



NCCN  
GUIDELINES  
FOR PATIENTS®

2021

# Non-Small Cell Lung Cancer

## Early and Locally Advanced

Presented with support from:  NATIONAL COMPREHENSIVE CANCER NETWORK  
**FOUNDATION**  
Guiding Treatment. Changing Lives.



Available online at [NCCN.org/patients](https://www.nccn.org/patients)



**It's easy to  
get lost in the  
cancer world**



**Let  
NCCN Guidelines  
for Patients<sup>®</sup>  
be your guide**

- ✓ Step-by-step guides to the cancer care options likely to have the best results
- ✓ Based on treatment guidelines used by health care providers worldwide
- ✓ Designed to help you discuss cancer treatment with your doctors

# About



## NCCN Guidelines for Patients® are developed by the National Comprehensive Cancer Network® (NCCN®)



### NCCN

- ✓ An alliance of leading cancer centers across the United States devoted to patient care, research, and education

**Cancer centers that are part of NCCN:**  
[NCCN.org/cancercenters](https://www.nccn.org/cancercenters)



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- ✓ For providers of cancer care all over the world
- ✓ Expert recommendations for cancer screening, diagnosis, and treatment

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- ✓ Present information from the NCCN Guidelines in an easy-to-learn format
- ✓ For people with cancer and those who support them
- ✓ Explain the cancer care options likely to have the best results

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**These NCCN Guidelines for Patients are based on the NCCN Guidelines® for Non-Small Cell Lung Cancer, Version 4.2021 – March 3, 2021.**

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NCCN Foundation seeks to support the millions of patients and their families affected by a cancer diagnosis by funding and distributing NCCN Guidelines for Patients. NCCN Foundation is also committed to advancing cancer treatment by funding the nation's promising doctors at the center of innovation in cancer research. For more details and the full library of patient and caregiver resources, visit [NCCN.org/patients](https://www.nccn.org/patients).

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# Supporters

## Endorsed by

### American Lung Association

The American Lung Association strongly supports efforts to help ensure all patients facing lung cancer get the highest standard of treatment and care. Helping patients understand treatment guidelines is one important step in empowering them to get the care they want and need. That is why we are pleased to endorse NCCN's efforts to provide accessible treatment guidelines and information to patients through the NCCN Guidelines for Patients. [lung.org](http://lung.org)

### American Lung Cancer Screening Initiative

The American Lung Cancer Screening Initiative strongly advocates spreading awareness about the importance of lung cancer screening for high-risk individuals. It is critical to help patients and healthcare providers understand that increasing early detection of lung cancer through low-dose CT screening has been proven to be one of the easiest ways to combat lung cancer. We are determined to empower high-risk individuals, especially those from disadvantaged backgrounds, and provide them with accessible screening and treatment options. Thus, we are proud to collaborate with the NCCN and endorse their Guidelines for Patients. [alcsi.org](http://alcsi.org)

### Caring Ambassadors

The Caring Ambassadors Lung Cancer Program is pleased to endorse these NCCN Guidelines for Patients: Lung Cancer. Patients and their loved ones need reliable resources to achieve the best possible outcomes for their disease. [lungcancercap.org](http://lungcancercap.org)

### Clifton F. Mountain Foundation for Education and Research in Lung Cancer

The Clifton F. Mountain Foundation for Education and Research in Lung Cancer was created approximately 30 years ago by Clifton F. Mountain, MD, who developed the International System for the Staging of Lung Cancer while at M.D. Anderson Cancer Center in Houston, Texas. The Foundation's primary function has been to educate physicians about application of the Staging System to lung cancer patients, and to emphasize that early detection of lung cancer is key to the best outcomes possible. The Foundation has created and distributed (worldwide) handbooks for physicians' pockets, as a practical aid to proper staging. The Foundation has a current interest in educating primary care providers to keep lung cancer in their differential diagnoses. As President, Merel Mountain Nissenberg participates as the Advocate for the M.D. Anderson Lung Cancer SPORE; serves on the Lung Cancer Collaborative Group of the Early Detection Network of NCI; and is a participant in LungCAN.

### Free ME From Lung Cancer

As a lung cancer survivor and Vice President and CEO of Free ME From Lung Cancer, I am pleased to endorse this vitally important resource so that lung cancer patients can have the information needed to make informed decisions about their treatment. [freemefromlungcancer.org](http://freemefromlungcancer.org)

### GO2 Foundation for Lung Cancer

Founded by patients and survivors, GO2 Foundation for Lung Cancer, transforms survivorship as the world's leading organization dedicated to saving, extending, and improving the lives of those vulnerable, at risk, and diagnosed with lung cancer. We work to change the reality of living with lung cancer by ending stigma, increasing public and private research funding, and ensuring access to care. [go2foundation.org](http://go2foundation.org)

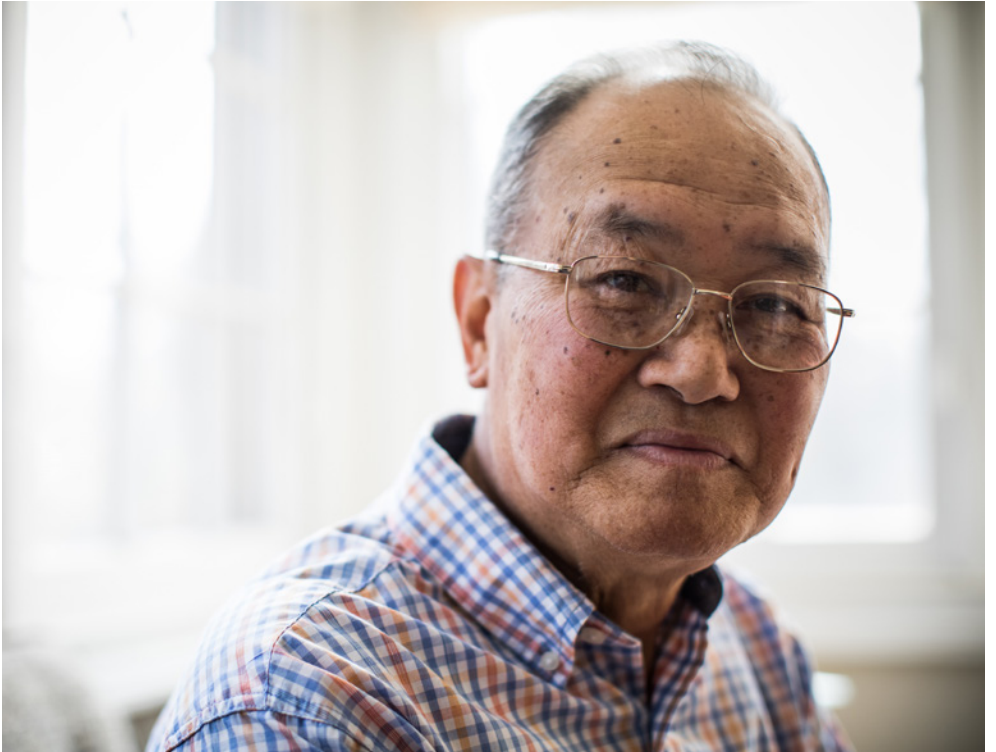
### Lung Cancer Research Foundation

As a non-profit organization focused on supporting lung cancer research, the Lung Cancer Research Foundation is proud to endorse the NCCN Guidelines for Patients. These guidelines play an important role in providing lung cancer patients with up to date information and empowering them to make informed decisions about their care. [lcrf.org](http://lcrf.org)

## With generous support from

- David Ettinger, MD, FACP, FCCP in honor of Joan McClure
- Kyle Hermann in honor of Don and Jeanne Cromwell
- Peng Liang
- Miranda Hughes
- Michael Winkel

To make a gift or learn more, please visit [NCCNFoundation.org/donate](http://NCCNFoundation.org/donate) or e-mail [PatientGuidelines@nccn.org](mailto:PatientGuidelines@nccn.org).



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# 1

## Lung cancer basics

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Lung cancer starts in the cells of the lungs. Non-small cell lung cancer is the more common type of lung cancer. Read this chapter to learn more about lung cancer, including early and locally advanced lung cancer.

## Types of lung cancer

The lungs are the main organs of the respiratory system. They deliver oxygen to the blood and remove carbon dioxide from the blood. The transfer of these gases in and out of the body is called respiration.

Lung cancer is a cancer of lung cells. Other cancers that have spread to the lung are not lung cancers. For example, breast cancer that has spread to the lungs is still breast cancer.

### Lung carcinomas

Almost all lung cancers are carcinomas. Carcinomas are cancers of cells that line the inner or outer surfaces of the body. Lung carcinomas form from cells that line the airways of the lungs. The airways of the lungs are called the bronchus, bronchioli, and alveoli. Lung carcinomas are divided into 2 groups based on how the cells look.

- small cell lung cancer (SCLC)
- non-small cell lung cancer (NSCLC)

### Airways of the lungs

Air moves through your body in a series of airways. It travels down your throat and through the windpipe (trachea). The windpipe splits into 2 airways called bronchi. Inside the lung, each bronchus branches off into the parts of the lung, called lobes. The right lung has 3 lobes, and the left lung has 2 lobes. The bronchi divide into smaller airways called the bronchioli. At the end of the bronchioli are sacs called alveoli. Oxygen is transferred from air into the blood in the alveoli.



## Non-small cell lung cancer

NSCLC is much more common than SCLC. There are 3 main types of NSCLC.

- adenocarcinoma
- squamous cell carcinoma
- large cell carcinoma

Adenocarcinoma is the most common lung cancer. It often forms from cells that line the alveoli and make mucus. Squamous cells line the bronchi. Large cell carcinoma forms from any of the large cells that are throughout the airways.



When you are diagnosed with cancer, the most important thing that you can arm yourself with is knowledge and education.

– Anonymous

Lung cancer survivor

## Lung cancer stages

The stage of the cancer describes the extent of the cancer in the body. Doctors use it for many things. It is used to assess the outlook of your cancer called the prognosis. It is used to plan the right treatment. It is also used for research.

The stages of NSCLC range from stage 0 to stage 4. Often, the stages are written with Roman numerals—stages 0, I, II, III, and IV. Occult carcinoma is a rare finding of cancer cells in mucus and no detection of a lung tumor. More information on cancer stages is in Chapter 4. In brief, the cancer stages of lung cancer are:

### Stage 0

Stage 0 is rare. Abnormal or cancer cells have formed in the airways but haven't grown into the lung tissue. Stage 0 is also called carcinoma in situ.

### Stages 1 through 3

Stage 1, stage 2, and stage 3 cancers have grown into lung tissue. Some have spread to nearby disease-fighting tissue called lymph nodes. These cancers have not spread to body parts far from the lung tumor.

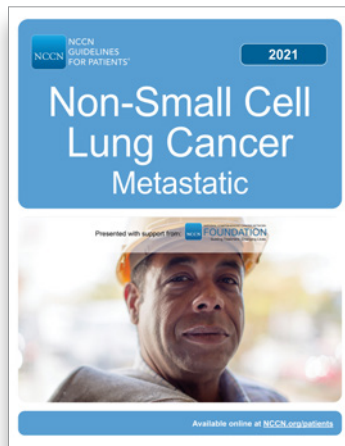
### Stage 4

To be stage 4, lung cancer must have already spread far by the time of diagnosis. Lung cancer tends to travel to the brain and adrenal gland and from one lung to the other lung. Most lung cancers are stage 4.

## Early and locally advanced lung cancer

Stage 1 and stage 2 cancers are also described as early-stage cancers. Stage 3 cancers are locally advanced. This book is about the diagnosis and first treatments of stage 1, stage 2, and stage 3 lung cancers. Some early and locally advanced cancers spread far after diagnosis.

Learn more about treatment for these cancers in *NCCN Guidelines for Patients: Metastatic Non-Small Cell Lung Cancer*, available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines).



### Symptoms

Early cancers may not cause symptoms but many advanced cancers do. Some symptoms of lung cancer are:

- A new cough that doesn't go away
- A chronic cough that worsens
- Coughing up bloody mucus
- Getting short of breath quicker than before
- Ongoing pain in the chest or upper back
- Frequent lung infections that don't go away or keep coming back

Lung cancer is often found because of symptoms and less often found in x-rays before symptoms start. Lung cancers may be found by chance in x-rays or through a cancer screening program. Learn more about screening in *NCCN Guidelines for Patients: Lung Cancer Screening*, available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines).

### Treatment team

A team of health care providers is involved in diagnosing and treating lung cancers. Your primary doctor may be the first to suspect you have lung cancer and refer you to specialists. The diagnostic, treatment, and supportive care experts are explained throughout this book. These experts are supported by nurses, technicians, and assistants, who are often on the frontline of cancer care. Patient navigators can help you through the maze of cancer care.

