



NCCN
GUIDELINES
FOR PATIENTS®

2024

Early and Locally Advanced Non-Small Cell Lung Cancer



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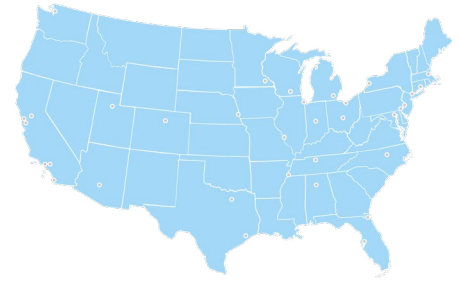
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About the NCCN Guidelines for Patients®



Did you know that top cancer centers across the United States work together to improve cancer care? This alliance of leading cancer centers is called the National Comprehensive Cancer Network® (NCCN®).



Cancer care is always changing. NCCN develops evidence-based cancer care recommendations used by health care providers worldwide. These frequently updated recommendations are the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®). The NCCN Guidelines for Patients plainly explain these expert recommendations for people with cancer and caregivers.

These NCCN Guidelines for Patients are based on the NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Non-Small Cell Lung Cancer, Version 7.2024 — June 26, 2024.

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Lung cancer basics

- 5 What is NSCLC?
- 6 What is early and locally advanced NSCLC?
- 7 What's the best treatment?
- 7 Key points

If you're reading this, you or someone you care for might have non-small cell lung cancer (NSCLC). It's the most common type of lung cancer. In this chapter, you'll learn what this type of cancer is and what it means if it's early or locally advanced.

Lung cancer cells grow out of control. They don't die when they should and make many new cancer cells, which become tumors.

Lung cancer cells also don't stay in place. They can break away from a tumor, spread outside the lung, and form more tumors.

NSCLC is a type of lung carcinoma

Almost all lung cancers are carcinomas (kar-sin-OH-mas). Lung carcinomas form from cells that line the airways of the lungs. The airways inside the lungs are the bronchi, bronchioli, and alveoli.

NSCLC is the most common lung carcinoma. Other lung carcinomas are neuroendocrine tumors. Information on lung neuroendocrine tumors can be found at

What is NSCLC?

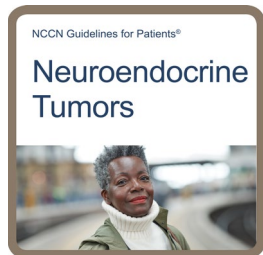
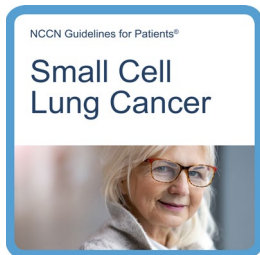
Non-small cell lung cancer (NSCLC) is a type of lung cancer. Another type of lung cancer is small cell lung cancer, but it is a different cancer covered in another book.

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 divides 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.



[NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.



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.

There are several types of NSCLC

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

- **Adenocarcinoma** (A-deh-noh-KAR-sih-NOH-muh) often forms from cells that line the alveoli and make mucus. This 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** (squay-mous) forms from cells that line the bronchi.

What is early and locally advanced NSCLC?

Early and locally advanced lung cancers have not spread to the tissue lining around the lung or to other organs. The difference between early and locally advanced cancer is mainly based on the cancer stage.

Cancer stages 1, 2, and 3

A cancer stage describes the extent of lung cancer in the body. The main stages of

lung cancer are often written with Roman numerals—stages I (1), II (2), III (3), and IV (4). We will be listing stages as 1, 2, 3, and 4 to make the stages easier to read.

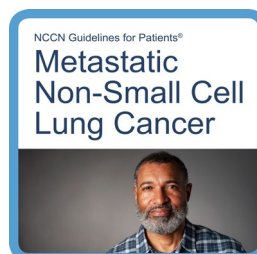
At diagnosis, stage 1, stage 2, and stage 3 cancers have grown from the airway into lung tissue. Some have spread to nearby disease-fighting structures called lymph nodes.

Stage 1 is early NSCLC. In general, stage 2 and stage 3 are considered locally advanced.

