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#Reference From NCCN Guidelines

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# 1

## Lung cancer basics

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- 6 What is early and locally advanced NSCLC?
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**Non-small cell lung cancer is the most common type of lung cancer. There are many treatments for cancers that haven't spread far from the lung. Experts have studied which treatments work best based on where and how lung cancer grows. Read this chapter to learn the answers to some common questions about lung cancer.**

## What is NSCLC?

Non-small cell lung cancer (NSCLC) is a cancer of lung cells. The lungs are the main organs of the respiratory system. They deliver oxygen to the blood and remove carbon dioxide from the blood.

Cancer is a disease that causes cells to grow out of control. The overgrowth of lung cancer cells becomes a mass called a tumor. Lung cancer cells also don't stay in place and may grow through the lung wall. They may break away from a tumor, spread outside the lung, and form more tumors.

Cancers that have spread to the lungs are not lung cancers. For example, stomach cancer that has spread to the lungs is still stomach cancer.

### Airways of the lungs

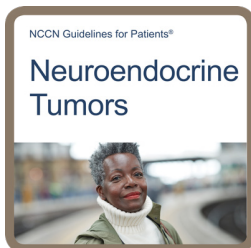
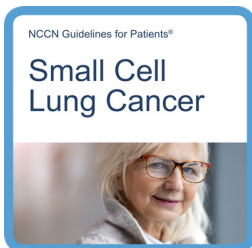
The air you breathe moves through a series of airways. It travels down your throat and through your windpipe (trachea). The windpipe splits into two airways called bronchi. Inside the lung, each bronchus branches off into the parts of the lung, called lobes. The right lung has three lobes, and the left lung has two 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.



## NSCLC is the most common type of lung cancer

Almost all lung cancers are carcinomas. Lung carcinomas are cancers of cells that line the airways of the lungs. The airways of the lungs are the bronchus, bronchioli, and alveoli.

NSCLC is the most common lung carcinoma. Other lung carcinomas are neuroendocrine tumors. Pulmonary carcinoids and small cell lung cancer are two types of these neuroendocrine tumors. Information on lung neuroendocrine tumors is available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.



## There are several types of NSCLC

Each type of NSCLC forms from a particular kind of cell. Below are the most common cell types of NSCLC:

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

## What is early and locally advanced NSCLC?

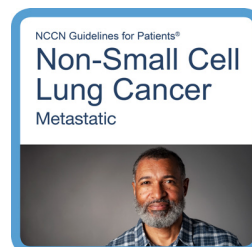
Early and locally advanced NSCLC have not spread far from the lung in which they started. The difference between early NSCLC and locally advanced NSCLC is mainly based on the cancer stage.

A cancer stage describes the extent of lung cancer in the body. There are four main stages of lung cancer that are often written with Roman numerals—stages I, II, III, and IV.

- Stage 1, stage 2, and stage 3 cancers have grown from the airway into lung tissue. Some have spread to nearby disease-fighting structures called lymph nodes.
- Stage 4 cancer has already spread far by the time of diagnosis. NSCLC can affect any organ but tends to spread to the brain, liver, bone, and adrenal glands and from one lung to the other lung.

Stage 1 is early NSCLC. Stage 2 is early NSCLC unless surgery is not a treatment option. Then, it is considered locally advanced. Stage 3 is locally advanced NSCLC.

Some early and locally advanced cancers spread far after diagnosis and then are called metastatic cancer. Information about metastatic NSCLC, including stage 4, is available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.

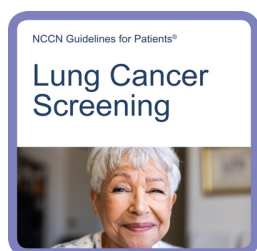


## What are the symptoms of NSCLC?

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. Information about lung cancer found by chance is in Chapter 2. Information on lung cancer screening is available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.



## What's the best treatment for NSCLC?

There's no treatment for lung cancer that's best for everyone. The best treatment is the treatment that's right for you. Your treatment plan should follow best practices—cancer care based on science and expert consensus. The following chapters explain the best practices of testing for and treating early and locally advanced NSCLC.

Some people with early or locally advanced NSCLC have surgery to remove cancer from the body. Other types of cancer treatment are used with surgery to improve results. Read Chapter 5 to learn more about treatment with surgery.

If you can't have surgery, there are other good options. Some early cancers are treated with radiation therapy, which is explained in Chapter 6. Other cancers are treated with two types of treatments called chemoradiation. Chemoradiation is discussed in Chapter 7.

Clinical trials offer hope to all people with lung cancer. Clinical trials are a type of health research that tests new ways of fighting cancer. Ask your care team if there is a clinical trial that is a good fit for you.

## Key points

- Non-small cell lung cancer (NSCLC) is a cancer of lung cells. Other cancers that spread to the lungs are not lung cancer.
- Lung cancer often starts in the cells that line the airways. These cancers are called carcinomas. NSCLC is a group of carcinomas.
- Common types of NSCLC are adenocarcinoma, squamous cell carcinoma, and large cell carcinoma.
- Early and locally advanced NSCLC are cancers that have not spread far from the lung in which they started. Early NSCLC includes both stage 1 and some stage 2 cancers. Locally advanced NSCLC is stage 3 cancer and stage 2 cancers that can't be treated with surgery.
- Early cancers often do not cause symptoms but many advanced cancers do.
- There are multiple treatments for early and locally advanced NSCLC. Ask your care team about your options for cancer care.



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

# 2

## Lung nodules

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- 11 Risk for lung cancer
- 12 Signs of lung cancer
- 13 Follow-up care
- 16 Diagnosing lung cancer
- 18 Key points



**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 experts decide if this nodule is cancer.**

## Lung nodule experts

Most lung nodules are not cancer but some are. Nodules can be caused by cancer, infections, scar tissue, and other health conditions. When a nodule found by chance seems to be cancer, it takes a team of experts to decide the best course of care.

Your care team should consist of members from different fields of medicine, including the following board-certified experts:

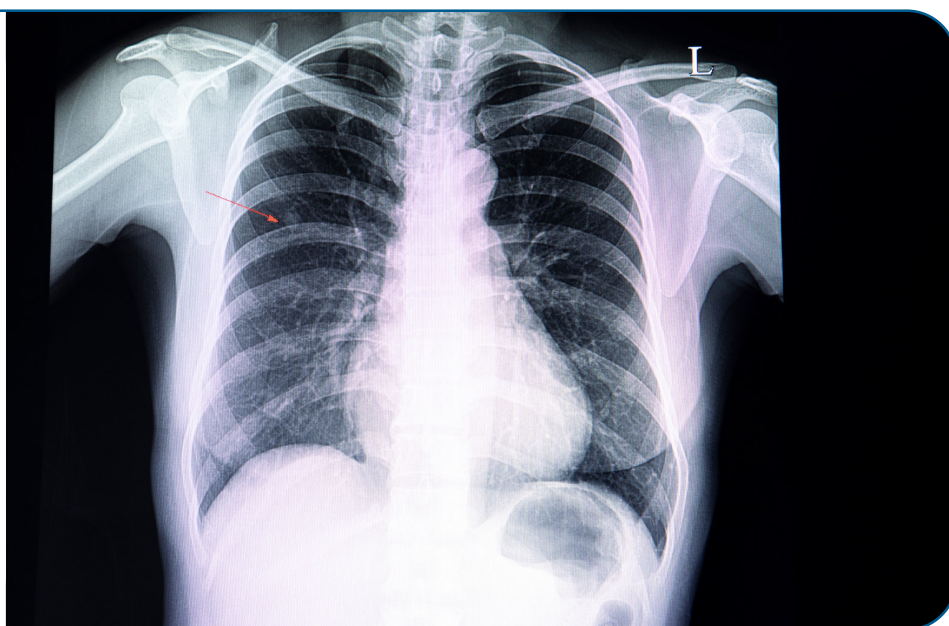
- A pulmonologist is a doctor who's an expert of lung diseases.
- A thoracic radiologist is a doctor who's an expert of imaging of the chest. Imaging makes pictures of the inside of the body.
- A thoracic surgeon is a doctor who's an expert in operations within the chest.

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

- Assess your risk for lung cancer
- Review lung images and request more imaging if there may be cancer
- Perform a procedure called a biopsy if needed

### 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.**



## Risk for 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 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. Experts are still learning why one person gets lung cancer and another does not.

### 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. Even smoking a little raises the risk of lung cancer. The risk grows the more times you smoke and the longer you smoke.

Exposure to second-hand smoke increases the risk of lung cancer. Secondhand smoke is the fumes from tobacco smoked by others. It is the smoke exhaled by another person and

the smoke from the burning end of tobacco products.

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

### Cancer-causing agents

You are more likely to get lung cancer, especially if you smoke, after exposure to:

- Radon
- Asbestos
- Arsenic, beryllium, cadmium, chromium, nickel
- Coal smoke, soot, silica, diesel fumes
- Air pollution by fine particulates, ozone, nitrogen oxides, sulfur dioxide

#### Guide 1 Risk factors for lung cancer

Current or past smoking

Advanced age

Certain cancers and cancer treatments

Family history of lung cancer

Exposure to cancer-causing agents

COPD or pulmonary fibrosis

Ask your care team for help to quit smoking. If you quit, your risk for cancer will decrease, and health problems related to smoking may improve.

## Age

As you age, you are more likely to get lung 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 birth 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.

## Other lung diseases

Two lung diseases have been linked to lung cancer.

- Chronic obstructive pulmonary disease (COPD) makes breathing hard because the lung tissue is damaged or there's too much mucus.
- Pulmonary fibrosis is major scarring of lung tissue that makes it hard to breathe.