## Review

- The lungs help the body get the air it needs to live.
- The lungs are made of many small airways and sacs.
- Lung cancer often starts in the cells that line the airways. These cancers are called carcinomas.
- Lung cancer more often affects the larger cells of the lungs. These cancers are called non-small cell lung cancer (NSCLC).
- The cancer stage is a rating of the extent of the cancer. Stages of lung cancer range from stage 0 to stage 4.
- Stage 1, stage 2, and stage 3 cancers have not spread far from the lung tumor.
- Early cancers often do not cause symptoms but many advanced cancers do.
- A team of experts will work together and with you to diagnose and treat the cancer as well as support you.

# 2

## Lung nodules

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Many people have small masses of tissue in their lungs. These small masses are called nodules. A nodule may have been found in your lung by chance. This chapter discusses how doctors decide if this nodule is cancer.

## Assessment team

There are very few nerves inside the lungs. Without nearby nerves, nodules don't cause symptoms. They are often found by chance on x-rays for an unrelated health problem. On x-rays, nodules may be called spots or shadows.

Nodules can be caused by cancer, infections, scar tissue, and other health conditions. Most nodules are not cancer but some are. It takes a team of experts to decide if a nodule is cancer. Your assessment team should include the following board-certified experts:

- pulmonologist
- thoracic radiologist
- thoracic surgeon

A pulmonologist is a doctor who's an expert of lung diseases. A thoracic radiologist is a doctor who's an expert of imaging of the chest. Imaging makes pictures of the insides of the body. A thoracic surgeon is a doctor who's an expert in operations within the chest.

To decide if a nodule is cancer, your doctors will do the following:

- Assess your risk for lung cancer.
- Review images for signs of cancer.
- Perform follow-up imaging if a nodule may be cancer.
- Perform a procedure called a biopsy if needed.

## Risk of lung cancer

Anyone can get lung cancer, but some people are more at risk. A risk factor is anything that increases your chance of lung cancer. Risk factors for lung cancer are listed in [Guide 1](#).

Some people with many risk factors never get lung cancer. Some people with no risk factors do get lung cancer. Doctors are still learning why one person gets lung cancer and another does not.

### Guide 1 Risk factors for lung cancer

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Current or past smoking

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Secondhand smoke

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Age

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Certain cancers and cancer treatments

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Family history of lung cancer

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Exposure to cancer-causing agents

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COPD or pulmonary fibrosis

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### **Tobacco smoke**

The biggest risk factor for lung cancer is smoking tobacco. There are more than 50 compounds in tobacco smoke known to cause cancer. Any smoking increases your risk of lung cancer. The more and longer you smoke, the higher your risk.

If you quit smoking, your risk for lung cancer will decrease to some degree. Ask your health care providers for help to quit.

Researchers are studying ways to prevent lung cancer caused by smoking. Treatments to prevent cancer are called chemopreventive agents. Ask your health care providers if there is a clinical trial on preventing lung cancer that you could join.

Secondhand smoke is the fumes from tobacco smoked by others. The risk of lung cancer increases as the exposure to second-hand smoke increases.

### **Age**

As you get older, you are more likely to get cancer. In recent years, half of the people who were diagnosed with lung cancer were over 71 years of age. Only 7 out of 100 people with lung cancer were under the age of 55 years.

### **Cancer and cancer treatment**

The risk for lung cancer increases after having some types of cancer. Having had lung cancer increases your risk for other lung cancers. If you had lymphoma, you are more likely to get lung cancer. If you've had another smoking-related cancer, such as head and neck cancer, your risk for lung cancer is increased.

Some cancer treatments also increase the risk of lung cancer. The risk increases after receiving radiation therapy in the chest, especially if you smoke. Treatment of Hodgkin lymphoma with an alkylating cancer drug increases the risk of lung cancer too.

### **Family history of lung cancer**

Your risk for lung cancer is increased if your parent, sibling, or child has had lung cancer. Your risk is even higher if the lung cancer occurred at a young age or among multiple relatives.

### **Cancer-causing agents**

There are several agents known to cause lung cancer. You are more likely to get lung cancer after exposure to these agents. Exposure may happen at work or home. The risk after exposure is higher for people who also smoke.

- Radon
- Asbestos
- Arsenic, beryllium, cadmium, chromium, nickel (metallic metals)
- Coal smoke, soot, silica, diesel fumes

### **Other lung diseases**

Two lung diseases have been linked to lung cancer. A history of chronic obstructive pulmonary disease (COPD) increases the risk for lung cancer. COPD makes breathing hard because the lung tissue is damaged or there's too much mucus. The second disease linked to lung cancer is pulmonary fibrosis. Pulmonary fibrosis is major scarring of lung tissue that makes it hard to breathe.

## Signs of cancer

Lung nodules may be first detected by chest x-rays (CXR), computed tomography (CT), or positron emission tomography (PET) scans. Your radiologist will review the images to decide if the nodule may be cancer. Important test results are the features of the nodule, abnormal lung tissue, and PET hot spots.

### Features of the nodule

Nodules caused by cancer have specific features. First, they aren't likely to have calcium. Second, they often have rough edges and odd shapes. Other very important features are the nodule size and density.

- Nodules with cancer often grow faster and are larger than ones without cancer.
- Nodules with cancer are most often solid or part solid.

Solid nodules have high density. They look like a thick cloud on imaging. Non-solid nodules have low density. They look like a hazy cloud on imaging. Non-solid nodules are also called ground-glass opacities (GGOs) or ground-glass nodules (GGNs). Part-solid nodules have both high and low areas of density.

### Abnormal lung tissue

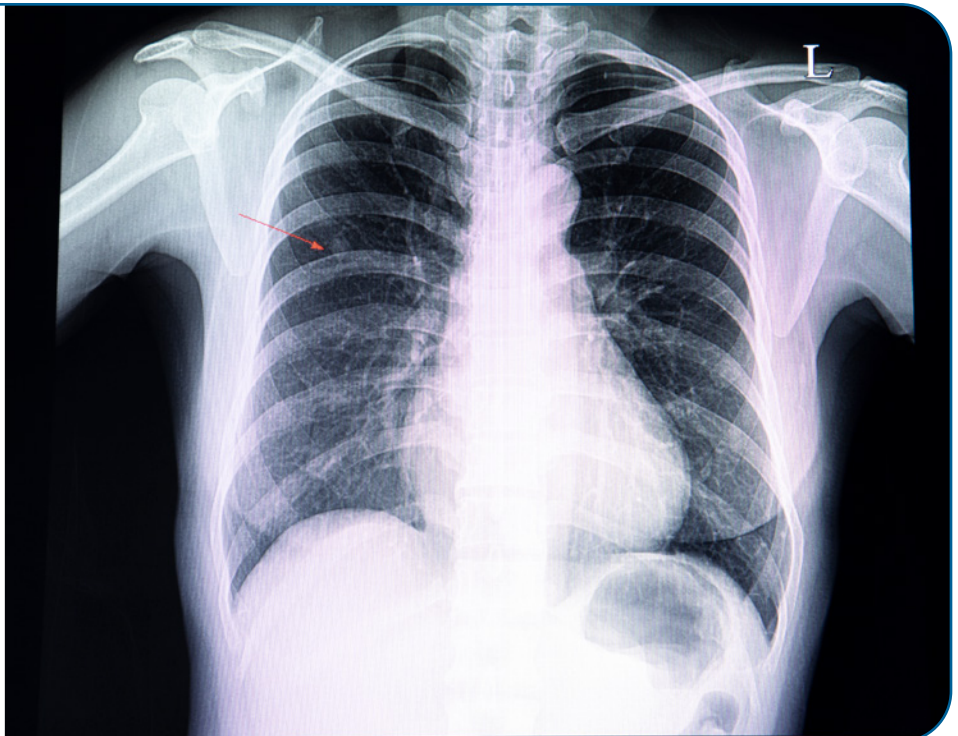
Besides nodules, imaging may show other abnormal findings. It may show tissue inflammation, tissue scarring, or both.

### PET hot spots

PET shows how your cells are using a simple form of sugar called glucose. To create the pictures, a sugar radiotracer is put into your body. The radiotracer emits a small amount of energy that is detected by the imaging machine.

### Lung nodule

**A lung nodule is a small mass of tissue in the lung. Many people have lung nodules. Most are not cancer. When nodules are found by imaging, you may receive more scans to assess if the nodule is cancer.**





Cancer quickly uses glucose so it appears “hot” in images. The more sugar the cancer cells use the quicker they are growing. Other health problems can also cause hot spots, too. Cancer detected by PET often needs to be confirmed with other testing.

## Follow-up imaging

For solid nodules, the next steps of care are based on your risk for lung cancer and the nodule size. Your risk is low if you have minor or no risk factors. You must not have smoked or smoked very little. Follow-up imaging for solid nodules found by chance is listed in [Guide 2](#).

### Guide 2 Solid nodules

Low risk for lung cancer	Nodule is smaller than 6 mm	No routine imaging is needed.
	Nodule is between 6 and 8 mm	Repeat CT in 6 to 12 months. If there is no increase in size or density, your doctor may order a CT between 18 to 24 months after baseline imaging.
	Nodule is larger than 8 mm	<ul style="list-style-type: none"> <li>Your doctor may order CT in 3 months.</li> <li>Your doctor may order PET/CT now.</li> <li>Your doctor may order a biopsy now.</li> </ul>
High risk of lung cancer	Nodule is smaller than 6 mm	It is an option to repeat CT in 12 months. If there is no increase in size or density, no routine imaging is needed.
	Nodule is between 6 and 8 mm	Repeat CT in 6 to 12 months. If there is no increase in size or density, your doctor may order a CT between 18 to 24 months after the first imaging.
	Nodule is larger than 8 mm	<ul style="list-style-type: none"> <li>Your doctor may order CT in 3 months.</li> <li>Your doctor may order PET/CT now.</li> <li>Your doctor may order a biopsy now.</li> </ul>

For part-solid and non-solid nodules, care is based on the number and size of nodules. Many of these nodules go away in time without treatment. Those that remain are not likely to become a problem. Follow-up care for part-solid and non-solid nodules found by chance is listed in [Guide 3](#).

Nodules are measured in millimeters (mm). The size of this “o” is about 2 mm.

### Repeat CT scan

Often, one CT scan doesn't clearly reveal whether the nodule is cancer. Instead, CT

needs to be repeated over time. Low-dose CT (LDCT) or a diagnostic CT may be used.

LDCT uses much less radiation than a standard scan. It also does not require contrast. Contrast is a dye that is injected into the body to make clearer pictures. LDCT is preferred by NCCN experts for cancer screening unless a clearer picture is needed.

Your radiologist will compare the first (baseline) scan with follow-up scans. Signs of cancer include increases in nodule size or density. If cancer is likely, read Chapter 3.

Guide 3 Part-solid and non-solid nodules		
1 part-solid nodule	Nodule is smaller than 6 mm	No routine imaging is needed.
	Nodule is equal to or larger than 6 mm	Repeat CT in 3 to 6 months. If there's no growth and solid part remains smaller than 6 mm, repeat CT every year for 5 years. If the solid part is 6 mm or larger, your doctor may order PET/CT or a biopsy.
1 non-solid nodule	Nodule is smaller than 6 mm	No routine imaging is needed.
	Nodule is equal to or larger than 6 mm	Repeat CT in 6 to 12 months. If there is no increase in size or density, repeat CT every 2 years until 5 years after the first scan.
2 or more non-solid or part-solid nodules	Nodules are smaller than 6 mm	Repeat CT in 3 to 6 months. If there is no increase in size or density, your doctor may order CT at 2 and 4 years after the first scan.
	Nodules are equal to or larger than 6 mm	Repeat CT in 3 to 6 months. Next steps depend on the nodule that is the most likely to be cancer.

**PET/CT scan**

Sometimes, CT is combined with PET. When used together, they are called a PET/CT scan. Your whole body will be scanned or the scan will extend from your neck to your knees.

Your doctor may order PET/CT if the nodule may be cancer. PET/CT may detect cancer quicker than follow-up CT scans. It is also useful for showing signs of cancer spreading in the body. If cancer is likely, read Chapter 3.

**Biopsy**

A biopsy is a procedure that removes tissue or fluid for testing. If your doctor strongly suspects cancer, you may get a biopsy. Read Chapter 3 to learn more about biopsies.

There are reasons not to get a biopsy. It may be better to wait and repeat CT. A biopsy may not be needed before treatment of early cancers. Sometimes, a biopsy can't be done.

