can enter homes through cracks in floors, walls, or the foundation, and levels of radon can build up over time.

Studies show that high levels of radon gas inside the home or workplace increase the number of new cases of lung cancer and the number of deaths caused by lung cancer. The risk of lung cancer is higher in smokers exposed to radon than in nonsmokers who are exposed to it. In people who have never smoked, about 26% of deaths caused by lung cancer have been linked to being exposed to radon.

- **Workplace exposure:** Studies show that being exposed to the following substances increases the risk of lung cancer:
 - asbestos
 - arsenic
 - chromium
 - nickel

- beryllium
- cadmium
- tar and soot

These substances can cause lung cancer in people who are exposed to them in the workplace and have never smoked. As the level of exposure to these substances increases, the risk of lung cancer also increases. The risk of lung cancer is even higher in people who are exposed and also smoke.

- **Air pollution:** Studies show that living in areas with higher levels of air pollution increases the risk of lung cancer.

Beta carotene supplements in heavy smokers

Taking beta carotene supplements (pills) increases the risk of lung cancer, especially in smokers who smoke one or more packs a day. The risk is higher in smokers who have at least one alcoholic drink every day.

The following are *protective* factors for lung cancer:

Not smoking

The best way to prevent lung cancer is to not smoke.

Quitting smoking

Smokers can decrease their risk of lung cancer by quitting. In smokers who have been treated for lung cancer, quitting smoking lowers the risk of new lung cancers. Counseling, the use of nicotine replacement products, and antidepressant therapy have helped smokers quit for good.

In a person who has quit smoking, the chance of preventing lung cancer depends on how many years and how much the person smoked and the length of time since quitting. After a person has quit smoking for 10 years, the risk of lung cancer decreases 30% to 60%.

Although the risk of dying from lung cancer can be greatly decreased by quitting smoking for a long period of time, the risk will never be as low as the risk in nonsmokers. This is why it is important for young people not to start smoking.

See the following for more information on quitting smoking:

- [Tobacco](#) (includes help with quitting)
- [Cigarette Smoking: Health Risks and How to Quit](#)

Lower exposure to workplace risk factors

Laws that protect workers from being exposed to cancer-causing substances, such as asbestos, arsenic, nickel, and chromium, may help lower their risk of developing lung cancer. Laws that prevent smoking in the workplace help lower the risk of lung cancer caused by secondhand smoke.

Lower exposure to radon

Lowering radon levels may lower the risk of lung cancer, especially among cigarette smokers. High levels of radon in homes may be reduced by taking steps to prevent radon leakage, such as sealing basements.

It is not clear if the following decrease the risk of lung cancer:

Diet

Some studies show that people who eat high amounts of fruits or vegetables have a lower risk of lung cancer than those who eat low amounts. However, since smokers tend to have less healthy diets than nonsmokers, it is hard to know whether the decreased risk is from having a healthy diet or from not smoking.

Physical activity

Some studies show that people who are physically active have a lower risk of lung cancer than people who are not. However, since smokers tend to have different levels of physical activity than nonsmokers, it is hard to know if physical activity affects the risk of lung cancer.

The following do not decrease the risk of lung cancer:

Beta carotene supplements in nonsmokers

Studies of nonsmokers show that taking beta carotene supplements does not lower their risk of lung cancer.

Vitamin E supplements

Studies show that taking vitamin E supplements does not affect the risk of lung cancer.

Cancer prevention clinical trials are used to study ways to prevent cancer.

Cancer prevention clinical trials are used to study ways to lower the risk of developing certain types of cancer. Some cancer prevention trials are conducted with healthy people who have not had cancer but who have an increased risk for cancer. Other prevention trials are conducted with people who have had cancer and are trying to prevent another cancer of the same type or to lower their chance of developing a new type of cancer. Other trials are done with healthy volunteers who are not known to have any risk factors for cancer.

Lung Cancer Screening (PDQ®)–Patient Version

[Go to Health Professional Version](#)

What Is Screening?