Cancer stages and metastasis

Some early and locally advanced cancers spread to the tissue lining around the lung or to other organs after diagnosis and then are called metastatic cancer. Stage 4 cancer is metastatic cancer at the time of diagnosis.

Information about metastatic NSCLC 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?

There's no single treatment for NSCLC that's best for everyone. The best treatment is the treatment that's right for you. The following chapters explain expert recommendations that are based on the latest research and current practices at leading cancer centers.

Often, multiple treatments are used to get the best results

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 2 types of treatments called chemoradiation. Chemoradiation is discussed in Chapter 7.

Supportive care addresses the challenges of cancer

Supportive care has been shown to extend and enhance life for people with lung cancer. Tell your care team about your symptoms and other needs to get the best supportive care for you. More information on supportive care can be found throughout this book.

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. Learn more about clinical trials in Chapter 3.

Advocate for yourself

You are an important member of your cancer care team. Discuss the recommendations in this book with your team. Together, you can make a care plan that's best for you.

There is a list of suggested questions in Chapter 9 to ask your team. You're more likely to get the care you want by asking questions and making decisions with your team.

Key points

- Non-small cell lung cancer (NSCLC) is a cancer of lung cells. Cancers that spread to the lungs are not lung cancer.
- Early and locally advanced NSCLCs are cancers that have grown from the airways into lung tissue, and some have spread to lymph nodes.
- Treatment for NSCLC varies based on what is best for each person. When possible, surgery is used for primary treatment.

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Lung nodules

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Many people have small masses of tissue in their lungs, 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 in lung diseases.
- A **thoracic radiologist** is a doctor who's an expert in imaging of the chest. Imaging takes pictures of the inside of the body.
- A **thoracic surgeon** is a doctor who is an expert in operations within the chest.

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

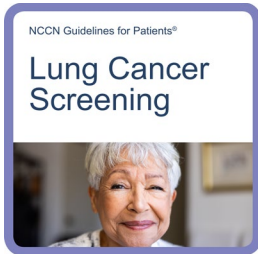
- Assess your risk for lung cancer.
- Review lung images and request more imaging if there may be cancer.
- Perform a procedure called a biopsy, if needed.

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.



If the nodule is unlikely cancer, your team may refer you for lung cancer screening. Lung cancer screening is for people at high risk for lung cancer. 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.



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 for lung cancer are listed in **Guide 1**.

Some people with many risk factors never get lung cancer. Some people with no risk factors do get lung cancer. 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. The risk grows the more times a person smokes and the longer they smoke.

Exposure to second-hand smoke increases the risk of lung cancer. Secondhand smoke 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, and nickel
- Coal smoke, soot, silica, and diesel fumes
- Air pollution by fine particulates, ozone, nitrogen oxides, and sulfur dioxide

Guide 1 Risk factors for lung cancer

Current or past smoking

Exposure to cancer-causing agents

Advanced age

Certain cancers and cancer treatments

Family history of lung cancer

Certain lung diseases like COPD or pulmonary fibrosis

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.

Previous cancers and cancer treatment

The risk for lung cancer increases after having some types of cancer:

- Having one type of lung cancer increases your risk for other types of 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:

- Receiving radiation therapy in the chest increases the risk of having lung cancer years after treatment, 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 lung cancer occurred at a young age or among multiple relatives.

Other lung diseases

Some lung diseases can increase the risk of lung cancer. There's a strong link between lung cancer and these diseases:

- 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 and tissue scarring.

PET hot spots

Cancerous nodules often appear as hot spots on PET. Before the scan, a radiotracer will be injected into one of your veins. 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 often needs to be confirmed by other testing.

Planning follow-up care

After a lung nodule is found, follow-up care is sometimes scheduled. 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.

Nodule features

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 new crayon. The tip of a crayon is about 2 mm.

The first follow-up will be based on the nodule features seen on the baseline scan. The next follow-up, if needed, will be based on comparing your baseline scan to the most current scan.

Types of follow-up care

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

Why get scans? Scans are less invasive than a biopsy.

You may get low-dose CT (LDCT) or a diagnostic CT. 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.