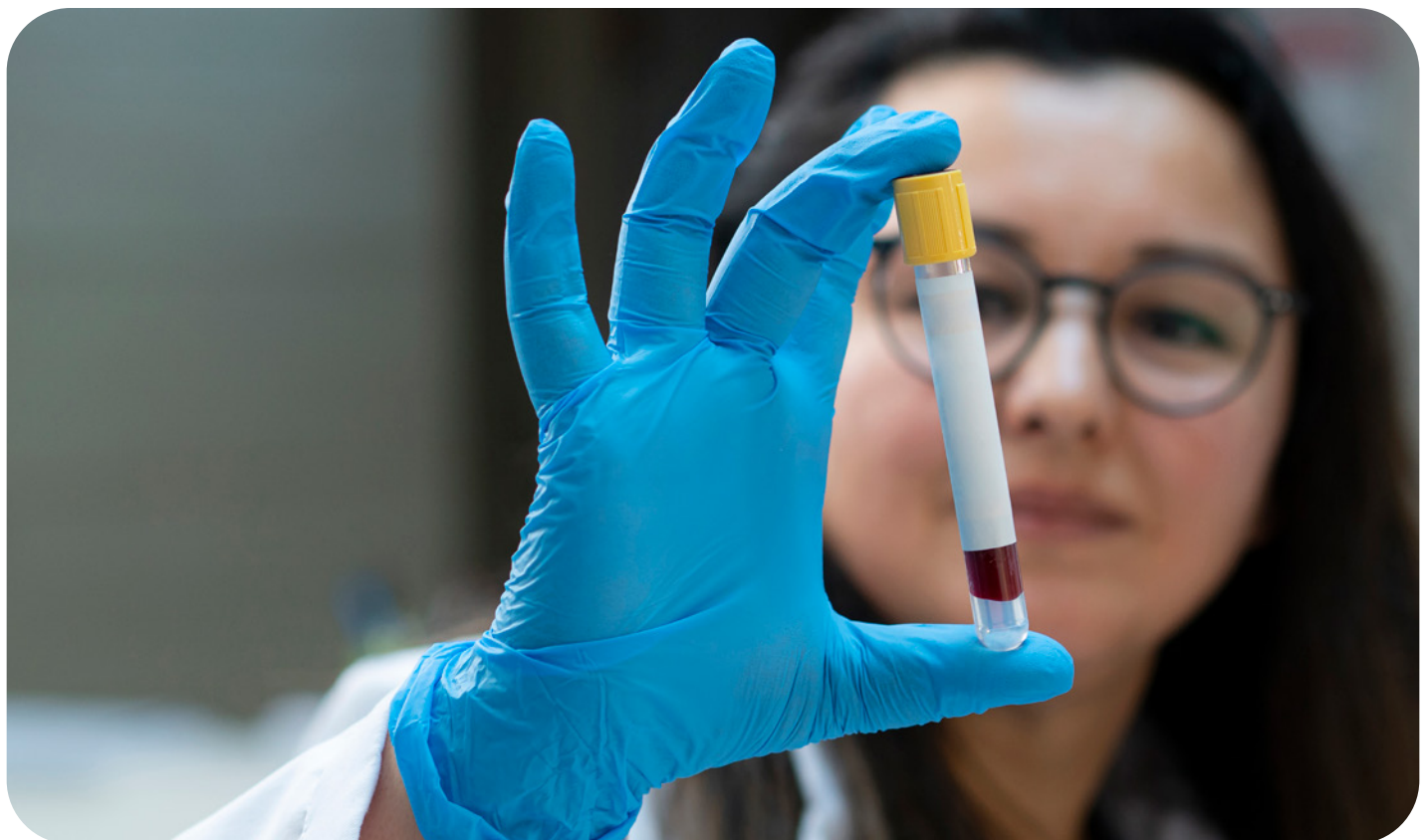
**Review**

- It takes a team of experts to assess lung nodules for cancer.
- Tobacco smoking is the biggest risk factor for lung cancer.
- Signs of cancer can be found with imaging tests. For lung cancer, doctors assess a nodule's features, the condition of the lung tissue, and for PET hot spots.
- Doctors assess changes in a nodule with a series of CT scans. Nodules that quickly increase in size or density are more likely to be cancer.
- Tissue from the nodule may be sampled by a procedure called a biopsy. The tissue will be tested for cancer.

# 3

## Initial tests for lung cancer

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If your doctor suspects that you have lung cancer, several tests are needed. It is important to get the right tests to learn about the cancer and your health. Read this chapter to learn what tests and other health care are needed before treatment.

## Diagnosis and staging

Your doctor may first suspect that you have lung cancer due to one of these reasons:

- A lung nodule found during cancer screening has shown signs of cancer.

- A lung nodule, found by chance, has shown signs of lung cancer.
- You have symptoms of lung cancer.

You will undergo a series of tests and exams to assess if you have lung cancer. A diagnosis of cancer requires testing of body tissue or fluid. When doctors suspect lung cancer, they will also start to assess the cancer stage. The cancer stage is a rating of the extent of the cancer. The first tests to diagnose and stage lung cancer are listed in [Guide 4](#).

### Guide 4

#### Initial tests and services for stage 1, 2, and 3 lung cancer

<b>Health history and exam</b>	<ul style="list-style-type: none"> <li>• Medical history</li> <li>• Current or past smoking</li> <li>• Weight loss</li> <li>• Physical exam</li> <li>• Performance status</li> </ul>
<b>Blood tests</b>	<ul style="list-style-type: none"> <li>• CBC with differential</li> <li>• Chemistry profile</li> </ul>
<b>Imaging</b>	<ul style="list-style-type: none"> <li>• Diagnostic CT of the chest and upper abdomen</li> <li>• FDG PET/CT</li> </ul>
<b>Cancer cell tests</b>	<ul style="list-style-type: none"> <li>• Biopsy or surgery to remove tissue samples</li> <li>• Pathology review to assess for lung cancer</li> </ul>
<b>Services</b>	<ul style="list-style-type: none"> <li>• Smoking treatment</li> <li>• Supportive care</li> </ul>

## Health history and exam

Your cancer doctors need to have all of your health information. A complete report of your health is called a medical history. Your doctor will also perform a physical exam of your body. An exam is done to find signs of disease and decide which treatments may be options.

### Medical history

Your doctor will ask about any health problems and treatments during your lifetime. When you meet with your cancer doctors, be ready to talk about:

- Illnesses
- Injuries
- Health conditions
- Symptoms
- Medications

Your doctor will ask about symptoms that may be related to lung cancer. Such symptoms include cough, trouble breathing, chest pain, fatigue, and weight loss. Early stages of lung cancer may not cause symptoms. Symptoms in late stages depend on where the cancer is.

### Smoking

You can get lung cancer even if you never smoked. If you have lungs, you can get lung cancer. Your doctors will ask about current and past smoking to plan treatment.

Tell your doctors if you smoke or have smoked in the past. Smoking is often measured by packs per day and the number of years that you have smoked.

If you do smoke, it is important to quit. Smoking can limit how well cancer treatment works. Nicotine addiction is one of the hardest addictions to stop. The stress of having cancer may make it harder to quit. There is help. Ask your health care providers about counseling and drugs to help you quit.

### Family history

Be prepared to discuss the health problems of your close blood relatives. Such family members include brothers, sisters, parents, and grandparents. Some cancers and other health conditions can run in families.

### Physical exam

Lung cancer can spread to lymph nodes and cause them to swell. Your doctor will gently press on your body to assess their size. There are lymph nodes all over your body. Lung cancer often spreads to nodes in the chest and neck.

During this exam, also expect the following to be checked:

- Your body temperature
- Your blood pressure
- Your pulse and breathing rate
- Your weight
- How your lungs, heart, and gut sound
- How your eyes, skin, nose, ears, and mouth look
- The size of your organs
- Level of pain when you are touched

### Performance status

Based on your history and exam, your doctor will rate your performance status. Performance status is your ability to do day-to-day activities. Doctors use it to assess if you can undergo certain treatments.

## Blood tests

Blood tests measure blood cells, proteins, and chemicals in the bloodstream. A blood draw removes a sample of blood for testing. It is done with a needle inserted into a vein.

### CBC with differential

If not done recently, a complete blood count (CBC) with differential is needed. A CBC measures parts of the blood including counts of white blood cells, red blood cells, and platelets. A differential measures the counts of each type of white blood cell and checks the balance of the counts. Cancer and other health problems can cause low or high blood counts.

### Chemistry profile

Chemicals in your blood come from your liver, bone, and other organs. A chemistry profile assesses if the chemicals in your blood are too low or high. Abnormal levels can be caused by spread of cancer or by other health problems.

## Imaging

Imaging makes pictures of the insides of your body. It can show cancer in deep tissue, lymph nodes, or distant body parts. A radiologist is a doctor who's an expert in reading images. This

doctor will convey the test results to your other doctors.

Diagnostic computed tomography (CT) is often the first scan done to stage the cancer. You will also need a PET/CT scan. PET is short for positron emission tomography.

Your doctors will use these scans to plan where to biopsy and which treatment is best. Scans that were done more than 60 days ago should not be used to decide your treatment. Some people need more imaging, like a brain scan, which is discussed in Chapter 4.

### Diagnostic CT

CT makes a more detailed image than a plain x-ray. It takes many pictures of your body from different angles using x-rays. A computer then combines the pictures to make a 3-D image.

A diagnostic CT involves a higher dose of radiation and contrast. Contrast is a substance that is often injected into the bloodstream. It makes the images easier to read. For cancer staging, images of your chest and upper abdomen are needed.

### FDG PET/CT

A PET/CT scan may detect cancer that was not found by CT alone. PET detects cancer with a radioactive sugar and special camera. The radioactive sugar, called fluorodeoxyglucose (FDG), will be injected into your vein.

Cancer quickly uses sugar so it appears “hot” in images. Other health problems can also cause hot spots, too. Cancer detected by PET/CT often needs to be confirmed with biopsy or other imaging.

## Biopsy vs. surgery

It takes a team of experts to decide the best steps to diagnose lung cancer. Your team should include doctors who work a lot with people who have cancer:

- thoracic radiologist
- interventional radiologist
- pulmonologist
- thoracic surgeon

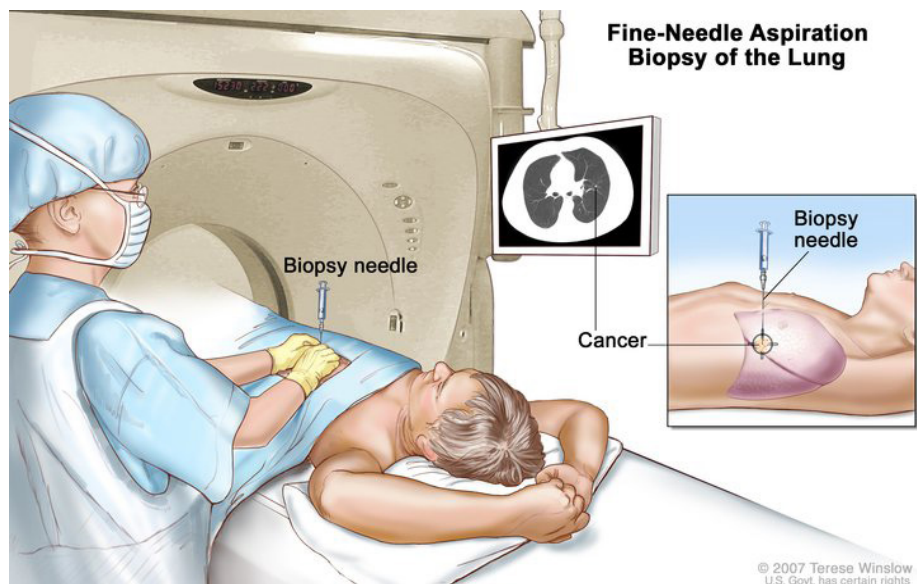
When planning, doctors think about the size and location of tumors, your health history, and their experience.

The plan to diagnose and stage lung cancer differs between people. A plan that is best for you may not be the best plan for another person. Your doctors will form a plan for you based on decisions to:

- Sample tissue by biopsy or surgery
- Diagnose and stage at the same time or separately
- Diagnose before or at the time of surgical treatment

### Lung biopsy

**A biopsy removes tissue or fluid from the body for testing. There are many types of biopsies for lung tumors. Your doctors will plan a biopsy that removes enough tissue and has the least impact on you.**





### Types of biopsy and surgery

To diagnose lung cancer, a biopsy or surgery is used to remove bits of tissue for testing. Your team will choose a method that removes tissue that likely has cancer. The tissue must be large enough to run several special lab tests. Your team will also consider the risk and ease of methods and what method you prefer.

Your doctor may try to diagnose and stage the cancer at the same time. The body part that likely has cancer and is farthest from the lung tumor will be sampled and tested. There are many types of methods to remove tissue for testing.

- **External needle biopsies** involve guiding a thin needle through your skin and into the tumor. These procedures include transthoracic needle aspiration (TTNA), core needle biopsies, pericardiocentesis, and thoracentesis.
- **Down-the-throat biopsies** involve guiding tools down your throat into your windpipe or esophagus. These procedures include standard bronchoscopy, navigational bronchoscopy, radial endobronchial ultrasound (EBUS) bronchoscopy, and endoscopic ultrasound (EUS)-guided biopsies.
- **Portal surgeries** involve making small openings (ports) into your chest. Small tools are inserted through the ports to remove tissue. Compared to open surgery, this technique is “minimally invasive.” These surgeries include mediastinoscopy and thoracoscopy. Thoracoscopy is also called video-assisted thoracoscopic surgery (VATS).

- **Open surgery** involves making a large cut through your chest wall to remove tissue. You may have open surgery when other methods won't work or a larger piece of tissue is needed.