## Signs of lung cancer

Lung nodules are often found by chance on medical images for an unrelated health problem. They may be first detected by a chest x-ray, computed tomography (CT) scan, or positron emission tomography (PET) scan. Lung nodules on imaging are sometimes called spots or shadows.

Your radiologist will review the images to decide if the nodule may be cancer. Important 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. They aren't likely to have calcium and compared to nodules without cancer, often have these features:

- Rough edges and odd shapes
- Fast growth and large size
- High density

## Abnormal lung tissue

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

## PET hot spots

Cancerous nodules often appear as hot spots on PET. Before the scan, a radiotracer will be put into your body. Cancer cells take in more of the tracer than normal cells and show up as bright (hot) spots on the scan. Multiple health problems can cause hot spots, so the cause of hot spots often needs to be confirmed by other testing.

## Follow-up care

Follow-up care is done to check for lung cancer. It is not needed for most lung nodules. It is scheduled when a nodule may be cancer and more tests are needed. Your care team will make a follow-up care plan specific to you.

## Types of care

The three types of follow-up care for lung nodules are CT scan, PET/CT scan, and biopsy.

**Why get CT scans?** Scans are less invasive than a biopsy. Often, one CT scan doesn't clearly show whether a 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, which is a substance that makes clearer images. LDCT is preferred by NCCN experts for cancer screening unless a clearer image is needed.

**Why get a PET/CT scan?** CT combined with PET may find cancer quicker than repeated CT scans. PET/CT is also useful for showing signs of cancer spreading in the body. Your whole body will be scanned, or the

scan will extend from above your neck down to almost your knees.

**Why get a biopsy?** If your team strongly suspects cancer, a biopsy may save time by allowing you to start cancer treatment earlier. A biopsy is a procedure that removes tissue or fluid for cancer testing. Read the next section, *Diagnosing lung cancer*, to learn more about biopsies.

## NCCN recommendations

NCCN recommendations for follow-up care are based on two important baseline nodule features:

- **Nodule density** described as either solid or subsolid
- **Nodule size** measured in millimeters (mm)

To understand the size of your nodule, compare it to the tip of a crayon. The tip of a crayon is about 2 mm. The length of two crayon tips is the same size as a 4 mm nodule. The length of three crayon tips is the size of a 6 mm nodule. An 8 mm nodule would be the length of four crayon tips.

The first follow-up will be based on the results of your baseline CT scan. The next follow-up, if needed, will be based on comparing your baseline CT scan to the most current scan.

## Follow-up of solid nodules

Solid nodules are dense and look like thick clouds on imaging. Follow-up care of these nodules is partly based on your risk for lung cancer. Your risk is low if you have minor or no risk factors. You must not have smoked or smoked very little.

Solid nodules that are less than 6 mm in size don't need immediate follow-up care.

Your team will decide what follow-up care is needed.

Nodules that are between 6 mm and 8 mm in size will be checked between 6 to 12 months, and if you have a high risk of lung cancer, checked a second time between 18 to 24 months. Nodules that are bigger than 8 mm may be checked with CT in 3 months or with PET/CT now, or they may be biopsied.

Follow-up care for solid nodules is listed in **Guide 2**.

**Follow-up of subsolid nodules**

Subsolid nodules are less dense than solid nodules. They include non-solid nodules and part-solid nodules.

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

**Guide 2**

**Follow-up care of solid lung nodules**

Low risk for lung cancer	Nodule is smaller than 6 mm	No routine follow-up care is needed. Your team will decide the next steps of care.
	Nodule is between 6 and 8 mm	A CT scan is recommended at 6 to 12 months after the first scan. If there is no increase in nodule size or density, you may get another CT scan at 18 to 24 months after the first scan.
	Nodule is larger than 8 mm	There are 3 options: <ul style="list-style-type: none"> <li>• CT scan in 3 months</li> <li>• PET/CT scan now</li> <li>• Biopsy now</li> </ul>
High risk for lung cancer	Nodule is smaller than 6 mm	It is an option to get a CT scan at 12 months after the first scan. If there is no increase in nodule size or density, your team will decide the next steps of care.
	Nodule is between 6 and 8 mm	A CT scan is recommended at 6 to 12 months and again at 18 to 24 months after the first scan.
	Nodule is larger than 8 mm	There are 3 options: <ul style="list-style-type: none"> <li>• CT scan in 3 months</li> <li>• PET/CT scan now</li> <li>• Biopsy now</li> </ul>

Many subsolid nodules go away in time without treatment. Those that remain are not likely to become a problem.

One subsolid nodule that is smaller than 6 mm does not need routine follow-up care. Larger or multiple nodules will be checked again.

A single non-solid nodule larger than 6 mm will be checked at 6 to 12 months after the first

scan. Nodules that are more likely to be cancer will be checked at 3 to 6 months. If a follow-up scan shows signs of cancer, you may get a PET/CT scan or biopsy.

Follow-up care for part-solid and non-solid nodules found by chance is listed in **Guide 3**.

### Guide 3

#### Follow-up care of subsolid lung nodules

1 non-solid nodule	Nodule is smaller than 6 mm	No routine follow-up care is needed. Your team will decide the next steps of care.
	Nodule is 6 mm or larger	A CT scan is recommended at 6 to 12 months after the first scan. If there is no increase in nodule size or density, repeat CT every 2 years until 5 years after the first scan.
1 part-solid nodule	Nodule is smaller than 6 mm	No routine follow-up care is needed. Your team will decide the next steps of care.
	Nodule is 6 mm or larger	A CT scan is recommended at 3 to 6 months after the first scan. If there's no nodule growth and the solid part remains smaller than 6 mm, repeat CT every year for 5 years. If the solid part is 6 mm or larger, you may get a PET/CT or a biopsy.
2 or more non-solid or part-solid nodules	Nodules are smaller than 6 mm	A CT scan is recommended at 3 to 6 months after the first scan of the nodule. If there is no increase in nodule size or density, your doctor may want another CT at 2 and 4 years after the first scan.
	Nodules are 6 mm or larger	A CT scan is recommended at 3 to 6 months after the first scan. The next steps depend on the nodule that is the most likely to be cancer.

## Diagnosing lung cancer

To diagnose lung cancer, bits of tissue need to be removed for testing. Your team may try to diagnose and stage the cancer at the same time. Cancer staging is a rating of the extent of cancer in the body. The body part that likely has cancer and is farthest from the lung nodule will be sampled and tested.

### **Cancer tests may be done before or on the day of surgical treatment**

Lung nodules that can't be removed by surgery are tested before treatment starts. Surgery may not be an option because of your overall health, location of a lung nodule, or advanced cancer.

On the other hand, the timing of cancer testing differs when nodules will be surgically treated. Cancer testing can be delayed for tiny nodules that are very likely to be early-stage lung cancer. Cancer testing done in advance of surgery would increase health risks, time spent, and costs. More lung tissue may be removed if the diagnosis is cancer.

There are times when it is better to diagnose before surgery:

- You shouldn't wait until surgery if your care team strongly suspects a disease other than lung cancer.
- An early diagnosis is also needed if whole-body drug treatment called systemic therapy will be received before surgery.
- It may be too hard or risky to diagnose on the same day as surgery.

### **Making a plan to remove tissue**

It takes a team to decide the best steps to remove tissue. Removing tissue for cancer testing is not always easy. Your team should include experts who work a lot with people who have cancer. Team members should include a:

- Thoracic radiologist
- Interventional radiologist
- Thoracic surgeon
- Pulmonologist

When planning, experts think about the size and location of tumors, your health history, and their experience. They rely on the results of a physical exam and imaging.

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 team will form a plan for you based on decisions to:

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

## Methods to remove samples

Your team will choose a method that removes tissue that likely has cancer. Your team will consider the risk and ease of methods and what method you prefer.

- **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 (bronchus) or food pipe (esophagus). These procedures include standard bronchoscopy, navigational bronchoscopy, radial endobronchial ultrasound (EBUS) bronchoscopy, endoscopic ultrasound (EUS)-guided biopsies, and robotic bronchoscopy.
- **Keyhole surgeries** involve making small openings into your chest. Small tools are inserted through the holes to remove tissue. Compared to open surgery, this method 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.

## The removed tissue must be large enough for testing

The tissue must be large enough to run several special lab tests. At some cancer centers, the pathologist checks the tissue size right after removal. This method is called rapid on-site evaluation (ROSE). It helps to prevent having the same procedure a second time.

## A pathologist will assess for cancer

Pathologists are doctors who are experts in testing cells and tissue and diagnosing cancer. First, they prepare biopsy tissue. This may take a couple of days. Then, they examine removed tissue with a microscope to classify the disease. This is called histologic typing. The remaining tissue will be saved for possible future testing.

Your pathologist will record the diagnostic results in a pathology report. The report will state if there is cancer and 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:

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

Ask your care team for a copy of the pathology report and to review the results with you. Take notes and ask questions.



## Key points

- It takes a team of experts to assess lung nodules for cancer.
- Tobacco smoking is the biggest risk factor for lung cancer.
- Signs of lung cancer can be found with imaging. Imaging shows features of cancerous nodules, the condition of the lung tissue, and abnormal activity of cells.
- Lung nodule experts 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.
- If the nodule is likely cancer, you may have a PET/CT scan, or tissue from the nodule may be sampled by a procedure called a biopsy and tested for cancer.



### **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)

# 3

## Tests for NSCLC

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Your care team will make a treatment plan just for you. To make the plan, they'll need to learn about your general health and the cancer. This chapter describes the tests that are needed for treatment planning and supportive services that you'll receive before treatment.