Often, one CT scan doesn't clearly show whether a nodule is cancer. Instead, CT needs to be repeated over time.

A PET/CT scan after a CT scan 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 the middle of your thighs.

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 removes a small amount of tissue or fluid for cancer testing. More information on biopsies can be found in *Removing samples for cancer testing*.

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 less than 6 mm in size don't need immediate follow-up care. Your team will decide what follow-up care is needed.

Nodules between 6 mm and 8 mm in size will be checked between 6 to 12 months, and if you have a high risk for 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**.

Guide 2

Follow-up care for 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"> • CT scan in 3 months • PET/CT scan now • Biopsy now
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"> • CT scan in 3 months • PET/CT scan now • Biopsy now

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.

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

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

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

Guide 3

Follow-up care for 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.

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.

Planning to remove tissue

The plan to remove tissue to test for lung cancer differs between people. A plan that is best for you may not be the best plan for another person.

Your team should include experts who work often with people who have cancer. Team members should include treating providers and specialists, such as:

- Thoracic surgeon
- Thoracic radiologist
- Interventional radiologist
- 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.

Your team will decide the best method to remove test samples.

Removing tissue for cancer testing is not always easy. Your team will decide the best steps to remove tissue. Ways to remove test samples are explained in the next section.

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.

Your team will decide the best time for cancer testing.

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

When nodules will be surgically treated, cancer testing may be done before or on the day of surgical treatment.

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 surgical treatment:

- 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 or if treatment will include stereotactic ablative radiotherapy (SABR).

Removing samples for cancer testing

Your team will choose a method that removes tissue that likely has cancer. They 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 thin tools down your throat into your airways (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, which means healing is easier. These surgeries include mediastinoscopy and thoracoscopy. Thoracoscopy can be performed by video-assisted thoracoscopic surgery (VATS) or robot-assisted thoracoscopic surgery (RATS).
- **Open surgery** involves making a large cut through your chest wall to remove tissue. Open surgery is seldom needed for diagnosis. 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 by the pathologist. Pathologists are health care providers who are experts in testing cells and tissue and diagnosing cancer.

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.

Confirming lung cancer

First, the pathologist prepares the biopsy tissue. This may take a couple of days. Then, they examine the 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 would 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 but not the only risk factor for lung cancer.
- Signs of lung cancer can be found with imaging.
- Lung nodule experts assess changes in a nodule with a series of CT scans over time. 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.



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

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 cancer and your general health. This chapter describes the tests and other care needed to make your treatment plan.

Goals of testing

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

- 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

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

Care team

It takes a team to plan treatment of NSCLC. Your team will use your test results to plan treatment. You are an important part of the team. Tell your team about your wishes for treatment and any challenges you are facing. Your input is just as important as tests for treatment planning.

Your team may consist of many members:

- Thoracic surgical oncologist, medical oncologist, and radiation oncologist to treat the cancer
- 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.

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 everything possible 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
- 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. It is one of the most important factors that your team will use to plan treatment.

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.

Complete blood count

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

A chemistry profile assesses natural salts in your body and how well your liver and kidneys are working.

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 like CT, MRI, or PET scans, or

x-rays. 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 scan

A CT scan is a more detailed kind of x-ray. It takes many pictures from different angles. A computer combines the images to make 3D 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 regular CT. You'll receive an injection of contrast if it's safe for you. Contrast is a substance that makes images clearer. Contrast travels through your bloodstream, and you pee it out.

FDG-PET/CT scan

PET/CT is necessary if you haven't had this scan already. It may detect cancer that was not found by CT alone.

Your whole body will be scanned, or the scan will extend from your neck to the middle of your thighs.

The PET scan highlights tissue in your body that may be cancerous. Before the scan, you will be injected with a sugar radiotracer called fluorodeoxyglucose (FDG). The tracer will pass out of your body in your pee in about 2 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. MRI may show small brain tumors that aren't causing symptoms. Most people with lung cancer need a brain scan, but a brain scan isn't needed for small stage 1 cancers.