### Timing of biopsy or surgery

Some people can wait to be diagnosed until the day of surgical treatment. If a nodule is very likely to be cancer, a biopsy done in advance would increase health risks, time spent, and costs. Instead, a biopsy or surgery can be done right before surgical treatment. More lung tissue may be removed if the diagnosis is cancer.

There are times when it is better to diagnose before treatment. You shouldn't wait until treatment if your doctors strongly suspect a cancer other than lung cancer. An early diagnosis is also needed before treatments called radiation therapy and chemoradiation. If you're having surgery, it may be too hard or risky to diagnose on the same day as treatment.

Test results will determine your treatment plan. Ask questions about and keep copies of all your test results.

## Cancer cell tests

Tissue removed during biopsy or surgery is sent to a doctor called a pathologist. Pathologists are experts in tissue and cells and diagnosing cancer. In a lab, a pathologist will look at the tissue with a microscope. The pathologist will preserve remaining tissue for possible future testing.

The pathologist will study the tumor to classify the disease. This is called histologic typing. The pathology report will state if the cancer started in the lung or elsewhere. If the cancer started in the lung, the report will also list the type of lung cancer. Cell (histologic) types of lung cancer include:

- Squamous cell carcinoma
- Adenocarcinoma
- Large-cell lung carcinoma
- Small cell carcinoma
- Mixed and rare types

Lab results used for diagnosis are included in a pathology report. This report will be sent to your cancer doctor. Ask for a copy. It is used to plan your treatment. Your doctor will review the results with you. Take notes and ask questions.

## Supportive care

Supportive care aims to improve your quality of life. It is also sometimes called palliative care. Supportive care is important for everyone, not just people at the end of life.

Supportive care can address many needs. It includes care for health problems caused by cancer or cancer treatment. You can get help with making treatment decisions. You can get help with coordination of care between health providers.

Your palliative care doctor will work with your oncologists to provide you with the best care. Other specialists that may be involved in your care include:

- Respiratory therapists
- Rehabilitation specialists
- Registered dietitians
- Social workers

## Review

- If your doctors suspect you have cancer, you'll undergo a series of tests and exams.
- Be ready to tell your doctors about any health problems and treatments you've had in your lifetime.
- Ask your doctor for help to quit smoking. Quitting may improve treatment results.
- Your doctors will examine your body for signs of disease. The exam will include touching parts of your body to see if anything feels abnormal.
- Your doctors will rate your ability to do day-to-day activities in order to decide your treatment options.
- Your doctors will order blood tests. Blood tests are used to look for signs of cancer.
- Diagnostic CT can help show where the cancer has spread. PET/CT may detect cancer that CT did not.
- A biopsy or surgery is needed to remove tissue samples for cancer testing. Doctors use imaging to decide what tissue should be removed and how best to remove it. If you will undergo surgery, a diagnosis of lung cancer may be deferred until the day of treatment.
- A pathologist will study the removed tissue with a microscope. If there is cancer, the pathologist will identify the type of cell from which the cancer formed.
- Supportive care aims to improve your quality of life. It is important for everyone, not just people at the end of life.



### **We want your feedback!**

Our goal is to provide helpful and easy-to-understand information on cancer.

Take our [survey](#) to let us know what we got right and what we could do better:

[NCCN.org/patients/feedback](https://www.nccn.org/patients/feedback)

# 4

## Treatment by cancer stage

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A cancer stage is a rating of the growth and spread of cancer. In this chapter, the system used for lung cancer staging is explained. Your doctors will plan additional tests and treatment based on the cancer stage.

## TNM staging system

The American Joint Committee on Cancer (AJCC) staging manual is used to stage lung cancer. In this manual, a TNM system is used to score different areas of cancer growth. Your doctors will assign a score to each letter. These scores will be combined to assign the cancer a stage.

### T = Tumor

The T score describes the primary tumor. The primary tumor is the main group of cancer cells in the lung. The T scores are based on:

- The size of the primary tumor. In medicine, tumors are measured in centimeters (cm).
- The growth of the primary tumor into nearby structures. This type of growth is called invasion.
- The number of tumors in a lung.

There are several T scores. Each score has a number that stands for a level of tumor growth. The more serious the growth, the higher the T score. [See Guide 5](#) for a brief description of T scores used for treatment planning in this book.

### Guide 5 T scores

<b>T1</b>	A T1 tumor is 3 cm or smaller.
<b>T2a</b>	A T2a tumor is larger than 3 cm but no larger than 4 cm. It may have grown into the inner lining of the lung or the main airway. It may have caused the lung to collapse or swell.
<b>T2b</b>	A T2b tumor is larger than 4 cm but no larger than 5 cm. It may have grown into the inner lining of the lung or the main airway. It may have caused the lung to collapse or inflame.
<b>T3</b>	A T3 tumor may have one or more of these features: <ul style="list-style-type: none"> <li>• Tumor size is larger than 5 cm but no larger than 7 cm.</li> <li>• Invasion into the chest wall, phrenic nerve, outer lining of the lung, or heart's lining.</li> <li>• Multiple related tumors in same lobe of the lung.</li> </ul>
<b>T4</b>	A T4 tumor may have one or more of these features: <ul style="list-style-type: none"> <li>• Tumor size is larger than 7 cm.</li> <li>• Invasion into the diaphragm, middle of the chest, heart or its major blood vessels, windpipe or the area below, nerve to the voicebox, esophagus, or spine.</li> <li>• Related tumors in more than 1 lobe of the lung.</li> </ul>

**N = Nodes**

The N score describes cancer growth in nearby lymph nodes. Lymph nodes are small, oval-shaped structures that help fight disease. The N score is based on:

- The spread of cancer to lymph nodes in the lung.
- The spread of cancer to lymph nodes just outside the lung.
- The spread of cancer to lymph nodes far from the lung.

There are several N scores. Each score has a number for the level of cancer spread in lymph nodes. The more serious the spread, the higher the N score. [See Guide 6](#) for a brief description of N scores used for treatment planning in this book.

**M = Metastasis**

The M score tells you if the cancer has spread far from the lung. The spread of cancer is called metastasis. Lung cancer tends to travel to the brain, the adrenal gland, and from one lung to the other. M0 means the cancer has not spread far. M1 means the cancer has spread far.

### Guide 6 N scores

<b>N0</b>	The cancer has not spread to lymph nodes.
<b>N1</b>	The cancer has spread to lymph nodes in the lung.
<b>N2</b>	The cancer has spread to lymph nodes in one or both of these places: <ul style="list-style-type: none"> <li>• in the middle of the chest next to the lung with cancer</li> <li>• below the windpipe</li> </ul>
<b>N3</b>	The cancer has spread to lymph nodes in one or more of these places: <ul style="list-style-type: none"> <li>• in the middle of the chest near the other lung</li> <li>• in the other lung</li> <li>• near the collarbone</li> </ul>

## Stages of lung cancer

Cancer stages consist of combinations of TNM scores based on prognosis. A prognosis is the likely outcome of the cancer. Occult carcinoma and stage 0 are rare diagnoses. There are 4 main cancer stages:

- Stage 1 consists of subgroups stage 1A and 1B.
- Stage 2 consists of subgroups stage 2A and 2B.
- Stage 3 consists of subgroups stage 3A, 3B, and 3C.
- Stage 4 consists of subgroups stage 4A and 4B.

For some people, cancer staging is done twice. The staging before treatment is called the clinical stage. It is noted with a lowercase “c.” An example is cN0.

Some cancers may not be correctly staged until after surgical treatment. For example, all the lymph nodes with cancer might not be found until surgery. On the other hand, some nodes thought to have cancer may be cancer-free.

The second staging occurs after surgery. It is based on tests of tissue removed from the body. It is called the pathologic stage and is marked with a lowercase “p.” An example is pN1.



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## Additional tests

The clinical stage is first based on the initial tests listed in Chapter 2. Your doctor may order more tests to plan for treatment. The clinical stage may be changed based on the results of these tests:

### Brain MRI

Lung cancer tends to spread to the brain. Magnetic resonance imaging (MRI) may show small brain tumors that aren't causing symptoms. It uses a magnetic field and radio waves to make pictures. Contrast should be used.

MRI is not needed for clinical stage 1A but is an option for stage 1B. It is needed for clinical stage 2 and stage 3. If MRI can't be done, you may get computed tomography (CT) with contrast of your head.

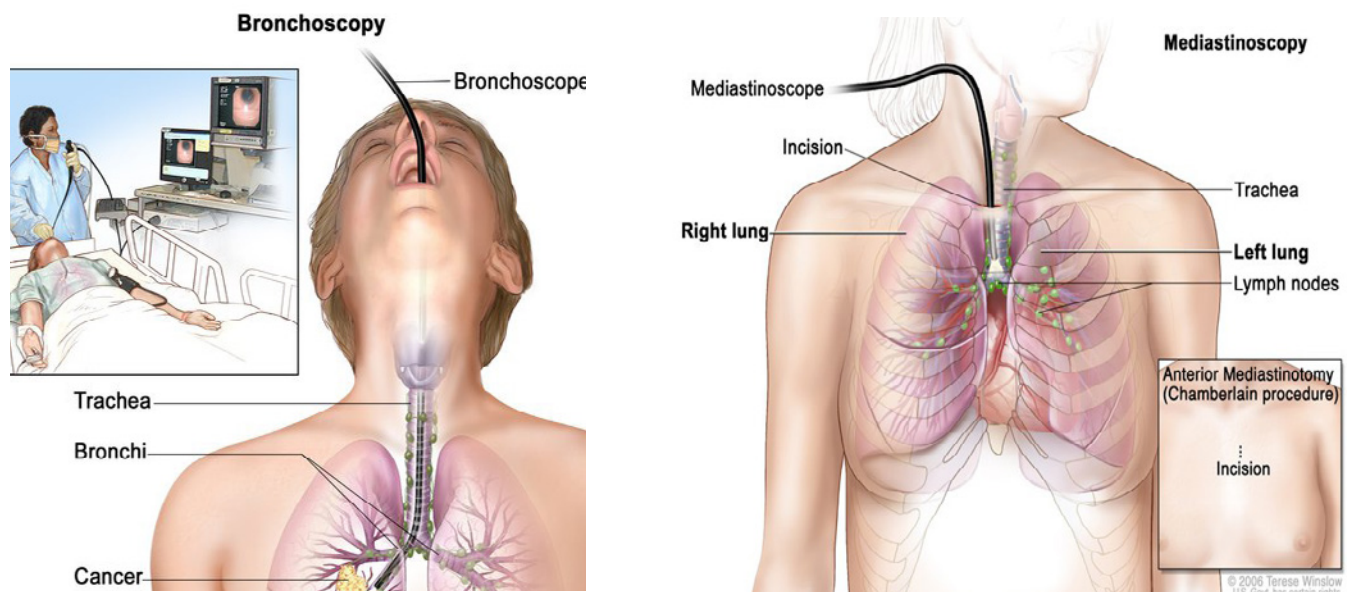
### MRI of spine and thoracic inlet

Some stage 2B and stage 3 lung cancers are superior sulcus tumors. This type of tumor starts at the top of the lung. It typically grows into the chest wall.

This tumor may have grown next to your spine or nearby blood vessels. In this case, MRI of your spine and thoracic inlet is needed.

## Scopes for lung cancer

It is very important for your doctors to know which lymph nodes have cancer. There are a few methods for examining or removing lymph nodes in the lungs and between the lungs. Bronchoscopy and mediastinoscopy are two of those methods.





The thoracic inlet is the center of a ring of bones at the top of the ribcage.

### **Bronchoscopy**

A bronchoscopy is a procedure that allows doctors to see inside of airways. It is also used to biopsy lung tissue and certain lymph nodes. NCCN experts recommend a bronchoscopy for clinical stages 1, 2, and 3A. A bronchoscopy is not needed for some stage 3B and 3C cancers. If you will have surgery, the bronchoscopy may be done right before the operation.

### **Mediastinal evaluation**

The space between your lungs is called the mediastinum. This space has many lymph nodes. These nodes are more likely to have cancer when the lung tumor is larger and closer to this area. They can be seen using procedures called mediastinoscopy, mediastinotomy, and image-guided biopsies.

An evaluation of mediastinal nodes may not be needed for stage 1A. For clinical stage 1B, 2, and 3A, these nodes should be checked. A mediastinal evaluation is not needed for all stage 3B and 3C. Lymph nodes along the collarbone may be checked instead.

### **Lung function tests**

To plan treatment, your doctors will need to know how well your lungs work. There are 3 pulmonary function tests:

- ▶ Spirometry involves blowing into a tube to measure how much air and how fast you breathe.
- ▶ A gas diffusion test involves breathing in a harmless gas and measuring how much you breathe out. It tells how much oxygen travels from your lungs into your blood.
- ▶ Body plethysmograph involves sitting in a small room and breathing into a tube. This test measures how much air your lungs can hold and how much air is left in your lungs after you exhale.

## Treatment options

Not everyone with lung cancer receives the same treatment. Doctors plan treatment based on many factors, including:

- The number of primary tumors
- The cancer stage
- Challenges to treating the cancer
- Your health

A primary tumor is the main mass of cancer cells in the lung. Two or more unrelated masses of cancer cells are called multiple primary tumors. Most people with lung cancer have one primary tumor. People with one primary tumor can have separate yet related lung tumors. These separate tumors are sometimes called satellite tumors.