## Goals of testing

Not all non-small cell lung cancers (NSCLC) are alike. Before you can be treated, several tests are needed to learn about the cancer and you. These tests are needed to:

- Assess your general health and well-being
- Stage the cancer by testing areas where it may have spread
- Profile the cancer by testing for defining features called biomarkers

Tests for early and locally advanced NSCLC are listed in **Guide 4**.

### Guide 4

#### Initial tests and services for early and locally advanced NSCLC

<b>Health history and exam</b>	<ul style="list-style-type: none"> <li>• Medical history including weight loss and smoking history</li> <li>• Physical exam and performance status</li> </ul>
<b>Blood tests</b>	<ul style="list-style-type: none"> <li>• CBC</li> <li>• Chemistry profile</li> </ul>
<b>Imaging</b>	<ul style="list-style-type: none"> <li>• Diagnostic CT of the chest and upper abdomen using contrast</li> <li>• FDG-PET/CT scan</li> <li>• Brain MRI if the lung cancer may have spread to the brain</li> <li>• MRI of spine and thoracic inlet if you have a superior sulcus tumor</li> </ul>
<b>Lung tests</b>	<ul style="list-style-type: none"> <li>• Pulmonary function tests</li> <li>• Bronchoscopy</li> </ul>
<b>Cancer cell tests</b>	<ul style="list-style-type: none"> <li>• Lymph node biopsy</li> <li>• Biomarker tests</li> </ul>
<b>Initial services</b>	<ul style="list-style-type: none"> <li>• Supportive care</li> <li>• Smoking treatment</li> </ul>

It takes a team to plan treatment of NSCLC. You are part of the team. Tell your team about your goals and any challenges you are having. Your team may consist of many members, including a:

- Thoracic surgical oncologist, medical oncologist, and radiation oncologist to treat NSCLC
- Palliative care provider, social worker, mental health provider, and registered dietitian to provide supportive services

Many of these experts are supported by nurses, technicians, or assistants who are often on the frontline of cancer care. Look for descriptions of team members throughout this book.

## Health history

Expect your care team to review your health in detail. This is known as taking a medical history. Your team will want to know a lot about your past and current health. You will likely be asked about:

- Illnesses and injuries
- Symptoms like unexplained weight loss, trouble breathing, chest pain, and cough
- Prescribed and over-the-counter medicines, herbals, and supplements, as well as surgeries
- Lifestyle choices, including your diet, how active you are, and whether you smoke or drink alcohol

Some cancers and other diseases run in families. Be prepared to discuss the health problems of your close blood relatives. Such family members include siblings, parents, and grandparents related to you by birth and not by adoption.

Bring a list of your medications, herbals, and supplements to appointments.

## Physical exam

A team member will also perform a thorough physical exam of your body. This exam may include:

- Checking your vital signs—blood pressure, heart rate, breathing rate, oxygen level, and body temperature—and assessing your overall appearance
- Feeling and listening to organs, including your spleen and liver
- Feeling for enlarged lymph nodes, which are small disease-fighting structures throughout the body
- Assessing your level of pain, if any, when you are touched

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

## Blood tests

Blood tests are commonly used to screen for disease. They are also used to assess if cancer is affecting organs. Samples of your blood will be removed with a needle that is inserted into a vein. This is called a blood draw.

### CBC

A complete blood count (CBC) is needed. A CBC measures parts of the blood including counts of white blood cells, red blood cells, and platelets.

### Chemistry profile

Chemicals in your blood come from your liver, kidneys, bone, and other organs. A chemistry profile assesses if the chemicals in your blood are too low or high.

## Imaging

Imaging takes pictures of the inside of your body. It is used to help stage the cancer by showing cancer in lung tissue and if the cancer has spread from the lung.

A radiologist is a doctor who's an expert in reading images. This doctor will convey the test results to your care team. Scans that were done more than 60 days ago should not be used to decide your treatment.

### Diagnostic CT

Computed tomography (CT) is a more detailed kind of x-ray. It takes many pictures from different angles. A computer combines the images to make 3-D pictures.

A *diagnostic* CT shows body tissue more clearly. It is often the first scan done to stage lung cancer. Images of your chest and upper abdomen including the adrenal glands are needed.

A higher dose of radiation is used for diagnostic CT compared to a low-dose CT. You'll receive an injection of contrast if it's safe for you. Contrast is a substance that makes images clearer. Contrast travels in the bloodstream and is flushed out in urine.

### FDG-PET/CT

CT combined with positron emission tomography (PET) is referred as PET/CT. PET/CT is needed if you haven't had this scan. It may detect cancer that was not found by CT alone. Your whole body will be scanned, or the scan will extend from above your neck down to near your knees.

PET highlights tissue in your body that may be cancerous. About an hour before PET, you will be injected with a radiotracer called fluorodeoxyglucose (FDG). The tracer will pass out of your body in your urine in about two days.

Cancer cells take in more of the tracer than normal cells and show up as bright (or hot) spots on the scan. Multiple health problems can cause hot spots, so the cause of hot spots often needs to be confirmed by other testing.

### Brain MRI

Lung cancer tends to spread to the brain, so most people with lung cancer need a brain scan. A brain scan isn't needed for small stage 1 cancers.

Magnetic resonance imaging (MRI) may show small brain tumors that aren't causing

symptoms. MRI uses a magnetic field and radio waves to make pictures. Contrast should be used. If you can't have MRI, you may get a CT scan of your brain with contrast.

### MRI of spine and thoracic inlet

Superior sulcus tumors are lung cancers that start at the top of the lung. They typically grow into the chest wall and may grow next to your spine, blood vessels, or nerves. In this case, MRI of your spine and thoracic inlet is needed. The thoracic inlet is the center of a ring of bones at the top of the ribcage.

## Pulmonary function tests

For some people, treatment of lung cancer is based on how well their lungs work. There are three pulmonary function tests to assess how well you breathe:

- **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 plethysmography** 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.

## Bronchoscopy

A bronchoscopy is a procedure that allows providers to see inside of airways. It is done with a medical device called a bronchoscope. A bronchoscope has a small, flexible tube that is gently guided down your throat and into your airways. A bronchoscopy is needed if:

- You haven't already had a bronchoscopy for diagnosis or cancer staging, and
- The lung cancer will be treated with surgery.

A bronchoscopy can likely be done on the day of surgery to save time, costs, and risks. Sometimes, a bronchoscopy is done before surgery for a tumor in the middle of a lung.

**Testing may take some time. You may not get test results for days or weeks.**



## Lymph node biopsy

Lymph nodes are small, bean-shaped structures that help the body fight disease. There are hundreds of lymph nodes throughout the body. When lung cancer spreads, it typically spreads to lymph nodes in the lungs and then to lymph nodes outside the lungs. Your care team will use the imaging results to decide which lymph nodes to biopsy, if any.

### Mediastinal lymph nodes

The space between your lungs is called the mediastinum. This space has many lymph nodes. Lung cancer is more likely to spread to these nodes when the tumor is larger and closer to this area.

For many early and locally advanced lung cancers, the mediastinal lymph nodes need to be tested for cancer. Testing may not be done for very small lung tumors that are on the side of the lung opposite from the mediastinum.

Testing is not needed for advanced cancers if lymph nodes along the collarbone are tested.

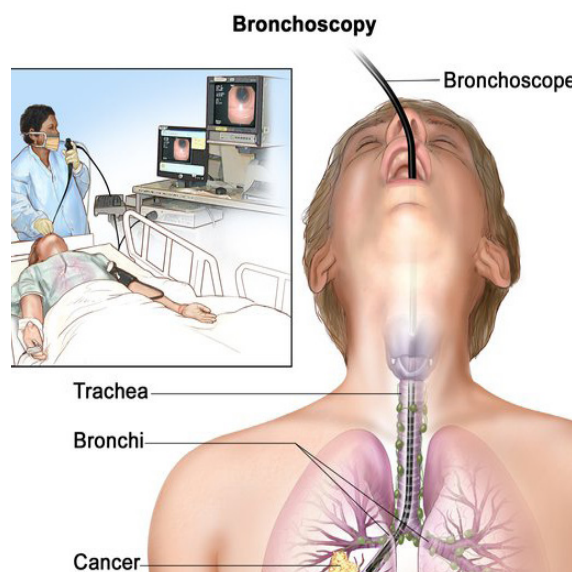
Mediastinal lymph nodes can be reached by one of several procedures:

- Mediastinoscopy is performed using a medical device that is inserted through a small cut in the chest
- Mediastinotomy is an open surgery of the middle of the chest through a small cut near the breastbone
- Endoscopic ultrasound (EUS)-guided biopsy is performed using a medical device that is guided down the food tube (esophagus)
- Endobronchial ultrasound (EBUS)-guided biopsy is performed using a bronchoscope

EBUS- and EUS-guided lymph node biopsies are often done days ahead of surgical treatment.

### Lymph node biopsy

**It is very important for your care team 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 is one of those methods.**



## Other regional lymph nodes

Some advanced lung cancers have spread to lymph nodes in the other lung or by the collarbone. Methods to biopsy these nodes include:

- An excisional biopsy removes an entire node through a cut into the skin
- Thoracoscopy is a surgery that makes small openings into your chest through which small tools are inserted to see and remove tissue (also called video-assisted thoracoscopic surgery, or VATS)
- A needle biopsy involves guiding a thin needle through your skin and into a node

## A pathologist will assess for cancer

Pathologists are doctors who are experts in testing cells and tissue and diagnosing cancer. They examine tissue from lymph nodes with a microscope to classify the disease. This is called histologic typing.