MRI uses a safe magnetic field and radio waves to make pictures. Contrast will also be used unless it would not be safe for you. If you can't have an MRI, you may get a CT scan of your head 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. Pulmonary function tests assess how well you breathe:

- Spirometry measures how much air and how fast you breathe.
- A gas diffusion test tells how much oxygen travels from your lungs into your blood.
- Body plethysmography measures how much air your lungs can hold and how much air is left in your lungs after you breathe out.

Bronchoscopy

A bronchoscopy is a procedure that allows providers to see inside your 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.

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 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.

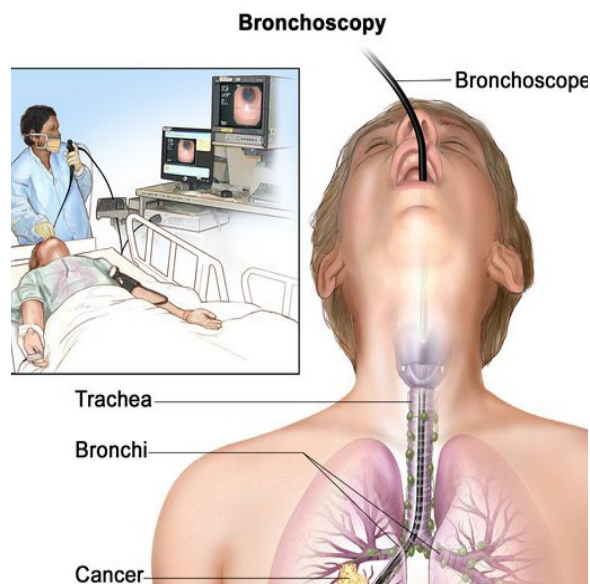
Testing is not needed for advanced cancers if lymph nodes along the collarbone are tested.

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 your body's food tube (esophagus)
- Endobronchial ultrasound (EBUS)-guided biopsy is performed using a bronchoscope

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.



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

Other regional lymph nodes

Some advanced lung cancers have spread to lymph nodes in the other lung or near 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 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. Because of biomarkers, a treatment that helps one person might not help you.

Biomarker tests are performed on tumor tissue removed with biopsy or during surgery, but a blood sample may be tested as well.

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 may include:

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 then 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 when parts of two genes switch places with each other. This is called a gene rearrangement.

Supportive care

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. It has been shown to extend and enhance life for people with lung cancer.

Start supportive care early

Supportive care is sometimes called palliative care since symptom relief is a main goal. You may undergo procedures that help you breathe and eat better and reduce coughing up blood.

Supportive care addresses many needs other than symptom relief. 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.

A palliative care specialist may be a member of your cancer care team. This specialist has received specific training to provide additional support to you. Some cancer centers have palliative care programs.

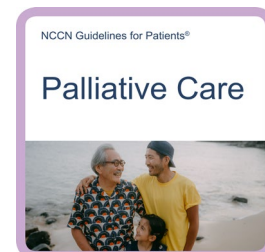
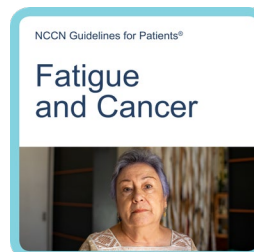
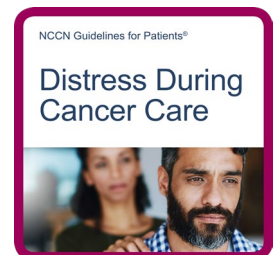
Other specialists who may be involved in your care include:

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

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 distressed at some point. It is normal to feel worried, sad, helpless, or angry. Distress can become severe and affect the way you live.

The library of NCCN Guidelines for Patients is at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) 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

- Your care team will make a treatment plan based on test results and your wishes.
- A member of your team will ask about your health, examine your body, and test blood samples.
- 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 function tests, and your lungs may be 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

- 28 TNM staging system
- 30 Lung cancer stages
- 30 Planning primary treatment
- 32 Clinical trials
- 34 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, the tumor, node, metastasis (TNM) system is used to score different areas

of cancer growth. Your care team will assign a score to each letter – T, N, and M. These scores will be combined to stage the cancer.

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

See Guide 5 for a brief description of T scores mentioned in this book.