### Primary treatment

Primary treatment is the main treatment used to rid your body of cancer. Primary treatment for stage 1, 2, and 3 lung cancer includes surgery, radiation therapy, and chemoradiation. [See Guide 7](#) for options by clinical stage of one primary tumor.

- Surgery is a treatment that removes tumors or organs with cancer.
- Radiation therapy most often uses high-energy x-rays to treat lung cancer.
- Chemoradiation is treatment with both chemotherapy and radiation therapy. Chemotherapy uses powerful drugs to kill cancer cells.

When possible, surgery is the primary treatment. Your surgeon will perform an evaluation using the tests listed in Chapter 2 and this chapter. You must be healthy enough to have lung cancer surgery. Your surgeon will decide if the cancer can be removed. More information on surgery is in Chapter 5.

You may decline or be unable to have surgery. In these cases, cancer that is only in the lung may be treated with radiation therapy. When the cancer has grown or spread outside the lung, chemoradiation is standard treatment. More information on primary treatment with radiation or chemoradiation is in Chapter 6.

**Guide 7****Primary treatment options for clinical stages 1, 2, and 3**

Stage	TNM score	Surgery	Radiation therapy	Chemoradiation
1A	T1, N0, M0	●	●	
1B	T2a, N0, M0	●	●	
2A	T2b, N0, M0	●	●	
2B	T3, N0, M0 (no invasion)	●	●	
2B	T3, N0, M0 (invasion) T1, N1, M0 T2, N1, M0	●		●
3A	T3, N1, M0 T4, N0, M0 T4, N1, M0 T1, N2, M0 T2, N2, M0	●		●
3B	T3, N2, M0 (no invasion)	●		●
3B	T3, N2, M0 (invasion) T4, N2, M0 T1, N3, M0 T2, N3, M0			●
3C	T3, N3, M0 T4, N3, M0			●

## Clinical trials

Despite advances in treatment, more research is needed. Many lung cancers are not cured. Improving treatment is made possible with clinical trials.

A clinical trial is a type of medical research study. After being developed and tested in a laboratory, potential new ways of fighting cancer need to be studied in people. If found to be safe and effective in a clinical trial, a drug, device, or treatment approach may be approved by the U.S. Food and Drug Administration (FDA).

Everyone with cancer should carefully consider all of the treatment options available for their cancer type, including standard treatments and clinical trials. Talk to your doctor about whether a clinical trial may make sense for you.

### Phases

Most cancer clinical trials focus on treatment. Treatment trials are done in phases.

- Phase I trials study the dose and safety of an investigational drug or treatment approach.
- Phase II trials study how well the drug or approach works against a specific type of cancer.
- Phase III trials test the drug or approach against a standard treatment. If the results are good, it may be approved by the FDA.
- Phase IV trials study the long-term safety and benefit of an FDA-approved treatment.

### Who can enroll?

Every clinical trial has rules for joining, called eligibility criteria. The rules may be about age, cancer type and stage, treatment history, or general health. These requirements ensure that participants are alike in specific ways and that the trial is as safe as possible for the participants.

### Informed consent

Clinical trials are managed by a group of experts called a research team. The research team will review the study with you in detail, including its purpose and the risks and benefits of joining. All of this information is also provided in an informed consent form. Read the form carefully and ask questions before signing it. Take time to discuss with family, friends, or others you trust. Keep in mind that you can leave and seek treatment outside of the clinical trial at any time.

### Start the conversation

Don't wait for your doctor to bring up clinical trials. Start the conversation and learn about all of your treatment options. If you find a study that you may be eligible for, ask your treatment team if you meet the requirements. Try not to be discouraged if you cannot join. New clinical trials are always becoming available.

### Frequently asked questions

There are many myths and misconceptions surrounding clinical trials. The possible benefits and risks are not well understood by many with cancer.

#### What if I get the placebo?

A placebo is an inactive version of a real medicine. Placebos are almost never used alone in cancer clinical trials. All participants

receive cancer treatment. You may receive a commonly used treatment, the investigational drug(s), or both.

#### Do I have to pay to be in a clinical trial?

Rarely. It depends on the study, your health insurance, and the state in which you live. Your treatment team and the research team can help determine if you are responsible for any costs.



## Finding a clinical trial

### In the United States

#### NCCN Cancer Centers

[NCCN.org/cancercenters](https://www.nccn.org/cancercenters)

#### The National Cancer Institute (NCI)

[cancer.gov/about-cancer/treatment/clinical-trials/search](https://www.cancer.gov/about-cancer/treatment/clinical-trials/search)

### Worldwide

#### The U.S. National Library of Medicine (NLM)

[clinicaltrials.gov/](https://clinicaltrials.gov/)

#### Need help finding a clinical trial?

NCI's Cancer Information Service (CIS)

1.800.4.CANCER (1.800.422.6237)

[cancer.gov/contact](https://www.cancer.gov/contact)

## Review

- A cancer stage is a rating of the growth and spread of cancer.
- A TNM system is used to score different areas of cancer growth.
- There are 4 main cancer stages.
- For some people, cancer staging is done twice. The staging before treatment is called the clinical stage. The pathologic stage is based on test of tissue removed during surgery.
- Based on the cancer stage, you may get more tests. You may get more scans and procedures to get a more accurate cancer stage. You may get lung function tests to assess how well your lungs work.
- Doctors use the cancer stage to plan treatment. Surgery is a standard treatment for stage 1, 2, and 3 cancers. If surgery is not an option, radiation therapy or chemoradiation may be done instead.
- Clinical trials are a type of research. New ways of fighting cancer are studied among people in clinical trials. A clinical trial may be an option in addition to standard treatment.

# 5

## Surgery

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Surgery is a standard treatment for lung cancer, but the treatment approach differs between people. Read this chapter to learn how doctors tailor treatment for each person.

## Types of surgery

The goal of surgery is to remove all of the cancer from the body. The tumor will be removed, along with some normal-looking tissue around its rim. The normal-looking tissue is called the surgical margin.

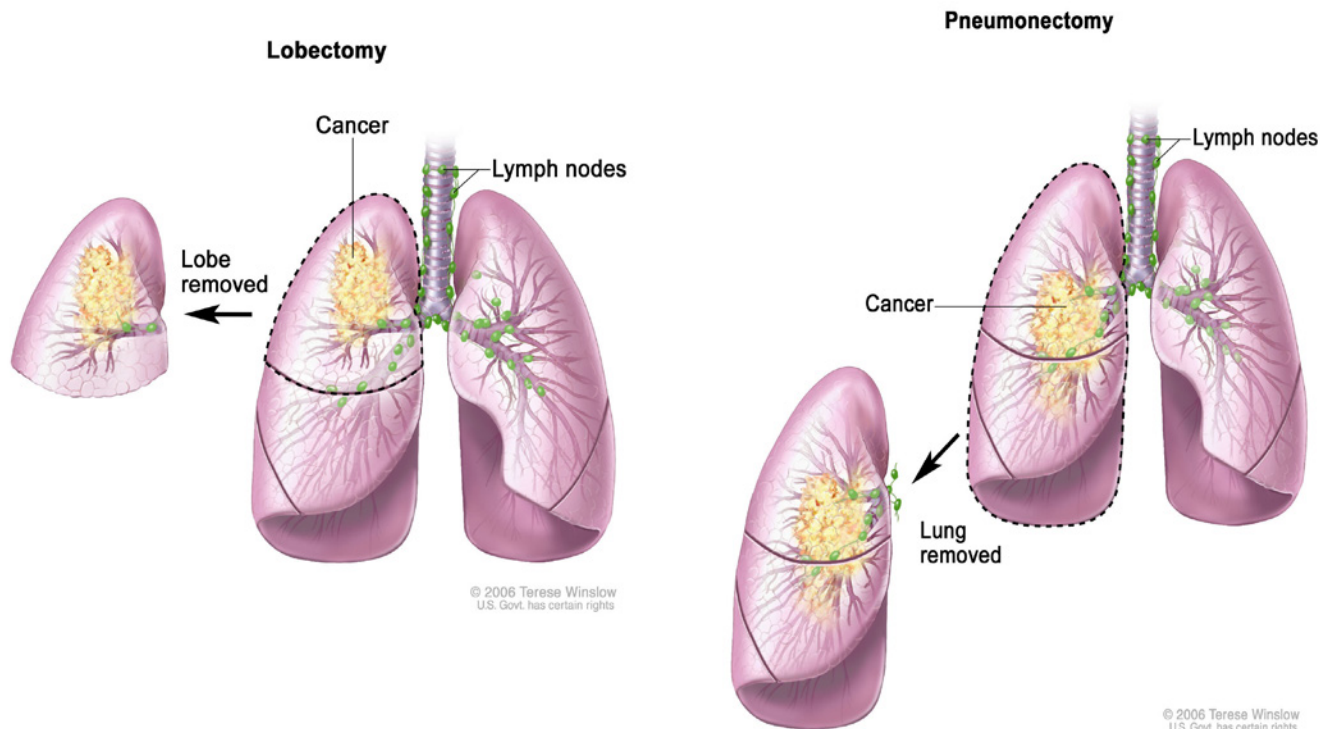
There are 5 types of lung surgery:

- Wedge resection removes a small part of a lobe.
- Segmentectomy removes a large part of a lobe.
- Lobectomy removes an entire lobe.
- Sleeve lobectomy removes an entire lobe and part of the main airway.
- Pneumonectomy removes an entire lung

Which surgery you will have depends on where the tumor has grown and how well your

### Lung cancer surgery

There are 5 common lung cancer surgeries. The most common are lobectomy and pneumonectomy and are shown below. A sleeve lobectomy removes a lobe and part of the main airway called the bronchus. Wedge resection and segmentectomy remove only part of a lobe.



lungs work. The preferred surgery for most lung cancers is a lobectomy. If T3 or T4 tumors are invasive, lung tissue as well as the invaded tissue will be removed together. The invaded tissue may include structures next to the lung, such as ribs and fat. This surgery is called an en-bloc resection.

### Lymph node surgery

During surgery, lymph nodes will also be removed. These nodes include those that have or may have cancer. There are 2 methods to remove lymph nodes.

- systematic lymph node sampling
- lymph node dissection

For sampling, some nodes in the lung and between the lungs are removed. A lymph node dissection removes as many nodes as possible from the lung and between the lungs. To remove nodes, some organs may need to be moved or cut.

### Surgical methods

Removal of a lung tumor can sometimes be done with one of two methods. The classic method is thoracotomy. This surgery removes tissue through a large opening in the chest. Surgeons use a knife-like tool called a scalpel. Sometimes, surgeons need to remove part of the rib in order to perform the cancer surgery.

Thoracoscopy is a newer method. It removes tissue through small openings. A small camera and surgical tools are inserted through the openings. Thoracoscopy can be done with or without help from a robot. Thoracoscopy is also called video-assisted thoracoscopic surgery (VATS).

## Treatments used with surgery

Most stage 1 cancers will be treated with only surgery. In contrast, it is rare for stage 2 and stage 3 lung cancers to be treated only with surgery. Instead, a combination of treatments is used to cure or control the cancer. There are 4 types of treatment used with surgery:

- Radiation therapy
- Chemotherapy
- Chemoradiation
- Targeted therapy

### Radiation therapy, chemotherapy, and chemoradiation

Radiation therapy and chemotherapy may be used together or separately. When used together, the treatment is called chemoradiation. Sequential chemoradiation is the use of one treatment then the other. Concurrent chemoradiation is the use of both treatments at the same time. More information on radiation therapy, chemotherapy, and chemoradiation is in Chapter 6.

### Osimertinib

Targeted therapy stops the specific ways by which cancer cells live, survive, and die. Osimertinib (Tagrisso®) is a targeted therapy. Unlike most other lung cancer treatments, it is a pill that can be taken at home

Osimertinib is used to treat lung cancer with an overactive protein called EGFR. Overactive EGFR is caused by certain abnormal changes (mutations) in the gene that makes EGFR. Biomarker testing is needed to confirm if cancer cells have these *EGFR* mutations.