Your pathologist will record the diagnostic results in a pathology report. Ask your care team for a copy of the pathology report and to review the results with you. Take notes and ask questions.

## Biomarker tests

Biomarker tests look for biological clues, or markers, of cancer that differ between people. Biomarkers are used to predict which treatment might best help you. Biomarker tests are performed on tumor tissue or on a blood sample.

Biomarker tests are needed for most people with lung cancer who will be treated with surgery. Your care team will use biomarker tests to decide which whole-body drug treatments, called systemic therapy, are options before and after surgery. Biomarker tests aren't needed for very small lung tumors because surgery alone has very good results.

Biomarker tests for early and locally advanced lung cancer are:

### PD-L1 level

PD-L1 is a protein on the surface of cells. PD-L1 on cancer cells stops white blood cells called T cells from killing them. The cancer cells survive and make more cancer cells.

### EGFR mutations

Lung cancer cells have a receptor on their surface called EGFR. Cell receptors receive and send signals like antennas. Some mutations in the gene that makes EGFR cause the receptor to be overactive. EGFR overactivity makes the cancer cells quickly grow. Among *EGFR* mutations, *EGFR* exon 19 deletion and *EGFR* exon 21 L858R mutation are the most common.

### ALK gene rearrangement

Some lung cancers grow quickly due to an overactive ALK surface receptor. The overactivity is caused by parts of two genes



switching places with each other. This is called a gene rearrangement.

## Supportive services

This section explains some specialized services that you'll receive. It's important to start to receive these services right after a lung cancer diagnosis. They can improve your quality of life and may also help you live longer.

### Start supportive care early

Supportive care is cancer care that improves your quality of life. It is not just for people at the end of life who need hospice. In fact, it has been shown to extend and enhance life for people with lung cancer.

Supportive care is sometimes called palliative care since symptom relief is a main goal. But supportive care addresses many other needs. You can get help with making treatment decisions and coordination of care between health providers. You can get emotional or spiritual support, financial aid, or family counseling.

Your palliative care provider will work with your care team to provide you with the best care. Other specialists who may be involved in your care include:

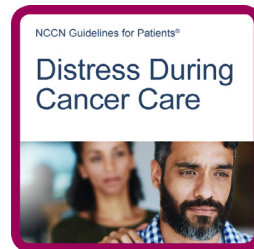
- Respiratory therapists
- Rehabilitation specialists
- Registered dietitians
- Social workers

### Supportive care guidelines

The library of NCCN Guidelines for Patients has books on supportive care. These books

focus on common physical and emotional effects of many cancers and their treatment.

One of the NCCN books is about distress. Everyone with cancer feels distress at some point. It is normal to feel worried, sad, helpless, or angry. Distress can become severe and affect the way you live. More information about managing distress is available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](https://www.nccn.org/patientguidelines) app.



### It's never too late to quit smoking

If you 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 care team about counseling and drugs to help you quit.

If you tried to quit before, try again. Most people slip or relapse before quitting for good.

## Key points

- › Tests are needed to learn about your overall health and the cancer. A team of experts will use the results to make a treatment plan for you.
- › Be ready to tell your care team about any health problems and treatments you've had in your lifetime.
- › A member of your team will examine your body for signs of disease. The exam will include touching parts of your body to see if anything feels abnormal.
- › Your team will rate your ability to do day-to-day activities in order to decide your treatment options.
- › Your care team 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. You may get a brain MRI.
- › Your ability to breathe may be tested with pulmonary functioning tests, and your lungs examined by bronchoscopy.
- › To help stage the cancer, lymph nodes inside or outside the lungs will be sampled or removed and tested for cancer.
- › Biomarker tests look for small yet important features of cancer that differ between people. There are treatments for some markers.
- › Supportive care aims to improve your quality of life. It is important for everyone, not just people at the end of life.

- › Ask your care team for help to quit smoking. Quitting may improve treatment results.



DO NOT be afraid to ask your medical team ANY questions at any time!!! Your questions will help you and them. No question is stupid.”

# 4

## Treatment by cancer stage

- 29 TNM staging system
- 31 Lung cancer stages
- 32 Primary treatment
- 35 Key points

**A cancer stage is a rating of the growth and spread of cancer. It is an important factor in treatment planning. Read this chapter to learn more about staging and how it is used to plan treatment.**

## TNM staging system

The American Joint Committee on Cancer staging manual is used to stage lung cancer. In this manual, a TNM system is used to score different areas of cancer growth. Your care team 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 measured in centimeters (cm)
- Invasive growth of the primary tumor into nearby body parts, such as the chest wall
- 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

### Guide 5

#### T scores used to stage lung cancer

<b>T1</b>	A T1 tumor is 3 cm or smaller. It's no larger than a grape.
<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. For comparison, a golf ball is 4.3 cm. The lung tumor 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>• Invasive growth 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>• Invasive growth into the diaphragm, middle of the chest, heart or its major blood vessels, windpipe or the area below, nerve to the voice box, esophagus, or spine</li> <li>• Related tumors in more than one lobe of the lung</li> </ul>

of T scores used for treatment planning in this book.

## 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, liver, adrenal glands, and bones and from one lung to the other. M0 means the cancer has not spread far. There are three M1 scores:

- **M1a** means the cancer has spread far within the chest
- **M1b** means the cancer has spread to one place beyond the chest
- **M1c** means the cancer has spread to more than one place beyond the chest

### Guide 6

#### N scores used to stage lung cancer

<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>

## Lung cancer stages

Lung cancer stages consist of combinations of TNM scores based on prognosis. A prognosis is the likely outcome of the cancer. **See Guide 7** for a list of TNM scores by cancer stage.

- **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, lung cancer staging is done twice

The cancer stage before treatment is called the clinical stage. It is noted with a lowercase “c.” An example is cN0.

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

Some lung 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.

### Guide 7 Stages of lung cancer

Cancer stage	TNM scores
<b>1A</b>	T1, N0, M0
<b>1B</b>	T2a, N0, M0
<b>2A</b>	T2b, N0, M0
<b>2B</b>	T3, N0, M0
	T1, N1, M0 T2, N1, M0
<b>3A</b>	T3, N1, M0
	T4, N0, M0
	T4, N1, M0
	T1, N2, M0 T2, N2, M0
<b>3B</b>	T3, N2, M0
	T4, N2, M0
	T1, N3, M0
	T2, N3, M0
<b>3C</b>	T3, N3, M0
	T4, N3, M0
<b>4A</b>	Any T, Any N, M1a
	Any T, Any N, M1b
<b>4B</b>	Any T, Any N, M1c

## Primary treatment

Primary treatment is the main treatment used to rid your body of cancer. Not everyone with non-small cell lung cancer (NSCLC) receives the same primary treatment. Experts plan treatment based on many factors, including:

- The cancer stage
- The number of unrelated (primary) tumors, which is one for most people
- Challenges to treating the cancer
- Your health

## Types of primary treatment

There are three types of primary treatment used for early and locally advanced NSCLC:

**Surgery** is a treatment that removes tumors or organs with cancer. When possible, surgery is used for primary treatment. For many people, other types of treatments are received before or after surgery. More information is in Chapter 5.

**Radiation therapy** most often uses high-energy x-rays to treat lung cancer. When the goal is to cure cancer, it is called definitive radiation therapy. Read Chapter 6 for more information.

### Lung cancer stages

The stages of lung cancer are complex because they take into account the many ways lung cancer grows. Stages are based on the size and number of lung tumors, and if a lung tumor grew through the wall of the lung into nearby body parts (shown). The latter is called invasive growth. Cancer stages are further based on cancer spread to nearby lymph nodes (also shown) and to distant body parts.

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

Nerve that controls voice box  
Trachea

Carina

Esophagus

Breastbone

Diaphragm

Nerve that controls diaphragm

Vena cava

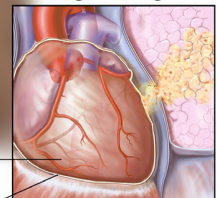
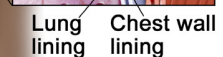
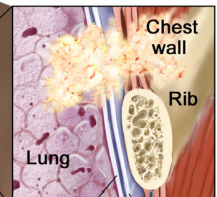
Aorta

Heart

Sac around heart

Cancer in lymph nodes

Primary tumor



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**Chemoradiation** is treatment with both chemotherapy and radiation therapy. Chemotherapy uses powerful drugs to kill cancer cells. When the goal is to cure cancer, chemoradiation is called definitive chemoradiation. More information on chemoradiation is in Chapter 7.

**See Guide 8** to learn options for primary treatment based on the clinical stage of the cancer.

### Guide 8

#### Options for primary treatment of early and locally advanced NSCLC

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



## Clinical trials

Another possible option for cancer care is 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 care team 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



## 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)

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 it with family, friends, or others whom 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 care team to bring up clinical trials. Start the conversation and learn about all of your treatment options. If you find a study for which you may be eligible, ask your treatment team if you meet the requirements. If you have already started standard treatment, you may not be eligible for certain clinical trials. 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.

### Will I get a placebo?

Placebos (inactive versions of real medicines) are almost never used alone in cancer clinical trials. It is common to receive either a placebo with a standard treatment or a new drug with a standard treatment. You will be informed, verbally and in writing, if a placebo is part of a clinical trial before you enroll.

## Are clinical trials free?

There is no fee to enroll in a clinical trial. The study sponsor pays for research-related costs, including the study drug. You may, however, have costs indirectly related to the trial, such as the cost of transportation or child care due to extra appointments. During the trial, you will continue to receive standard cancer care. This care is billed to—and often covered by—insurance. You are responsible for copays and any costs for this care that are not covered by your insurance.