Screening is looking for cancer before a person has any symptoms. This can help find cancer at an early stage. When abnormal tissue or cancer is found early, it may be easier to treat. By the time symptoms appear, cancer may have begun to spread.

Scientists are trying to better understand which people are more likely to get certain types of cancer. They also study the things we do and the things around us to see if they cause cancer. This information helps doctors recommend who should be screened for cancer, which screening tests should be used, and how often the tests should be done.

It is important to remember that your doctor does not necessarily think you have cancer he or she suggests a screening test. Screening tests are given when you have no cancer symptoms.

If a screening test result is abnormal, you may need to have more tests done to find out if you have cancer. These are called diagnostic tests.

Questions?

General Information About Lung Cancer

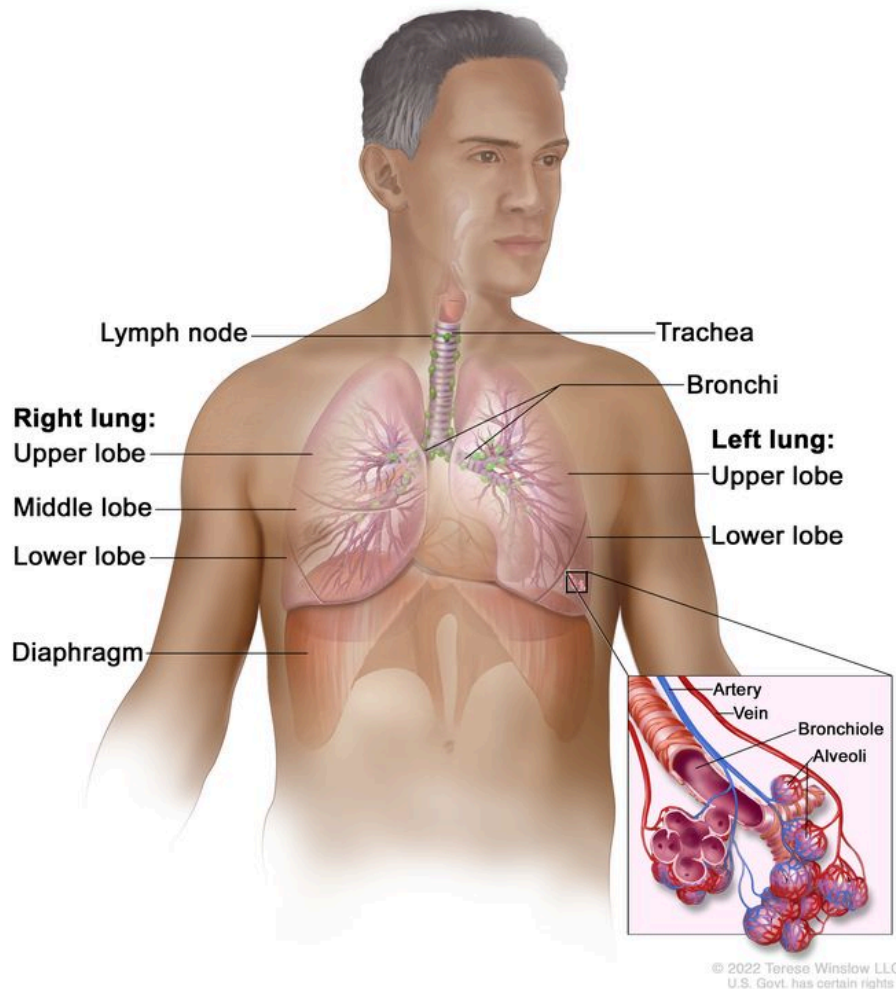
KEY POINTS

- Lung cancer is a disease in which malignant (cancer) cells form in the tissues of the lung.
- Lung cancer is the leading cause of cancer death in the United States.
- Different factors increase or decrease the risk of lung cancer.