### Order of treatments

The order of treatments used with surgery differs between people. The order mainly depends on the cancer stage. There are 2 terms that convey the order of a treatment:

- Induction treatment
- Adjuvant treatment

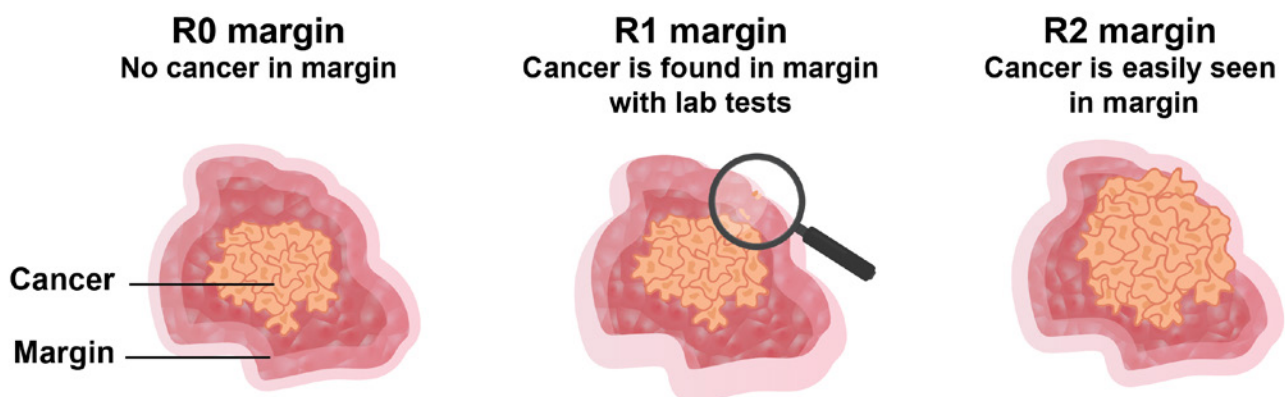
Induction treatment is the first treatment received for some higher-staged cancers. The goal is to reduce the extent of cancer. It consists of chemotherapy with or without radiation. Induction treatment is sometimes used as the first treatment before surgery.

Adjuvant treatment is given after surgery to treat any remaining cancer. It consists of chemotherapy, radiation therapy, or chemoradiation. Osimertinib may be an option if the cancer cells have a marker called *EGFR* mutation. Treatment is based on tests of the normal-looking tissue around the tumor, called the surgical margin.

- A test result of R0 means there is no cancer in the margin.
- A test result of R1 means there are tiny, unseen amounts of cancer in the margin.
- A test result of R2 means the cancer in the margin can be easily seen.

### Surgical margin

The tumor will be removed, along with some normal-looking tissue around its rim. The normal-looking tissue is called the surgical margin. The surgical margin will be tested for cancer. Adjuvant treatment is based on if there is cancer in the margins.



## Surgery by cancer stage

Your treatment team will plan treatment based on the cancer stage. More specifically, the plan is based on TNM scores. TNM scores can be very confusing. For example, T3 and T4 tumors may have grown outside the lung (invasion) or not (no invasion). Your treatment team can show you which of the options below apply to you.

### Stage 1A

Stage 1A cancer is very likely to be only in the lung. Surgery is usually the primary treatment. The tumor will be removed. Lymph nodes will also be removed and checked for cancer.

### Stage 1B and 2A

The growth of stage 1B and 2A tumors is very limited. Surgery is usually the primary treatment. The tumor will be removed. Lymph nodes will be removed and checked for cancer.

Some people receive adjuvant chemotherapy if the cancer is likely to come back. If the cancer cells have an *EGFR* mutation, osimertinib may be received as well.

### Limited stage 2B and 3A

Some 2B and 3A cancers appear mainly confined to tissue inside the lung. Some may have grown into the main airway called the bronchus. First, the tumor will be removed. Lymph nodes with and without cancer will be removed, too.

Chemotherapy is often used for adjuvant treatment. If the cancer cells have an *EGFR* mutation, osimertinib may be received as well. If the cancer may still be in a certain part of the

chest, chemoradiation may be used instead of chemotherapy.

### Stage 2B and stage 3 with invasion and stage 3A with T4 tumors

Some stage 2B and 3 lung cancers are not confined to lung. A lung tumor may be scored T3 or T4 because it has grown into (invaded) nearby tissue, such as the chest wall or a blood vessel. Stage 3A also includes large T4 tumors that haven't invaded structures next to the lung.

Surgery is a common treatment if the cancer has not spread to lymph nodes (N0) or only to lymph nodes inside the lungs (N1).

The preferred treatment approach is to start with surgery. Removed tissue should be tested for *EGFR* mutations. Chemotherapy is often used for adjuvant treatment. If the cancer cells have an *EGFR* mutation, osimertinib may be received as well. If the cancer may still be in a certain part of the chest, chemoradiation may be used instead of chemotherapy.

Another approach is to start with concurrent chemoradiation or chemotherapy. Your surgeon may proceed with surgery if the tumor looks smaller on scans.

### Stage 2B and stage 3 superior sulcus tumors with invasion

Superior sulcus tumors are a distinct subset of invasive lung cancers. They start at the top of the lung and typically grow into the chest wall.

Surgery is often an option for T3 tumors. The first treatment is chemoradiation and is followed by surgery. After surgery, chemotherapy is used for adjuvant treatment.

If the cancer cells have an *EGFR* mutation, osimertinib may be received as well.

Surgery is less likely an option for T4 tumors. Concurrent chemoradiation may shrink the tumor. If it does shrink, surgery may be possible. After surgery, chemotherapy is used for adjuvant treatment. If the cancer cells have an *EGFR* mutation, osimertinib may be received as well.

### Stage 3A and 3B with N2 scores

Some stage 3 cancers have spread to N2 lymph nodes. N2 nodes are in the middle of the chest next to the lung with cancer. Some are right below the windpipe. Some of these cancers may be treated with surgery.

Induction treatment may shrink the cancer or stop its growth. This treatment consists of chemotherapy with or without radiation therapy. If induction works, surgery may be an option. The tumor and N2 nodes will be removed. Other lymph nodes will be checked for cancer. After surgery, you may get radiation therapy if you didn't have it before.



Keep seeking out information and read information again as the diagnosis and treatment process continues.

– Anonymous

Lung cancer survivor

## Side effects

All cancer treatments can cause unwanted health issues. Such health issues are called side effects. Some side effects may be harmful to your health. Others may just be unpleasant.

Side effects depend on many factors. These factors include the treatment type, length or dose of treatment, and the person.

Common side effects of any surgery are pain, swelling, and scars. Pain can be intense after lung surgery. Pain and swelling often fade away in the weeks after surgery.

Numbness near the surgical area may be long-lasting. There is a chance of infection, which may cause pneumonia. There's also a chance of a collapsed lung, which is called pneumothorax.

Many effects of treatment quickly resolve after treatment ends. Long-term effects start during treatment and persist after treatment is done. Less often, effects start long after treatment has ended.

Ask your treatment team for a complete list of side effects of your treatments. Also, tell your treatment team about any new or worse symptoms you get. There may be ways to help you feel better. There are also ways to prevent some side effects.



### **Let us know what you think!**

Please take a moment to complete an online [survey](#) about the NCCN Guidelines for Patients.

[NCCN.org/patients/response](https://www.nccn.org/patients/response)

## Review

- Surgery is a common treatment of lung cancer. The goal is to remove the lung tumor and any lymph nodes with cancer.
- There are 5 types of lung surgery that range from removing a piece of a lobe to removing the entire lung.
- Other treatments are often used with surgery to treat lung cancer. They may be given before or after surgery.
- Treatment options largely depend on where the cancer has grown and spread.
- Early cancers usually are treated with surgery. If some cancer cells may remain, more treatment will be received after surgery.
- Advanced cancers are less likely to be treated with only surgery. Treatment is often given before surgery to stop the growth of the cancer. Surgery may follow if the first treatment has good results.
- Learn about the side effects of your treatments. Let your treatment team know about any new or worsening symptoms.

# 6

## Radiation therapy and chemoradiation

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Radiation therapy and chemotherapy are common treatments of lung cancer. They are often used together for a treatment called chemoradiation. Read this chapter to learn what to expect.

## Types of radiation therapy

Radiation therapy uses high-energy x-rays or particles to treat lung cancer. It damages cancer cells. The cancer cells either die or stop making new cancer cells.

External beam radiation therapy (EBRT) is the most common method used for treatment. A large machine makes radiation beams that are shaped to the form of the tumor. The highest radiation dose is aimed at the cancer. A much lower dose is given to nearby tissue. There are several common techniques for lung cancer:

- ▶ **Intensity-modulated radiation therapy (IMRT)** delivers x-ray beams that very closely match the shape of the target and spare more normal tissue. Treatment is finished in about 6 weeks.
- ▶ **Three-dimensional conformal radiation therapy (3D-CRT)** delivers an x-ray beam that matches the shape of the target but may not be as focused as IMRT. Treatment is finished in about 6 weeks.
- ▶ **Stereotactic ablative radiotherapy (SABR)** treats cancer with very precise, high-dose x-ray beams. It delivers a very high dose of radiation per treatment, but for only a few treatments. Treatment is finished in about 1½ weeks.

- ▶ **Proton therapy** treats cancer with proton beams. Proton beams deliver radiation mostly within the tumor. Treatment is completed in about 6 weeks.

A radiation oncologist is a doctor who is an expert in treating cancer with radiation. This doctor will lead a team that designs your treatment plan and provides treatment.

A lung tumor is harder to target than some other tumors in the body. To account for tumor movement caused by breathing, four-dimensional computed tomography (4D-CT) may be used for treatment planning. Motion control methods may be used during treatment. The radiation oncologist uses PET/CT to know where to deliver the radiation treatment.

Radiation therapy is typically delivered each day Monday through Friday. Treatment visits are about 15 minutes. Some radiation oncologists deliver SABR treatment 2 to 3 times per week. Treatment does not hurt. People feel nothing at all. Treatment will not make you radioactive.

## Definitive radiation therapy

Radiation therapy is a treatment option for stage 1, stage 2, and stage 3 lung cancer. It is sometimes part of surgical treatment as described in Chapter 5. It is also combined with chemotherapy, called chemoradiation, as described later in this chapter.

Radiation therapy can be the main treatment of lung cancer. In this case, it is called definitive radiation therapy. Instead of surgery, radiation therapy may be an option for stage 1 and some stage 2 cancers. These tumors are typically treated with SABR. The goal of treatment is to cure the cancer.

For stage 1B and stage 2, your doctor may want you to get chemotherapy after radiation. Chemotherapy can treat cancer cells that radiation did not. Large tumors and very abnormal-looking cancer cells may have spread to places outside the radiation field.

### Radiation therapy

**Radiation therapy is often delivered from a large machine. The x-rays or particles pass through skin and travel to the tumor. Healthy tissue is protected using modern types of treatment.**





## Types of chemotherapy

Chemotherapy is a term for powerful drugs that kill cancer cells. Often, cisplatin or carboplatin—drugs made with platinum—is used with another drug. These regimens are called platinum-doublet chemotherapy. Recommended regimens are based on the type of lung cancer. Chemotherapy regimens are listed in [Guide 8](#) and [Guide 9](#).

Chemotherapy drugs for lung cancer are slowly injected into a vein. This is called infusion. The drugs travel in your bloodstream to treat cancer throughout your body. Treatment that affects cancer throughout the body is called systemic therapy. Medical oncologists are cancer doctors trained to use systemic therapy.

Chemotherapy is given in cycles of treatment days followed by days of rest. Giving chemotherapy in cycles gives your body a chance to recover after receiving chemotherapy. The cycles vary in length depending on which drugs are used. Ask your doctor how many cycles you will have and how many days of treatment there are within a cycle.

### Guide 8

#### Chemotherapy used for sequential chemoradiation or by itself

##### Preferred option for adenocarcinoma, large cell, and rare types of lung cancer

- Cisplatin, pemetrexed

##### Preferred options for squamous cell

- Cisplatin, gemcitabine
- Cisplatin, docetaxel

##### Other options for any cell type

- Cisplatin, vinorelbine
- Cisplatin, etoposide

##### Sometimes useful for any cell type

- Carboplatin, paclitaxel
- Carboplatin, gemcitabine
- Carboplatin, pemetrexed

### Guide 9

#### Chemotherapy used for preoperative or adjuvant concurrent chemoradiation

##### Adenocarcinoma, large cell, and rare types of lung cancer

- Carboplatin, pemetrexed
- Cisplatin, pemetrexed
- Paclitaxel, carboplatin
- Cisplatin, etoposide

##### Squamous cell lung cancer

- Carboplatin, paclitaxel
- Cisplatin, etoposide

## Chemoradiation

Chemoradiation is treatment with both chemotherapy and radiation therapy. It is sometimes part of surgical treatment as described in Chapter 5. Chemoradiation may also be the main treatment of lung cancer. It is an option for lung cancers that grew or spread outside the lung.

The goal of definitive chemoradiation is to cure the cancer. Often, both treatments are received at the same time. This is called concurrent chemoradiation. Another option is to receive one treatment then the other. This is called sequential chemoradiation.

For concurrent chemoradiation, radiation therapy is typically delivered in 30 to 35 small doses called fractions over 6 to 7 weeks. For sequential chemoradiation, you may be treated with about 15 higher-dose fractions. If you will receive radiation therapy, ask about your treatment schedule.

### Consolidation treatment

Immunotherapy is a treatment that uses the immune system to kill cancer cells. Durvalumab (Imfinzi®) is a type of immunotherapy called an immune checkpoint inhibitor. It enables T cells to attack cancer cells.

Durvalumab is used as consolidation treatment after definitive chemoradiation. The goal is to bolster the results of treatment and to delay the cancer from coming back.

Durvalumab is slowly injected into a vein (infusion). It may take 60 minutes to get the full dose. Infusions are received every 2 or 4 weeks for 1 year.