## Key points

- A cancer stage is a rating of the growth and spread of cancer.
- A TNM staging system is used to score different areas of lung cancer growth. The T score is a rating of the growth of the lung tumor. The N score is a rating of cancer in lymph nodes, and the M score is a rating of distant cancer spread.
- There are 4 main stages of lung cancer based on the TNM scores. For some people, cancer staging is done twice—before and after surgery.
- Your care team will plan treatment largely based on the cancer stage. Surgery is a standard primary treatment for stage 1, stage 2, and stage 3 lung cancers. If surgery is not an option, radiation therapy or chemoradiation may be used for primary treatment instead.
- Another possible option for cancer care is a clinical trial. A clinical trial tests new ways of stopping cancer in people.

# 5

## Surgery

- 37 Planning treatment
- 39 Treatment before surgery
- 40 Lung cancer surgery
- 43 Treatment after surgery
- 44 Key points

**Surgery is a standard treatment for lung cancer, but the treatment approach differs between people. Read this chapter to learn how treatment is tailored for every person.**

## Planning treatment

Surgery, by itself or with other treatments, is used to treat most early non-small cell lung cancers (NSCLC) and many locally advanced NSCLC. The goal of treatment is to cure cancer. Ask your care team if surgery is an option for you.

### Surgery

Surgery may be an option if all the cancer can be safely removed. See a highly experienced, board-certified thoracic surgeon. Lung cancer surgery should be a major part of their practice. To decide if you can safely undergo surgery, your surgeon will consider:

- Where the cancer is within your lung and outside your lung
- The health of your lungs
- Your overall health

Cancer that can be safely and completely removed is called resectable cancer.

### Perioperative therapy

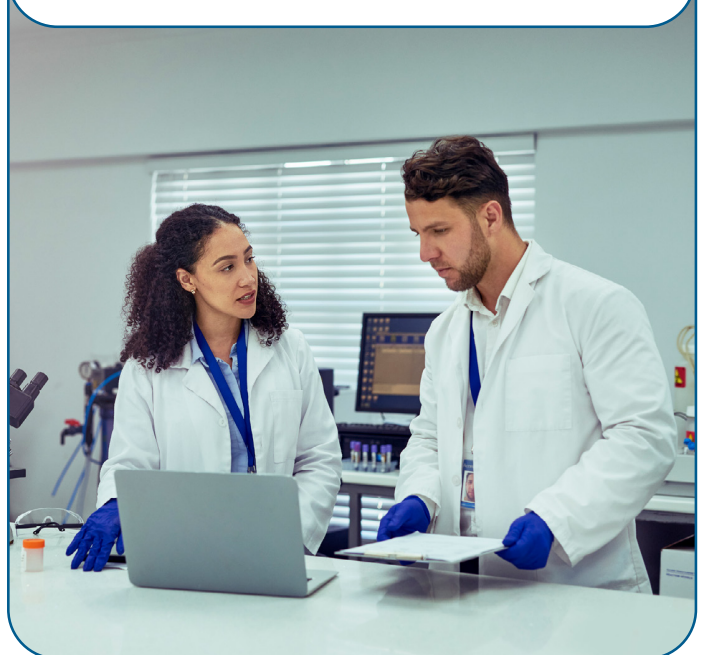
Resectable NSCLC is sometimes treated with more than one type of treatment. These other treatments are referred to as perioperative therapy. Your care team will decide whether you'll start perioperative therapy before or after surgery.

### Systemic therapy

Systemic therapy is commonly used for perioperative therapy. It is a whole-body treatment with cancer drugs.

A medical oncologist is an expert in systemic therapy and will prescribe a regimen based on your overall health and the cancer. A regimen

**"The good news is that today the medical industry has made great advances in treating cancer. They create a custom designed treatment specifically for you."**



consists of one or more drugs that are taken at a specific dose, schedule, and length of time.

### Radiation therapy

Radiation therapy is sometimes used for perioperative therapy. It may be used alone or combined with chemotherapy to treat cancer in one area of the body. A radiation oncologist is an expert in treating cancer with radiation and will plan your radiation therapy.

**See Guide 9** for a list of all the types of perioperative therapy.

### Supportive care

You will receive supportive care to improve your quality of life. Supportive care can relieve symptoms caused by cancer and its treatment. Unwanted health issues caused by treatment are called side effects.

## Guide 9

### Types of perioperative therapy for NSCLC

<b>Platinum-doublet chemotherapy</b>	Platinum-doublet chemotherapy is a systemic therapy that kills fast-growing cells like cancer. It consists of cisplatin or carboplatin and another type of chemotherapy. These drugs are given as a slow injection into a vein called an infusion. Some are a pill.
<b>Immune checkpoint inhibitors</b>	Atezolizumab (Tecentriq), pembrolizumab (Keytruda), and nivolumab (Opdivo) are immune checkpoint inhibitors. Immune checkpoint inhibitors are a type of systemic immunotherapy that restores the ability of T cells to kill cancer cells. They are given by infusion.
<b>Chemoimmunotherapy</b>	Chemoimmunotherapy is a systemic therapy consisting of both platinum-doublet chemotherapy and nivolumab.
<b>Targeted therapy</b>	Osimertinib (Tagrisso) is a type of systemic therapy called targeted therapy. It stops chemical signals from proteins called EGFR that tell lung cancer cells to grow. It is a pill that can be taken at home.
<b>Radiation therapy</b>	Radiation therapy kills fast-growing cells like cancer with high-energy x-rays. A large machine aims radiation beams at the cancer as you lie on a table. More information is in Chapter 6.
<b>Chemoradiation</b>	Chemoradiation is treatment with both chemotherapy and radiation therapy. Sequential chemoradiation is the use of one treatment then the other. Concurrent chemoradiation is the use of both treatments during the same time frame. More information is in Chapter 7.

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

## Treatment before surgery

Neoadjuvant therapy is perioperative therapy that's given before the main treatment. It is sometimes called preoperative therapy or induction therapy. For NSCLC, neoadjuvant therapy before surgery consists of systemic therapy with or without radiation therapy.

### Neoadjuvant instead of adjuvant therapy

Neoadjuvant systemic therapy may be received in place of getting adjuvant systemic

therapy. Adjuvant therapy is received after surgery.

**Neoadjuvant chemoimmunotherapy** is used to treat NSCLC tumors that are 4 centimeters or larger or NSCLC that has spread to lymph nodes. Chemoimmunotherapy regimens are listed in **Guide 10**.

Your medical oncologist will not prescribe chemoimmunotherapy if it is unsafe for you. It may not be safe if you have an autoimmune disease or you are taking medications that suppress your immune system.

Your medical oncologist may not prescribe chemoimmunotherapy if it likely won't work well. Immune checkpoint inhibitors don't work as well for lung cancer with *EGFR* mutations or *ALK* rearrangements compared to lung cancers without these biomarkers.

### Guide 10

#### Neoadjuvant chemoimmunotherapy for NSCLC

	Adenocarcinoma, large cell carcinoma, and rare cell types	Squamous cell carcinoma
<b>Regimens used with nivolumab:</b>		
Cisplatin, pemetrexed	●	
Carboplatin, pemetrexed	●	
Cisplatin, gemcitabine		●
Carboplatin, gemcitabine		●
Carboplatin, paclitaxel	●	●
Cisplatin, paclitaxel	●	●

When chemoimmunotherapy is not an option, **platinum-doublet chemotherapy** may be received. Platinum-doublet chemotherapy regimens are listed in **Guide 11**.

### Shrinking cancer before surgery

For some lung cancers, neoadjuvant therapy is given to shrink the cancer and make surgery easier.

Although not the preferred approach to treatment, concurrent chemoradiation or systemic therapy may be the first treatment for:

- Stage 2B and stage 3A cancers with T3 tumors that invaded tissue near the lung
- Stage 3A cancers with T4 tumors

Concurrent chemoradiation is the first treatment of superior sulcus tumors before surgery. 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.

NSCLC with an N2 stage is sometimes treated with surgery. Neoadjuvant systemic therapy or neoadjuvant chemoradiation may stop cancer growth and make surgery possible.

### Lung cancer surgery

Surgery will be scheduled if there's a good chance that all the cancer will be removed. Your surgeon must see a way to remove the tumor with enough normal-looking tissue at its edge, which is called the surgical margin. The goal is to have no cancer cells in the margin, so a cure is likely.

During surgery, your surgeon will explore your inner chest to see where the cancer is

#### Guide 11

#### Perioperative platinum-doublet chemotherapy for NSCLC

Regimens	Adenocarcinoma, large cell carcinoma, and rare cell types	Squamous cell carcinoma
Cisplatin, pemetrexed	●	
Cisplatin, gemcitabine		●
Cisplatin, docetaxel		●
Cisplatin, vinorelbine	●	●
Cisplatin, etoposide	●	●
Carboplatin, paclitaxel	●	●
Carboplatin, gemcitabine	●	●
Carboplatin, pemetrexed	●	

● preferred regimens      ● other regimens

growing. Your surgeon will have a better view of the tumor during surgery. Also, there may be areas of growth that weren't seen on imaging scans but then will be found during surgery.

### Types of lung surgery

The type of surgery you will have depends on where the tumor has grown and how well your lungs work. There are five types of lung surgery:

- **Wedge resection** removes a small part of a lobe.