Lung cancer is a disease in which malignant (cancer) cells form in the tissues of the lung.

The lungs are a pair of cone-shaped breathing organs in the chest. The lungs bring oxygen into the body as you breathe in. They release carbon dioxide, a waste product of the body's cells, as you breathe out. Each lung has sections called lobes. The left lung has two lobes.

The right lung is slightly larger, and has three lobes. A thin membrane called the pleura surrounds the lungs. Two tubes called bronchi lead from the trachea (windpipe) to the right and left lungs. The bronchi are sometimes also involved in lung cancer. Tiny air sacs called alveoli and small tubes called bronchioles make up the inside of the lungs.



Anatomy of the respiratory system showing the trachea, the right and left lungs and their lobes, and the bronchi. The lymph nodes and the diaphragm are also shown. Oxygen is inhaled into the lungs and passes through the alveoli (the tiny air sacs at the end of the bronchioles) and into the bloodstream (see inset), where it travels to the tissues throughout the body.

There are two main types of lung cancer: small cell lung cancer and non-small cell lung cancer.

Other PDQ summaries containing information related to lung cancer include:

- [Lung Cancer Prevention](#)
- [Non-Small Cell Lung Cancer Treatment](#)

- [Small Cell Lung Cancer Treatment](#)

Lung cancer is the leading cause of cancer death in the United States.

Lung cancer is the second most common type of non-skin cancer in the United States. Lung cancer is the leading cause of cancer death in men and in women.

Different factors increase or decrease the risk of lung cancer.

Anything that increases your chance of getting a disease is called a risk factor. Anything that decreases your chance of getting a disease is called a protective factor.

Tobacco smoking is the most important risk factor for lung cancer. Cigarette, cigar, and pipe smoking all increase the risk of lung cancer. Tobacco smoking causes about 9 out of 10 cases of lung cancer in men and about 8 out of 10 cases of lung cancer in women. The best way to prevent lung cancer is to not smoke.

For information about risk factors and protective factors for lung cancer, see [Lung Cancer Prevention](#).

Lung Cancer Screening

KEY POINTS

- Tests are used to screen for different types of cancer when a person does not have symptoms.
- Three screening tests have been studied to see if they decrease the risk of dying from lung cancer.
- Screening with LDCT scans has been shown to decrease the risk of dying from lung cancer in heavy smokers.
- Screening with chest x-rays and/or sputum cytology does not decrease the risk of dying from lung cancer.
- Screening tests for lung cancer are being studied in clinical trials.

Tests are used to screen for different types of cancer when a person does not have symptoms.

Scientists study screening tests to find those with the fewest harms and most benefits. Cancer screening trials also are meant to show whether early detection (finding cancer before it causes symptoms) helps a person live longer or decreases a person's chance of

dying from the disease. For some types of cancer, the chance of recovery is better if the disease is found and treated at an early stage.

Three screening tests have been studied to see if they decrease the risk of dying from lung cancer.

The following screening tests have been studied to see if they decrease the risk of dying from lung cancer:

- Low-dose computed tomography (LDCT): A procedure that uses low-dose radiation to make a series of very detailed pictures of areas inside the body using an x-ray machine that scans the body in a spiral path. This procedure is also called spiral scan or helical scan.
- Chest x-ray: An x-ray of the organs and bones inside the chest. An x-ray is a type of energy beam that can go through the body and onto film, making a picture of areas inside the body.
- Sputum cytology: Sputum cytology is a procedure in which a sample of sputum (mucus that is coughed up from the lungs) is viewed under a microscope to check for cancer cells.

Screening with LDCT scans has been shown to decrease the risk of dying from lung cancer in heavy smokers.

The National Lung Screening Trial studied people aged 55 years to 74 years who had smoked at least 1 pack of cigarettes per day for 30 years or more. Participants were either current smokers or former smokers who had quit within the last 15 years. The trial used chest x-rays or LDCT scans to check for signs of lung cancer.