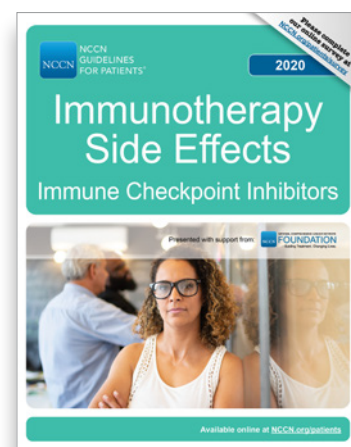
## Side effects

All cancer treatments cause health problems called side effects. Side effects from chemotherapy are caused by the death of fast-growing normal cells. You may feel nauseated during treatment. You may lose your hair.

Side effects of radiation therapy are cumulative. This means they build up slowly and are worse at the end of treatment. Fatigue and skin changes are common. Often, people describe skin changes as like a sunburn. Near the end of treatment, you may have pain when swallowing.

Although not common, your lung may become inflamed in the months of treatment. This can cause sudden shortness of breath or cough. Call your radiation oncologist immediately if you have these symptoms.

Immune checkpoint inhibitors can cause your immune cells to attack healthy cells in your body. Read about immune-related side effects in *NCCN Guidelines for Patients: Immunotherapy Side Effects, Immune Checkpoint Inhibitors* at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines).



Ask your treatment team for a complete list of side effects of your treatments. Also, tell your treatment team about any new or worse symptoms you get. There may be ways to help you feel better. There are also ways to prevent some side effects.

## Review

- Radiation therapy uses high-energy x-rays or particles to treat lung cancer. It is most often delivered from outside the body using a large machine.
- Radiation therapy is used with other treatments of lung cancer but can be used alone to treat early stages. You may receive chemotherapy after radiation therapy.
- Chemotherapy of lung cancer often consists of a drug made with platinum and one other drug.
- Chemotherapy is slowly infused into a vein. It is given in cycles of treatment days followed by days of rest.
- Chemoradiation is treatment with both chemotherapy and radiation therapy. It is used by itself to treat some advanced lung cancers. Durvalumab may be received after chemoradiation to delay the return of cancer.
- Learn about the side effects of your treatments. Let your treatment team know about any new or worsening symptoms.

# 7

## Survivorship care

- 51 Cancer tests
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- 53 Disease prevention
- 53 Review



Survivorship care includes recovering from cancer and promoting health. This chapter reviews a few key parts of survivorship care.

## Cancer tests

While lung cancer can sometimes be cured, it is very important to monitor for the return of the cancer. The return of cancer is called a recurrence. It is also important to be checked for other types of cancer.

### Surveillance

Survivorship care should include a schedule of tests for recurrence. Routine testing for cancer recurrence is called surveillance. Surveillance is started when there are no signs of cancer after treatment. Early detection of a recurrence will allow for timely treatment. [See Guide 10](#) for a schedule of tests.

You may be at risk for a second lung cancer. Anyone who has been treated and cured of one lung cancer is at risk for getting a new lung cancer. Your risk increases as you age. If you smoke, your chance for cancer increases the longer you smoke.

### Guide 10 Surveillance

#### Your treatment did not include radiation therapy

- Every 6 months for 2 to 3 years:
- Medical history
  - Physical exam
  - CT of the chest with or without contrast
- If test results are normal, then repeat every year:
- Medical history
  - Physical exam
  - Low-dose CT

#### Your treatment did include radiation therapy

- Every 3 to 6 months for 3 years:
- Medical history
  - Physical exam
  - CT of the chest with or without contrast
- If normal results, then repeat every 6 months for 2 years:
- Medical history
  - Physical exam
  - Low-dose CT
- If test results are normal, then repeat every year:
- Medical history
  - Physical exam
  - Low-dose CT

## Cancer screening

A second cancer is a possible late effect of some cancer treatments. Ask your doctor about your risk for another cancer. If you have a high risk for certain cancers, you may enroll in a screening program. Cancer screening is routine testing for cancer before cancer symptoms start. Not every type of cancer has a screening program, though.

There are cancer screening programs for:

- Prostate cancer
- Breast or cervical cancer
- Colorectal cancer
- Skin cancer



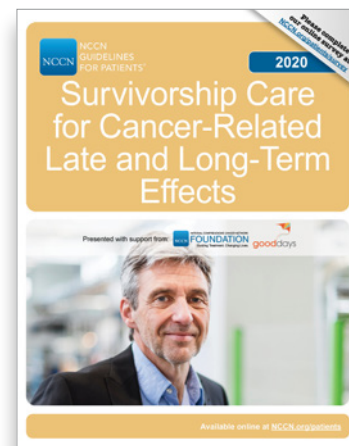
Learning to manage side effects is well worth the effort!

– Jon  
Lung cancer survivor

## Managing side effects

All cancer treatments can cause health issues called side effects. Many effects of treatment quickly resolve after treatment ends. An example is nausea and vomiting. Long-term effects start during treatment and persist after treatment is done. Less often, effects start long after treatment has ended. These are called late effects.

During health visits, your health care providers will assess for side effects. They will provide treatment for side effects as needed. Read about common effects in *NCCN Guidelines for Patients: Survivorship Care for Cancer-Related Late and Long-Term Effects*, available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines).



## Disease prevention

Another part of follow-up care is to prevent diseases. Such care can include getting immunization shots for the flu, herpes, shingles, and other diseases. Dental cleaning and exams on a regular basis can prevent disease, too.

It's important to start or keep a healthy lifestyle. Healthy living may improve your health and well-being. It may also help prevent the cancer from returning. Work with your treatment team to set goals and make plans for healthy living.

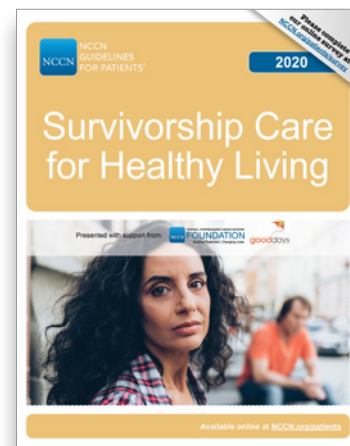
Common goals for healthy living include:

- Seeing a primary care provider on a regular basis
- Being physically active and avoiding inactivity
- Eating healthful foods
- Limiting or avoiding drinking alcohol
- Achieving and maintaining a normal body weight
- Not using tobacco
- Avoiding infections
- Getting safe vaccines

Read about preventing poor health in *NCCN Guidelines for Patients: Survivorship Care for Healthy Living*, available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines).

## Review

- Your cancer doctors will monitor for a return of lung cancer. Early detection will allow for timely treatment. You will also be checked for other cancers, including a second lung cancer. If you have a high risk for certain cancers, you may enroll in a screening program.
- Some side effects of treatment are long-term or may appear years later. At follow-up visits, your doctor will assess for side effects. Tell your doctor about any new or worse symptoms. There may be ways to prevent or treat side effects.
- Preventing diseases is a part of follow-up care. Such care can include getting immunization shots and dental cleaning. Healthy living may improve your health and prevent disease.



# 8

## Making treatment decisions

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55 It's your choice

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55 Questions to ask your doctors

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60 Resources





It's important to be comfortable with the cancer treatment you choose. This choice starts with having an open and honest conversation with your doctors.

## It's your choice

In shared decision-making, you and your doctors share information, discuss the options, and agree on a treatment plan. It starts with an open and honest conversation between you and your doctor.

Treatment decisions are very personal. What is important to you may not be important to someone else. Some things that may play a role in your decisions:

- What you want and how that might differ from what others want
- Your religious and spiritual beliefs
- Your feelings about certain treatments like surgery or chemotherapy
- Your feelings about pain or side effects such as nausea and vomiting
- Cost of treatment, travel to treatment centers, and time away from work
- Quality of life and length of life
- How active you are and the activities that are important to you

Think about what you want from treatment. Discuss openly the risks and benefits of specific treatments and procedures. Weigh options and share concerns with your doctor. If you take the time to build a relationship with your doctor, it will help you feel supported

when considering options and making treatment decisions.

## Second opinion

It is normal to want to start treatment as soon as possible. While cancer can't be ignored, there is time to have another doctor review your test results and suggest a treatment plan. This is called getting a second opinion, and it's a normal part of cancer care. Even doctors get second opinions!

Things you can do to prepare:

- Check with your insurance company about its rules on second opinions. There may be out-of-pocket costs to see doctors who are not part of your insurance plan.
- Make plans to have copies of all your records and imaging studies sent to the doctor you will see for your second opinion. Images can be burned onto a CD.

## Support groups

Many people diagnosed with cancer find support groups to be helpful. Support groups often include people at different stages of treatment. Some people may be newly diagnosed, while others may be finished with treatment. If your hospital or community doesn't have support groups for people with cancer, check out the websites listed in this book.

## Questions to ask your doctors

Possible questions to ask your doctors are listed on the following pages. Feel free to use these questions or come up with your own. Be clear about your goals for treatment and find out what to expect from treatment.



## Questions to ask about treatment options

1. What are my treatment options? Are you suggesting options other than what NCCN recommends? If yes, why?
2. Do your suggested options include clinical trials? Please explain why.
3. What will happen if I do nothing?
4. How do my age, overall health, and other factors affect my options? What if I am pregnant or planning to get pregnant?
5. Does any option offer a cure or long-term cancer control? Are my chances any better for one option than another? Less time-consuming? Less expensive?
6. How do you know if treatment is working? How will I know if treatment is working?
7. What are my options if treatment stops working?
8. What are the possible complications? What are the short- and long-term side effects of treatment?
9. What can be done to prevent or relieve the side effects of treatment?
10. What supportive care services are available to me during and after treatment?
11. Can I stop treatment at any time? What will happen if I stop treatment?

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## Questions to ask about getting treated

1. Will I have to go to the hospital or elsewhere? How often? How long is each visit?
2. What do I need to think about if I will travel for treatment?
3. Do I have a choice of when to begin treatment? Can I choose the days and times of treatment?
4. How do I prepare for treatment? Do I have to stop taking any of my medicines? Are there foods I will have to avoid?
5. Should I bring someone with me when I get treated?
6. Will the treatment hurt?
7. What should I do if a side effect gets bad when my cancer center is closed?
8. How much will the treatment cost me? What does my insurance cover?
9. Will I miss work or school? Will I be able to drive?
10. Is home care after treatment needed? If yes, what type?
11. How soon will I be able to manage my own health?
12. When will I be able to return to my normal activities?

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## Resources

### American Cancer Society

[cancer.org/cancer/lung-cancer.html](https://cancer.org/cancer/lung-cancer.html)

### American Lung Association

[lung.org](https://lung.org)

### American Lung Cancer Screening Initiative

[alcsi.org](https://alcsi.org)

### Caring Ambassadors Program, Inc.

[lungcancerap.org](https://lungcancerap.org)

### Free ME from Lung Cancer

[freeMEfromLungCancer.org](https://freeMEfromLungCancer.org)

### GO2 Foundation for Lung Cancer

[go2foundation.org](https://go2foundation.org)

### Lung Cancer Alliance

[lungcanceralliance.org](https://lungcanceralliance.org)

### Lung Cancer Research Foundation

[lcrf.org](https://lcrf.org)

### LUNgevity Foundation

[LUNgevity.org](https://LUNgevity.org)

### National Cancer Institute (NCI)

[cancer.gov/types/lung](https://cancer.gov/types/lung)

### National Coalition for Cancer Survivorship

[canceradvocacy.org/toolbox](https://canceradvocacy.org/toolbox)

## NCCN Patient Resources

[NCCN.org/patients](https://NCCN.org/patients)



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NCCN Guidelines for Patients  
better for everyone!

[NCCN.org/patients/comments](https://NCCN.org/patients/comments)



## Words to know

### **ablation**

A treatment that destroys very small tumors with heat or cold.

### **adenocarcinoma**

A cancer of cells that line organs and make fluids or hormones.

### **adjuvant treatment**

Treatment that is given to lower the chances of the cancer returning.

### **AJCC**

American Joint Committee on Cancer

### **alveoli**

The tiny sacs in the lungs where gases are transferred in and out of the blood.

### **biopsy**

A procedure that removes fluid or tissue samples to be tested for a disease.

### **board certified**

A status for doctors who finished training and passed exams in a specialized field of medicine.

### **body plethysmograph**

A test of how much air is in your lungs after inhaling or exhaling.

### **bronchioli**

Small airways within the lungs.

### **bronchoscope**

A device that is guided down the throat to work inside the airways.

### **bronchoscopy**

A procedure to work inside the airways with a device that is guided down the throat.

### **bronchus**

One of the two main airways that extends into the lungs.

### **cancer screening**

Routine testing to find cancer before signs of cancer appear.

### **cancer stage**

A rating of the outlook of a cancer based on its growth and spread.

### **carcinoma**

A cancer of cells that line the inner or outer surfaces of the body.

### **chemistry profile**

A lab test of the amount of 8 chemicals in a sample of blood. Also called metabolic panel.