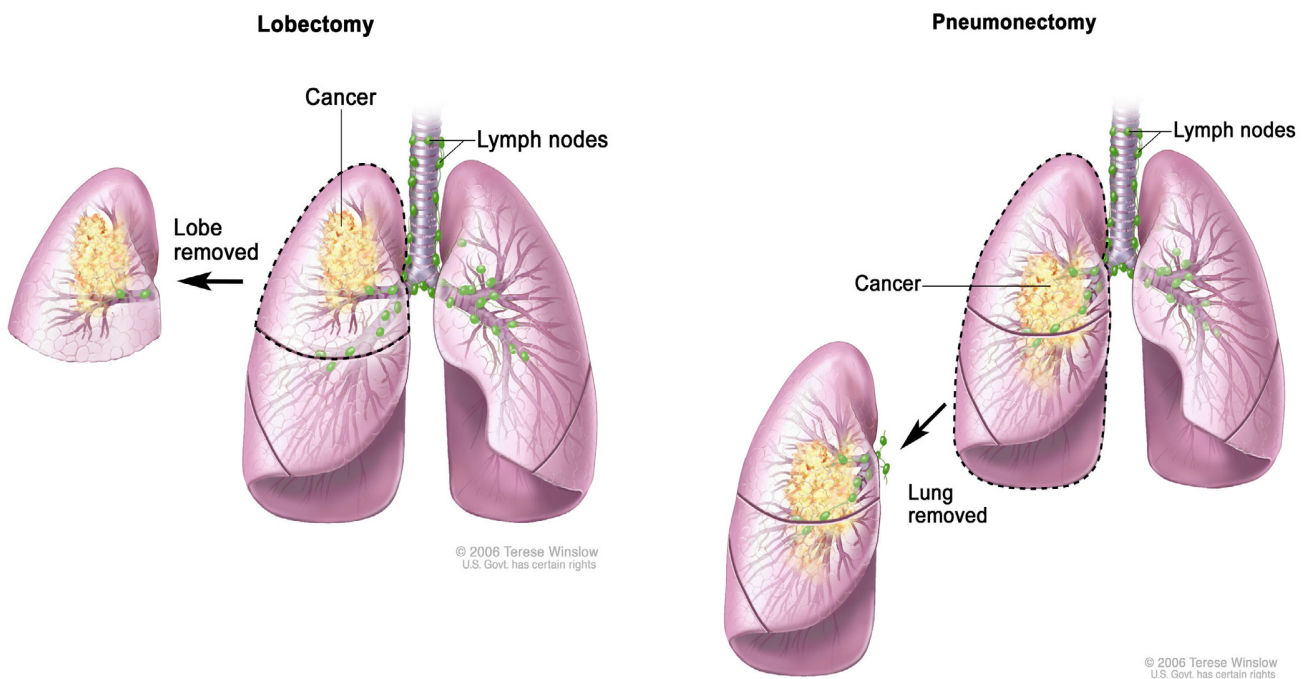
- **Segmentectomy** removes a large part of a lobe.
- **Lobectomy** removes an entire lobe and is preferred for most lung cancers.
- **Sleeve lobectomy** removes an entire lobe and part of the main airway.
- **Pneumonectomy** removes an entire lung.

Lung tumors that have grown through the lung wall into other body tissue will be removed in one piece. This surgery is called an en-bloc resection.

### Types of lymph node surgery

#### Lung cancer surgery

There are five 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.





During surgery, lymph nodes that have or may have cancer will also be removed. To remove nodes, some organs may need to be moved or cut. There are two types of lymph node surgery:

- A **systematic lymph node sampling** removes some nodes in the lung and between the lungs.
- A **lymph node dissection** removes as many nodes as possible from the lung and between the lungs.

## Methods of surgery

Removal of a lung tumor is done with one of two methods:

The classic or open method is called **thoracotomy**. The surgery is performed through a cut between the ribs. Sometimes, part of the rib needs to be removed, too.

The newer method is a less invasive surgery and is performed through smaller cuts between the ribs. Your surgeon will insert surgical tools through these cuts. One of the tools has a small video camera, and the video of your inner chest will be displayed on a screen

Minimally invasive surgery for lung cancer is called **thoracoscopy** or **video-assisted thoracoscopic surgery (VATS)**. Your surgeon may perform thoracoscopy using robotic arms to control the surgical tools. This approach is called **robotic-assisted thoracoscopic surgery**.

## Results of surgery

Removed tissue and any sampled fluid will be examined for cancer. Your surgeon and

pathologist will rate the surgical margin around the tumor:

- **R0** means no cancer was found in the margin
- **R1** means cancer was found in the margin with a microscope
- **R2** means cancer was seen in the margin without a microscope

Normal-looking lymph nodes that were removed will also be examined for cancer. When lymph nodes farthest from the tumor don't have cancer, it is likely that all nodes with cancer were removed.

Surgery is described as a complete resection when surgical margins, the furthest lymph nodes, and the fluid around the lungs and heart are cancer-free.

After surgery, you may start adjuvant therapy or surveillance. Adjuvant therapy is discussed in the next section in this chapter. Surveillance is ongoing testing to check if the cancer returned and is discussed in Chapter 8.

## Side effects of surgery

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.

## Treatment after surgery

Adjuvant therapy is perioperative treatment that follows the main treatment. It is also called postoperative therapy. It treats cancer that wasn't removed during surgery and lowers the chance of cancer returning.

Your care team will plan treatment based on several factors, including:

- The status of the surgical margin—R0, R1, R2
- The cancer stage after surgery, called the pathologic stage
- Results of biomarker tests

### Cancer-free margins (R0)

Stage 1B may be treated with platinum-doublet chemotherapy if the cancer is highly likely

to return. Chemotherapy is recommended for stage 2B and stage 3 cancers unless you had chemotherapy before surgery.

**See Guide 11** on page 40 for a list of chemotherapy regimens.

If platinum-doublet chemotherapy is not an option, you may receive osimertinib if the cancer has *EGFR* biomarkers.

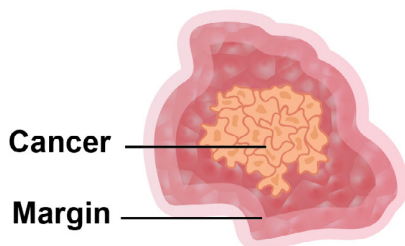
After chemotherapy, you may receive one of these three systemic therapies:

- Osimertinib is an option for stage 1B, stage 2, or stage 3 cancer with *EGFR* biomarkers.
- Atezolizumab is an option for stage 2 or stage 3 cancer with a PD-L1 level of 1 percent or higher and no *EGFR* and *ALK* biomarkers.

### 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 therapy is based on if there is cancer in the margins.

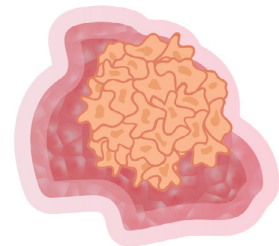
**R0 margin**  
No cancer in margin



**R1 margin**  
Cancer is found in margin with lab tests



**R2 margin**  
Cancer is easily seen in margin



- ▶ Pembrolizumab is an option for stage 2 or stage 3 cancer with no *EGFR* or *ALK* biomarkers.

Cancers with an N stage of N2 may be treated with radiation therapy after chemotherapy is completed.

### Cancer in margins (R1, R2)

A second surgery may be done unless the N stage is N2. After surgery, chemotherapy is an option for stage 2A cancer but is recommended for stage 2B and stage 3 cancers.

Radiation therapy is an option for early cancers—stages 1 and 2A—when surgery is likely to cause complications. After radiation therapy, stage 2A cancer may be treated with chemotherapy.

Chemoradiation is an option for stage 2B and stage 3 cancers if you haven't had it before. Either sequential or concurrent chemoradiation is recommended after surgery with R1 margins. Concurrent chemoradiation is recommended when there are R2 margins.

## Key points

- ▶ Surgery is a common treatment for lung cancer. The goal is to cure the cancer.
- ▶ Choose a highly experienced, board-certified thoracic surgeon who can remove all the cancer safely.
- ▶ Other treatments are often used with surgery to treat lung cancer. They may be given before or after surgery.
- ▶ There are five types of lung surgery that range from removing a piece of a lobe to removing the entire lung. Lymph nodes

that have or may have cancer will be removed, too.

- ▶ Lung cancer surgery can be performed by one of two methods. During open surgery, body tissue is removed through one large cut. Minimally invasive surgery is performed through several small cuts.
- ▶ Learn about the side effects of your treatments. Let your treatment team know about any new or worsening symptoms.



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and help make the  
NCCN Guidelines for Patients  
better for everyone!**

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

# 6

## Radiation therapy

- 46 Uses of radiation therapy
- 47 Types of radiation therapy
- 47 Curing lung cancer with radiation
- 48 Side effects of radiation
- 48 Key points

**Radiation therapy is a common treatment of lung cancer. This chapter explains how radiation therapy works and some things to expect during treatment.**

## Uses 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.

Radiation therapy is used in many ways to treat early and locally advanced non-small cell lung cancer (NSCLC):

- Radiation therapy is sometimes received after surgery as described in Chapter 5.

- Radiation therapy is sometimes combined with chemotherapy and called chemoradiation as described in Chapter 7.
- Radiation therapy may be the main (also called primary) treatment of stage 1 and some stage 2 lung cancers. When the goal is to cure cancer, it is called definitive radiation therapy.

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

### 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 radiation therapy

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

There are several common techniques of EBRT:

- **Intensity-modulated radiation therapy (IMRT)** delivers x-ray beams that very closely match the shape of the target and spare more normal tissue.
- **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.
- **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 1 to 1½ weeks.
- **Proton therapy** treats cancer with proton beams. Proton beams deliver radiation mostly within the tumor. Treatment is completed in about 6 weeks.