Screening with LDCT once a year for three years was better than chest x-rays at finding early-stage lung cancer and decreased the risk of dying from lung cancer in current and former heavy smokers.

Current smokers whose LDCT scan result shows possible signs of cancer may be more likely to quit smoking.

Screening with LDCT can cause possible harms, including:

- false-positive test results, which may lead to invasive procedures which are not needed
- overdiagnosis of some lung cancers, though it is not clear how often this happens

For more information about these possible harms, see the [Risks of Lung Cancer Screening](#) below.

A [Guide](#) is available for patients and doctors to learn more about the benefits and harms of screening for lung cancer.

Screening with chest x-rays and/or sputum cytology does not decrease the risk of dying from lung cancer.

Chest x-ray and sputum cytology are two screening tests that have been used to check for signs of lung cancer. Screening with chest x-ray, sputum cytology, or both of these tests does not decrease the risk of dying from lung cancer.

Screening tests for lung cancer are being studied in clinical trials.

Information about clinical trials supported by NCI can be found on NCI's [clinical trials search](#) webpage. Clinical trials supported by other organizations can be found on the [ClinicalTrials.gov](#) website.

Risks of Lung Cancer Screening

KEY POINTS

- Screening tests have risks.
- The risks of lung cancer screening tests include the following:
 - Finding lung cancer may not improve health or help you live longer.
 - False-negative test results can occur.
 - False-positive test results can occur.
 - Chest x-rays and CT scans expose the chest to radiation.
 - Talk to your doctor about your risk for lung cancer and your need for screening tests.

Screening tests have risks.

Decisions about screening tests can be difficult. Not all screening tests are helpful and most have risks. Before having any screening test, you may want to discuss the test with your doctor. It is important to know the risks of the test and whether it has been proven to reduce the risk of dying from cancer.

The risks of lung cancer screening tests include the following:

Finding lung cancer may not improve health or help you live longer.

Screening may not improve your health or help you live longer if you have lung cancer that has already spread to other places in your body.

When a screening test result leads to the diagnosis and treatment of a disease that may never have caused symptoms or become life-threatening, it is called overdiagnosis. It is not

known if treatment of these cancers would help you live longer than if no treatment were given, and treatments for cancer may have serious side effects. Harms of treatment may happen more often in people who have medical problems caused by heavy or long-term smoking.

False-negative test results can occur.

Screening test results may appear to be normal even though lung cancer is present. A person who receives a false-negative test result (one that shows there is no cancer when there really is) may delay seeking medical care even if there are symptoms.

False-positive test results can occur.

Screening test results may appear to be abnormal even though no cancer is present. A false-positive test result (one that shows there is cancer when there really isn't) can cause anxiety and is usually followed by more tests (such as biopsy), which also have risks. A biopsy to diagnose lung cancer can cause part of the lung to collapse. Sometimes surgery is needed to reinflate the lung. Harms of diagnostic tests may happen more often in patients who have medical problems caused by heavy or long-term smoking.

Chest x-rays and CT scans expose the chest to radiation.

Radiation exposure from chest x-rays and low-dose CT scans may increase the risk of cancer. Younger people and people at low risk for lung cancer are more likely to develop lung cancer caused by radiation exposure from screening than to be spared death from lung cancer.

Talk to your doctor about your risk for lung cancer and your need for screening tests.

Talk to your doctor or other health care provider about your risk for lung cancer, whether a screening test is right for you, and about the benefits and harms of the screening test. You should take part in the decision about whether a screening test is right for you. For more information, see [Cancer Screening Overview](#).

About This PDQ Summary

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Physician Data Query (PDQ) is the National Cancer Institute's (NCI's) comprehensive cancer information database. The PDQ database contains summaries of the latest published information on cancer prevention, detection, genetics, treatment, supportive care, and complementary and alternative medicine. Most summaries come in two versions. The health professional versions have detailed information written in technical language. The patient versions are written in easy-to-understand, nontechnical language. Both versions