### **chemoradiation**

A cancer treatment with both cell-killing drugs and high-energy rays.

### **chemotherapy**

Cancer drugs that stop the cell life cycle so cells don't increase in number.

### **chest wall**

The layer of muscle, bone, and fat that protects the vital organs.

### **chronic obstructive pulmonary disease (COPD)**

Lung damage or too much mucus that makes breathing hard.

### **clinical stage**

The rating of the extent of cancer before treatment is started.

### **clinical trial**

A type of research that assesses how well health tests or treatments work in people.

### **complete blood count (CBC)**

A lab test that measures the parts of the blood.



**computed tomography (CT)**

A test that uses x-rays from many angles to make a picture of the insides of the body.

**contrast**

A dye put into your body to make clearer pictures during imaging.

**CRX**

chest x-ray

**diagnosis**

An identification of an illness based on tests.

**endobronchial ultrasound–guided transbronchial needle aspiration (EBUS-TBNA)**

A procedure that removes lung tissue with a needle on an imaging device guided down the windpipe.

**endoscopic ultrasound–guided fine-needle aspiration (EUS-FNA)**

A procedure that removes fluid with a needle on an imaging device guided through a natural opening.

**esophagus**

The tube-shaped organ between the mouth and stomach.

**external beam radiation therapy (EBRT)**

Radiation therapy received from a machine outside the body.

**FDG**

fluorodeoxyglucose

**gas diffusion**

A test that uses harmless gas to measure how much you breathe out.

**GGN**

ground-glass nodule

**GGO**

ground-glass opacity

**immunotherapy**

A treatment with drugs that help the body find and destroy cancer cells.

**intensity-modulated radiation therapy (IMRT)**

Treatment with radiation that uses small beams of different strengths.

**invasion**

The growth of cancer cells from where it started into another tissue.

**large-cell lung carcinoma**

A cancer of lung cells that lack features to classify as another type of lung cancer.

**lobe**

A clearly seen division in an organ.

**lobectomy**

An operation that removes a whole lobe of an organ.

**low-dose computed tomography (LDCT)**

A test that uses small amounts of radiation to make pictures of the insides of the body.

**lymph node**

A small, bean-shaped, disease-fighting structure.

**magnetic resonance imaging (MRI)**

A test that uses radio waves and powerful magnets to make pictures of the insides of the body.

**mediastinoscope**

A device that is guided through a small cut to do work inside the chest.

**mediastinoscopy**

A procedure to do work in the chest with a device passed through a small cut in the skin.

**mediastinum**

The area of the chest between the lungs.

**medical history**

A report of all your health events and medications.

**metastasis**

The spread of cancer from the first tumor to a new site.

**multiple primary tumor**

One or more unrelated masses of cancer cells.

**navigational bronchoscopy**

A procedure to do work in the smallest airways with a device guided down the windpipe.

**NCCN**

National Comprehensive Cancer Network

**nodule**

A small mass of tissue.

**non-small cell lung cancer (NSCLC)**

A cancer that starts in lung cells that are not small.

**non-solid nodule**

A small tissue mass of low density.

**part-solid nodule**

A small tissue mass with areas of low and high density.

**pathologic stage**

A rating of the extent of cancer based on tests given after treatment.

**pathologist**

A doctor who's an expert in testing cells to find disease.

**physical exam**

A review of the body by a health expert for signs of disease.

**pneumonectomy**

An operation that removes the entire lung.

**positron emission tomography (PET)**

A test that uses radioactive material to see the shape and function of body parts.

**positron emission tomography/computed tomography (PET/CT)**

A test that uses two picture-making methods to show the shape and function of tissue.

**primary tumor**

The main mass of a certain type of cancer cells.

**prognosis**

The likely course and outcome of a disease based on tests.

**proton therapy**

Radiation therapy that uses protons to treat a disease. Also called hadron therapy.

**pulmonary function tests**

A set of breathing tests to test the strength of the lungs.

**pulmonologist**

A doctor who's an expert in lung diseases.

**radial endobronchial ultrasound (EBUS) bronchoscopy**

A procedure to do work inside the lung with an imaging device guided down the windpipe.

**radiation oncologist**

A doctor who's an expert in treating cancer with radiation.

**radiation therapy**

A treatment that uses intense energy to kill cancer cells.

**respiratory system**

The group of organs that transfers gases in and out of the body.

**risk factor**

Anything that increases the chance of an event.

**segmentectomy**

An operation that removes a large part of a lobe.

**side effect**

An unhealthy or unpleasant physical or emotional response to treatment.

**sleeve lobectomy**

An operation to remove an entire lobe and part of the bronchus.

**small cell lung cancer (SCLC)**

A cancer of small lung cells.

**solid nodule**

A small mass of tissue of high density.

**spirometry**

A test that uses a tube to measure how fast you breathe.

**squamous cell carcinoma**

A type of cancer of thin and flat cells that line the surface of organs.

**stereotactic ablative radiotherapy (SABR)**

Treatment with high-dose radiation within one or a few sessions. Also called SBRT.

**superior sulcus tumor**

A mass of cancer cells that starts at the top of the lung and easily grows into the chest wall.

**supportive care**

Health care that includes symptom relief but not cancer treatment. Also sometimes called palliative care.

**surgery**

An operation to remove or repair a part of the body.

**surgical margin**

The normal-looking tissue around a tumor that was removed during an operation.

**thoracic radiologist**

A doctor who's an expert in reading imaging tests of the chest.

**thoracic surgeon**

A doctor who's an expert in operating on organs inside the chest.

**thoracoscopy**

A procedure to do work in the chest with a device passed through a small cut in the skin. Also called VATS.

**three-dimensional conformal radiation therapy (3D-CRT)**

A treatment with radiation that uses beams matched to the shape of the tumor.

**trachea**

The airway between the throat and airway into the lungs. Also called the windpipe.

**transthoracic needle biopsy (TTNB)**

A procedure that removes tissue samples with a thin needle guided through the ribs.

**ultrasound**

A test that uses sound waves to take pictures of the inside of the body.

**video-assisted thoracic surgery (VATS)**

A procedure to do work in the chest with a device passed through a small cut in the skin. Also called thoracoscopy.

**wedge resection**

An operation that removes a small part of a lobe.

# NCCN Contributors

This patient guide is based on the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines<sup>®</sup>) for Non-Small Cell Lung Cancer, Version 4.2021. It was adapted, reviewed, and published with help from the following people:

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\* Reviewed this patient guide. For disclosures, visit [NCCN.org/disclosures](https://www.nccn.org/disclosures).

# NCCN Cancer Centers

Abramson Cancer Center  
at the University of Pennsylvania  
Philadelphia, Pennsylvania  
800.789.7366 • [pennmedicine.org/cancer](http://pennmedicine.org/cancer)

Fred & Pamela Buffett Cancer Center  
Omaha, Nebraska  
402.559.5600 • [unmc.edu/cancercenter](http://unmc.edu/cancercenter)

Case Comprehensive Cancer Center/  
University Hospitals Seidman Cancer  
Center and Cleveland Clinic Taussig  
Cancer Institute  
Cleveland, Ohio  
800.641.2422 • UH Seidman Cancer Center  
[uhhospitals.org/services/cancer-services](http://uhhospitals.org/services/cancer-services)  
866.223.8100 • CC Taussig Cancer Institute  
[my.clevelandclinic.org/departments/cancer](http://my.clevelandclinic.org/departments/cancer)  
216.844.8797 • Case CCC  
[case.edu/cancer](http://case.edu/cancer)

City of Hope National Medical Center  
Los Angeles, California  
800.826.4673 • [cityofhope.org](http://cityofhope.org)

Dana-Farber/Brigham and  
Women's Cancer Center |  
Massachusetts General Hospital  
Cancer Center  
Boston, Massachusetts  
617.732.5500  
[youhaveus.org](http://youhaveus.org)  
617.726.5130  
[massgeneral.org/cancer-center](http://massgeneral.org/cancer-center)

Duke Cancer Institute  
Durham, North Carolina  
888.275.3853 • [dukecancerinstitute.org](http://dukecancerinstitute.org)

Fox Chase Cancer Center  
Philadelphia, Pennsylvania  
888.369.2427 • [foxchase.org](http://foxchase.org)

Huntsman Cancer Institute  
at the University of Utah  
Salt Lake City, Utah  
800.824.2073  
[huntsmancancer.org](http://huntsmancancer.org)

Fred Hutchinson Cancer  
Research Center/Seattle  
Cancer Care Alliance  
Seattle, Washington  
206.606.7222 • [seattlecca.org](http://seattlecca.org)  
206.667.5000 • [fredhutch.org](http://fredhutch.org)

The Sidney Kimmel Comprehensive  
Cancer Center at Johns Hopkins  
Baltimore, Maryland  
410.955.8964  
[www.hopkinskimmelmcc.org](http://www.hopkinskimmelmcc.org)

Robert H. Lurie Comprehensive  
Cancer Center of Northwestern  
University  
Chicago, Illinois  
866.587.4322 • [cancer.northwestern.edu](http://cancer.northwestern.edu)

Mayo Clinic Cancer Center  
Phoenix/Scottsdale, Arizona  
Jacksonville, Florida  
Rochester, Minnesota  
480.301.8000 • Arizona  
904.953.0853 • Florida  
507.538.3270 • Minnesota  
[mayoclinic.org/cancercenter](http://mayoclinic.org/cancercenter)

Memorial Sloan Kettering  
Cancer Center  
New York, New York  
800.525.2225 • [mskcc.org](http://mskcc.org)

Moffitt Cancer Center  
Tampa, Florida  
888.663.3488 • [moffitt.org](http://moffitt.org)

The Ohio State University  
Comprehensive Cancer Center -  
James Cancer Hospital and  
Solove Research Institute  
Columbus, Ohio  
800.293.5066 • [cancer.osu.edu](http://cancer.osu.edu)

O'Neal Comprehensive  
Cancer Center at UAB  
Birmingham, Alabama  
800.822.0933 • [uab.edu/onealcancercenter](http://uab.edu/onealcancercenter)

Roswell Park Comprehensive  
Cancer Center  
Buffalo, New York  
877.275.7724 • [roswellpark.org](http://roswellpark.org)

Siteman Cancer Center at Barnes-  
Jewish Hospital and Washington  
University School of Medicine  
St. Louis, Missouri  
800.600.3606 • [siteman.wustl.edu](http://siteman.wustl.edu)

St. Jude Children's Research Hospital/  
The University of Tennessee  
Health Science Center  
Memphis, Tennessee  
866.278.5833 • [stjude.org](http://stjude.org)  
901.448.5500 • [uthsc.edu](http://uthsc.edu)

Stanford Cancer Institute  
Stanford, California  
877.668.7535 • [cancer.stanford.edu](http://cancer.stanford.edu)

UC Davis  
Comprehensive Cancer Center  
Sacramento, California  
916.734.5959 | 800.770.9261  
[health.ucdavis.edu/cancer](http://health.ucdavis.edu/cancer)

UC San Diego Moores Cancer Center  
La Jolla, California  
858.822.6100 • [cancer.ucsd.edu](http://cancer.ucsd.edu)

UCLA Jonsson  
Comprehensive Cancer Center  
Los Angeles, California  
310.825.5268 • [cancer.ucla.edu](http://cancer.ucla.edu)

UCSF Helen Diller Family  
Comprehensive Cancer Center  
San Francisco, California  
800.689.8273 • [cancer.ucsf.edu](http://cancer.ucsf.edu)

University of Colorado Cancer Center  
Aurora, Colorado  
720.848.0300 • [coloradocancercenter.org](http://coloradocancercenter.org)

University of Michigan  
Rogel Cancer Center  
Ann Arbor, Michigan  
800.865.1125 • [rogelcancercenter.org](http://rogelcancercenter.org)

The University of Texas  
MD Anderson Cancer Center  
Houston, Texas  
844.269.5922 • [mdanderson.org](http://mdanderson.org)

University of Wisconsin  
Carbone Cancer Center  
Madison, Wisconsin  
608.265.1700 • [uwhealth.org/cancer](http://uwhealth.org/cancer)

UT Southwestern Simmons  
Comprehensive Cancer Center  
Dallas, Texas  
214.648.3111 • [utsouthwestern.edu/simmons](http://utsouthwestern.edu/simmons)

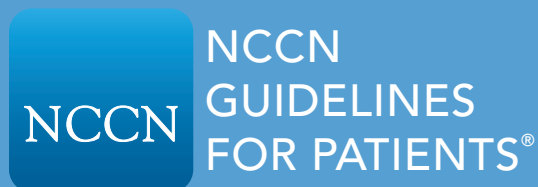
Vanderbilt-Ingram Cancer Center  
Nashville, Tennessee  
877.936.8422 • [vicc.org](http://vicc.org)

Yale Cancer Center/  
Smilow Cancer Hospital  
New Haven, Connecticut  
855.4.SMILOW • [yalecancercenter.org](http://yalecancercenter.org)

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# Non-Small Cell Lung Cancer

## Early and Locally Advanced

### 2021

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