Radiation therapy is typically delivered daily from Monday through Friday. Treatment visits are about 15 minutes for IMRT and 3D-CRT and 30 to 45 minutes for SABR and proton therapy. Some radiation oncologists deliver SABR treatment 2 to 3 times per week.

## Curing lung cancer with radiation

EBRT is used when trying to cure NSCLC. Any of the EBRT techniques described may be used though NCCN experts typically prefer SABR for early-stage cancer and IMRT for locally advanced cancer.

### Overcoming treatment challenges

A lung tumor is harder to target than some other tumors in the body. Lung tumors often move when you breathe. To account for these challenges, advanced methods may be used:

- Four-dimensional computed tomography (4D-CT) may be used for treatment planning. It's like a video, so your radiation oncologist will see how the tumor moves when you breathe.
- Motion control methods may be used to keep you still during treatment.
- At times, your radiation oncologist may ask you to hold your breath for 15 to 20 seconds at a time to better target the tumor.

### Adjuvant therapy

Adjuvant therapy is cancer treatment that follows the main treatment of cancer, in this case, radiation therapy. In special cases, stage 1B or stage 2 cancer may be treated with adjuvant chemotherapy if the cancer is highly likely to return.

Adjuvant chemotherapy can treat cancer that radiation did not. Large tumors and very abnormal-looking cancer cells may have spread to places outside the radiation field.

**See Guide 11** in Chapter 5 for a list of

chemotherapy regimens used for adjuvant therapy.

## Side effects of radiation

Radiation therapy does not:

- Cause pain during a treatment session—people feel nothing at all
- Make you radioactive

On the other hand, radiation therapy may cause health problems called side effects. Side effects of radiation therapy are cumulative. This means they build up slowly and are worse at the end of treatment. Side effects that start during radiation therapy typically improve 2 to 4 weeks after treatment is finished.

- Fatigue is a common side effect.
- Skin changes in the treatment area are also common. Often, people describe skin changes as like a sunburn. For people with darker skin, radiation can cause the skin to darken and be painful.
- Near the end of treatment, you may have pain when swallowing due to irritation to your esophagus.
- Although not common, your lung may become inflamed after treatment causing sudden shortness of breath or cough. These are symptoms of radiation pneumonitis. Call your radiation oncologist immediately if you have these symptoms.

Ask your treatment team for a complete list of side effects of your treatments. During your treatment, your radiation oncologist will see you about once a week to assess for possible side effects. Tell your care team about any new

or worsening symptoms you have. There may be ways to help you feel better. There are also ways to prevent some side effects.

## Key points

- Radiation therapy uses high-energy x-rays or particles to treat lung cancer.
- There are several ways radiation therapy is used to treat lung cancer. When used to cure cancer, it is called definitive radiation therapy.
- Radiation therapy is most often delivered from outside the body using a large machine.
- Several techniques are available to cure lung cancer, such as SABR for early-stage cancer and IMRT for locally advanced cancer.
- You may receive chemotherapy after radiation therapy.
- Side effects from radiation build up over the course of treatment and typically improve 2 to 4 weeks after treatment is done.

# 7

## Chemoradiation

50 Uses of chemoradiation

50 Types of chemotherapy

52 Curing lung cancer

52 Consolidation treatment

52 Side effects

53 Key points



**Chemoradiation uses the power of two different treatments. Read this chapter to learn the options and what to expect.**

## Uses of chemoradiation

Chemoradiation is a combination of these two treatments:

- **Chemotherapy** stops the process by which cells make more cells, so it affects fast-growing cells like cancer.
- **Radiation therapy** uses high-energy x-rays or particles to damage cancer cells. The cancer cells either die or can't make more cancer cells.

Chemoradiation is used in two ways to treat early and locally advanced non-small cell lung cancer (NSCLC):

- Chemoradiation is sometimes received before or after surgery as described in Chapter 5.
- Chemoradiation may also be the main (also called primary) treatment of lung cancer. When the goal is to cure cancer, it is called definitive chemoradiation.

## Types of chemotherapy

Radiation therapy is described in Chapter 6; below is a short description of chemotherapy.

Chemotherapy is a type of medication. Doctors called medical oncologists prescribe it. They know which medications treat which cancers.

For NSCLC, more than one type of chemotherapy is often received. Often,

### Chemotherapy

**Chemotherapy for lung cancer is often a liquid that is injected into a vein. Some injections are done in the arm or hand while others are done through an implanted device called a port. An infusion is a slow drip controlled by a pump that may take hours.**



cisplatin or carboplatin is used with another cancer drug. These regimens are called platinum-doublet chemotherapy.

Chemotherapy regimens used for chemoradiation are listed in **Guide 12**.

You will not receive chemotherapy every day. Instead, it will be 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.

You will need to go to a treatment center to get chemotherapy. The chemotherapy will be slowly injected into your vein. This is called an infusion. Some chemotherapy drugs are pills. Chemotherapy travels in your bloodstream to treat cancer throughout your body.

### Guide 12

#### Chemotherapy regimens used to treat NSCLC with chemoradiation

Sequential chemoradiation	Adenocarcinoma, large cell carcinoma, and rare cell types	Squamous cell carcinoma
Cisplatin, pemetrexed	●	
Cisplatin, gemcitabine		●
Cisplatin, docetaxel		●
Cisplatin, vinorelbine	●	●
Cisplatin, etoposide	●	●
Carboplatin, paclitaxel	●	●
Carboplatin, gemcitabine	●	●
Carboplatin, pemetrexed	●	
<b>Concurrent chemoradiation</b>		
Carboplatin, pemetrexed	●	
Cisplatin, pemetrexed	●	
Carboplatin, paclitaxel	●	
Cisplatin, etoposide	●	
Carboplatin, paclitaxel		●
Cisplatin, etoposide		●

● preferred regimens      ● other regimens

## Curing lung cancer

Definitive chemoradiation is a treatment option for some stage 2B and stage 3 NSCLC. There are two scheduling approaches to delivering chemoradiation:

- **Concurrent chemoradiation** means that chemotherapy and radiation therapy are given at the same time.
- **Sequential chemoradiation** means you will first complete chemotherapy and then receive radiation therapy. This schedule may be followed if concurrent treatment is likely too harmful for you.

### Chemoradiation differs between people

Your treatment team will make a plan for you based on several factors, such as:

- Concurrent or sequential schedule
- Type of lung cancer
- How well a chemotherapy works (preferred regimens work well and are safe)

Chemotherapy cycles vary in length depending on which drugs are used. Ask your medical oncologist how many cycles you will have and how many days of treatment there are within a cycle.

Radiation therapy also differs between people based on treatment schedule:

- For concurrent chemoradiation, radiation therapy is typically delivered in 30 to 35 small doses called fractions over 6 to 7 weeks.
- For sequential chemoradiation, radiation therapy is also delivered in 30 to 35 small doses called fractions over 6 to 7 weeks.

In some cases, you may be treated with about 15 higher-dose fractions.

## Consolidation treatment

The goals of consolidation are to bolster the results of treatment and improve the chance of a cure. Durvalumab (Imfinzi) is used as consolidation treatment after definitive chemoradiation.

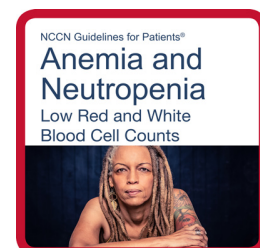
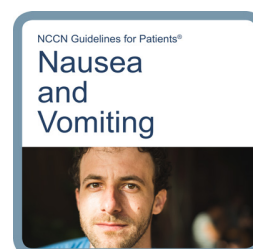
Durvalumab is a type of immunotherapy called a checkpoint inhibitor. Immunotherapy uses the immune system to kill cancer cells. Durvalumab works by enabling immune cells called T cells to attack cancer cells.

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

Side effects are unwanted health problems caused by treatment. All cancer treatments cause side effects. But side effects differ between people based on the type and length of treatment as well as the person.

Side effects from chemotherapy are caused by the death of fast-growing normal cells. Side effects are typically worse with concurrent chemoradiation compared with sequential chemoradiation. Information on management



of nausea and vomiting and low blood counts is available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.

Immune checkpoint inhibitors can cause your immune cells to attack healthy cells in your body. More information about immune-related side effects is available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.



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

## Key points

- Chemoradiation is a treatment with both chemotherapy and radiation therapy. It may be used to try to cure lung cancer.
- Chemotherapy for lung cancer often consists of a drug made with platinum and one other drug. It is slowly infused into a vein.
- Often, chemotherapy and radiation therapy are given at the same time.
- Durvalumab may be received after chemoradiation to improve the chance of a cure.
- Let your treatment team know about any new or worsening symptoms.



Learning to manage side effects is well worth the effort!”

# 8

## Survivorship care

- 55 Cancer tests
- 56 Managing side effects
- 56 Disease prevention
- 57 Key points

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

## Cancer tests

While non-small cell lung cancer (NSCLC) can sometimes be cured, it is very important to watch 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 to check 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 12** for a schedule of tests.

You may be at risk for a second lung cancer. Anyone who has been treated and cured of

### Guide 12 Surveillance after treatment of NSCLC

#### Your treatment did not include radiation therapy

Every 6 months for 2 to 3 years, see your care team for a:

- Medical history
- Physical exam
- Computed tomography (CT) of the chest with or without contrast

If test results are normal, then repeat every year:

- Medical history
- Physical exam
- Low-dose CT of the chest

#### Your treatment did include radiation therapy

Every 3 to 6 months for 3 years, see your care team for a:

- Medical history
- Physical exam
- CT of the chest with or without contrast

If test results are normal, then repeat every 6 months for 2 years:

- Medical history
- Physical exam
- CT scan of the chest with or without contrast

If test results remain normal, then repeat every year:

- Medical history
- Physical exam
- Low-dose CT of the chest

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.

## Cancer screening

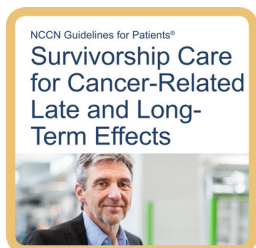
A second cancer is a possible late effect of some cancer treatments. Ask your care team about your risk for another cancer. If you have a high risk for certain cancers, you may enroll in a screening program. Cancer screening is routine testing for cancer before cancer symptoms start.

Not every type of cancer has a screening program. There are cancer screening programs for:

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

## 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 care team will assess for side effects. They will provide treatment for side effects as needed. More information on common effects is available at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.

## Disease prevention

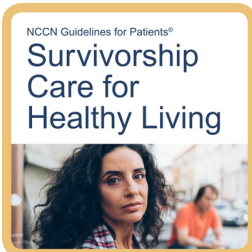
Another part of follow-up care is to prevent diseases. Such care can include getting immunization shots for the flu, herpes, shingles, and other diseases. Dental cleaning and exams on a regular basis can prevent disease, too.

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 healthy body weight
- Not using tobacco
- Avoiding infections
- Getting safe vaccines

Learn about preventing poor health at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.



## Key points

- Your care team will monitor for a return of lung cancer. Early detection allows 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 team will assess for side effects. Tell your team about any new or worsening 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.



### **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)



# 9

## Making treatment decisions

- 59 It's your choice
- 59 Questions to ask
- 67 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 care team.**

## 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 decision-making:

- What you want and how that might differ from what others want
- Your religious and spiritual beliefs
- Your feelings about certain treatments
- Your feelings about pain or side effects
- Cost of treatment, travel to treatment centers, and time away from school or 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 sent to the doctor you will see for your second opinion.

## 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

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 about cancer testing

1. What tests will I have?
2. Do I need a biopsy? Will enough tissue be removed for future testing?
3. Do the tests have any risks?
4. Do I need to do anything to prepare for testing?
5. Should I bring someone with me to the appointments?
6. Where do I go for testing, and how long will it take?
7. If any of the tests will hurt, what will you do to make me comfortable?
8. How soon will I know the results and who will explain them to me?
9. How can I get a copy of the pathology report and other test results?
10. Is there an online portal with my test results?

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## Questions about treatment options

1. Is a clinical trial an option for me?
2. What will happen if I do nothing?
3. Are you suggesting options other than what NCCN recommends? If yes, why?
4. How do my age, sex, overall health, and other factors affect my options?
5. What if I am pregnant or planning to become pregnant?
6. Does any option offer a cure or long-term cancer control?
7. How do I get a second opinion?
8. How long do I have to decide about treatment, and is there a social worker or someone who can help me decide?

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## Questions about what to expect

1. Do I have a choice of when to begin treatment?
2. How often will I need to come to the cancer clinic? How long will treatment last?
3. Will my care require any special arrangements like housing or a certain diet?
4. What may prevent me from getting the care I need?
5. How can I know if what I'm feeling is normal or if I need help?
6. What expenses will I have to pay out of pocket?
7. Whom should I contact with questions or concerns if the office is closed?
8. How will you know if treatment is working?
9. What are the chances of the cancer worsening or returning?
10. What follow-up care is needed after treatment?

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## Questions about side effects

1. What are the possible complications and side effects of treatment?
2. Does the cancer itself cause any side effects?
3. Which side effects are most common and how long do they usually last?
4. Which side effects are serious or life-threatening?
5. Are there any long-term or permanent side effects?
6. What symptoms should I report right away, and whom do I contact?
7. What can I do to prevent or relieve the side effects of treatment?
8. Do any medications worsen side effects?
9. Do any side effects lessen or worsen in severity over time?
10. Will you stop or change treatment if there are serious side effects?

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## Questions about clinical trials

1. Do you recommend that I consider a clinical trial for treatment?
2. How do I find clinical trials in which I can participate?
3. What are the treatments used in the clinical trial?
4. Has the treatment been used for other types of cancer?
5. What are the risks and benefits of this treatment?
6. What side effects should I expect and how will they be managed?
7. How long will I be in the clinical trial?
8. Will I be able to get other treatment if this doesn't work?
9. How will you know if the treatment is working?
10. Will the clinical trial cost me anything?

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## Questions about your care team's experience

1. Are you board certified? If yes, in what area?
2. What is your experience as well as your team's experience with treating the type of cancer I have?
3. How many patients like me (of the same age, gender, race) have you treated?
4. Will you be consulting with experts to discuss my care? Whom will you consult?
5. Is this treatment (or procedure) a major part of your practice? How often have you done this treatment (or procedure) in the last year?
6. How many of your patients have had complications? What were the complications?

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## Questions about supportive care

1. What supportive care and services are available to me and my caregivers?
2. Are there any programs to help pay for out-of-pocket costs of cancer care?
3. Does this center provide transportation to and from appointments? What about child care during health care appointments?
4. Is there help for basic needs like food and housing?
5. Where can I get legal advice? Is my job legally protected if I take a leave from work?
6. Who can help me cope with stress? Is there a support group that would be a good fit for me?
7. Who can advise me and my family about end-of-life concerns?

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## Resources

**American Lung Association**

[lung.org/lung-health-diseases/lung-disease-lookup/lung-cancer](https://lung.org/lung-health-diseases/lung-disease-lookup/lung-cancer)

**Cancer Hope Network**

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

**Caring Ambassadors Program, Inc.**

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

**Free Me from Lung Cancer**

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

**Go2 Foundation for Lung Cancer**

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

**LiveLung (Dusty Joy Foundation)**

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

**Lung Cancer Action Network (LungCAN)**

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

**Lung Cancer Research Foundation**

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

**Triage Cancer**

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



## Words to know

### **3D-CRT**

Three-dimensional conformal radiation therapy

### **adenocarcinoma**

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

### **adjuvant treatment**

Treatment that is given after the main treatment to prevent the cancer from returning.

### **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 look inside the airways.

### **bronchoscopy**

A procedure to look 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 for cancer in people without symptoms.

### **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.

### **chemoimmunotherapy**

A combined treatment with both chemotherapy and immunotherapy.

### **chemoradiation**

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

### **chemotherapy**

Treatment with cancer drugs that kill fast-growing cells.

### **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.

## Words to know

### **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 substance put into your body to make clearer pictures during imaging.

### **diagnosis**

An identification of an illness based on tests.

### **endobronchial ultrasound (EBUS)**

A procedure that takes detailed pictures inside the body with a device guided down the windpipe.

### **endoscopic ultrasound (EUS)**

A procedure that takes detailed pictures inside the body with a device guided down the throat.

### **esophagus**

The tube-shaped organ between the mouth and stomach.

### **external beam radiation therapy (EBRT)**

Radiation therapy received from a machine outside the body.

### **FDA**

Food and Drug Administration

### **FDG**

fluorodeoxyglucose

### **four-dimensional computed tomography (4D-CT)**

A test that makes of video of the inside of your body.

### **gas diffusion**

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

### **immunotherapy**

A drug treatment that helps the body's immune system 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 from where it started into another type of 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.

### **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.

## Words to know

### **medical history**

A report of all your health events and medications.

### **metastasis**

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

### **navigational bronchoscopy**

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

### **NCCN**

National Comprehensive Cancer Network

### **neoadjuvant therapy**

A cancer treatment that is given before the main treatment.

### **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.

**ROSE**

rapid on-site evaluation

**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**

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**

Cancer 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.

**survivorship care**

Interventions to improve the health and wellbeing of people who have or had cancer.

**thoracic radiologist**

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

**targeted therapy**

A drug treatment that impedes the growth process specific to cancer cells.

**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.

**transthoracic needle aspiration (TTNA)**

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®) for Non-Small Cell Lung Cancer, Version 3.2023. It was adapted, reviewed, and published with help from the following people:

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# NCCN Cancer Centers

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

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

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

**Dana-Farber/Brigham and Women's Cancer Center |  
Mass General 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)

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

**Fred Hutchinson Cancer Center**  
Seattle, Washington  
206.667.5000 • [fredhutch.org](http://fredhutch.org)

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

**Indiana University Melvin and Bren Simon  
Comprehensive Cancer Center**  
Indianapolis, Indiana  
888.600.4822 • [www.cancer.iu.edu](http://www.cancer.iu.edu)

**Mayo Clinic Comprehensive 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)

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

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

**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)

**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)

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

**The UChicago Medicine Comprehensive Cancer Center**  
Chicago, Illinois  
773.702.1000 • [uchicagomedicine.org/cancer](http://uchicagomedicine.org/cancer)

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

**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)

## NCCN Cancer Centers

### 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)

### 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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## **DR SHIVAM SHINGLA**

**BSES MG Hospital (Andheri):**

**9 am to 10 am (Monday to Friday)**

**Nanavati Max Hospital (Vile Parle):**

**10 am to 12 pm (Monday to Saturday)**

**S. L. Raheja Hospital (Mahim):**

**12 pm to 4 pm (Monday to Saturday)**

**Suvarna Hospital (Borivali):**

**5 pm to 6 pm (Monday and Friday)**

**Sushrut Hospital (Chembur):**

**By appointment**

**Hinduja Hospital (Khar): By**

**appointment**

**Galaxy Healthcare (Borivali): By**

**appointment**



**[www.drshivamshingla.com](http://www.drshivamshingla.com)**



**[drshivamshingla@gmail.com](mailto:drshivamshingla@gmail.com)**



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**#Reference From NCCN Guidelines**