Guide 5

T scores used to stage lung cancer

T1	A T1 tumor is 3 cm or smaller. It's no larger than a grape.
T2a	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.
T2b	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.
T3	A T3 tumor may have one or more of these features: <ul style="list-style-type: none"> • Tumor size is larger than 5 cm but no larger than 7 cm • Invasive growth into the chest wall, phrenic nerve, outer lining of the lung, or heart's lining • Multiple related tumors in same lobe of the lung
T4	A T4 tumor may have one or more of these features: <ul style="list-style-type: none"> • Tumor size is larger than 7 cm • 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 • Related tumors in more than one lobe of the lung

N = Node

The N score describes cancer growth in nearby lymph nodes. Lymph nodes are small, oval-shaped structures that are throughout your body and 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

See Guide 6 for a brief description of N scores mentioned in this book.

M = Metastasis

The M score tells you if the cancer has spread to the lining around the lung or to other organs. 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**

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

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.

Planning 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. Your care team will plan treatment based on

Guide 7 Stages of lung cancer

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

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

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

Types of primary treatment

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

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, N2, M0	●		●
3B	T4, N2, M0			
	T1, N3, M0			●
	T2, N3, M0			
3C	T3, N3, M0			●
	T4, N3, M0			

radiation therapy. More information on radiation therapy is in Chapter 6.

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.

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 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 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 that you may be eligible for, 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 childcare 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.



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

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)

Key points

- ▶ A cancer stage is a rating of the growth and spread of cancer.
- ▶ A tumor, node, metastasis (TNM) staging system is used to score different areas of lung cancer growth.
- ▶ There are 4 main stages of lung cancer based on TNM scores. For some people, cancer staging is done twice—before and after surgery.
- ▶ 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

- 36 Planning treatment
- 38 Treatment before surgery
- 40 Lung cancer surgery
- 42 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 what treatment might be best for you.

Planning treatment

Surgery, by itself or with other treatments, is used to treat most early non-small cell lung cancers (NSCLCs) and many locally advanced NSCLCs. The goal of treatment is to cure the 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. You should find and 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 suggest whether you should 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 can prescribe a regimen based on your overall health and the cancer. A regimen 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. 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.

Ask your care team for a complete list of side effects from 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.

Guide 9

Types of perioperative therapy for NSCLC

Platinum-doublet chemotherapy	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.
Immune checkpoint inhibitors	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.
Chemoimmunotherapy	Chemoimmunotherapy is a systemic therapy consisting of both platinum-doublet chemotherapy and immune checkpoint inhibitors.
Targeted therapy	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.
Radiation therapy	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.
Chemoradiation	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.

Treatment before surgery

Neoadjuvant therapy is a type of treatment that is received before surgery. It is sometimes called preoperative therapy or induction therapy. For NSCLC, neoadjuvant therapy consists of systemic therapy with or without radiation therapy.

Neoadjuvant instead of adjuvant therapy

If you'll likely need systemic therapy, you may receive it before surgery instead of after surgery.

Neoadjuvant chemoimmunotherapy is used to treat lung tumors that are at least 4 centimeters (cm) in size or lung cancer that

has spread to lymph nodes. Immunotherapy consists of either nivolumab (Opdivo) or pembrolizumab (Keytruda). Chemotherapy used with immunotherapy regimens is 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
Regimens used with nivolumab:		
Carboplatin, paclitaxel	●	●
Cisplatin, pemetrexed	●	
Cisplatin, gemcitabine		●
Cisplatin, paclitaxel	●	●
Carboplatin, pemetrexed	●	
Carboplatin, gemcitabine		●
Regimens used with pembrolizumab:		
Cisplatin, gemcitabine		●
Cisplatin, pemetrexed	●	

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.

Invasive tumors

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

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

Superior sulcus 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.

Cancer stages with N2

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

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 regimen because it works better, is safer, or costs less than other options or there are better data supporting its use

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 that a cure is the likely result of surgery.

During surgery, your surgeon will explore your inner chest to see where the cancer is growing. Your surgeon will have a better view of the tumor during surgery. Also, areas of

growth that weren't seen on imaging scans may be found during surgery.

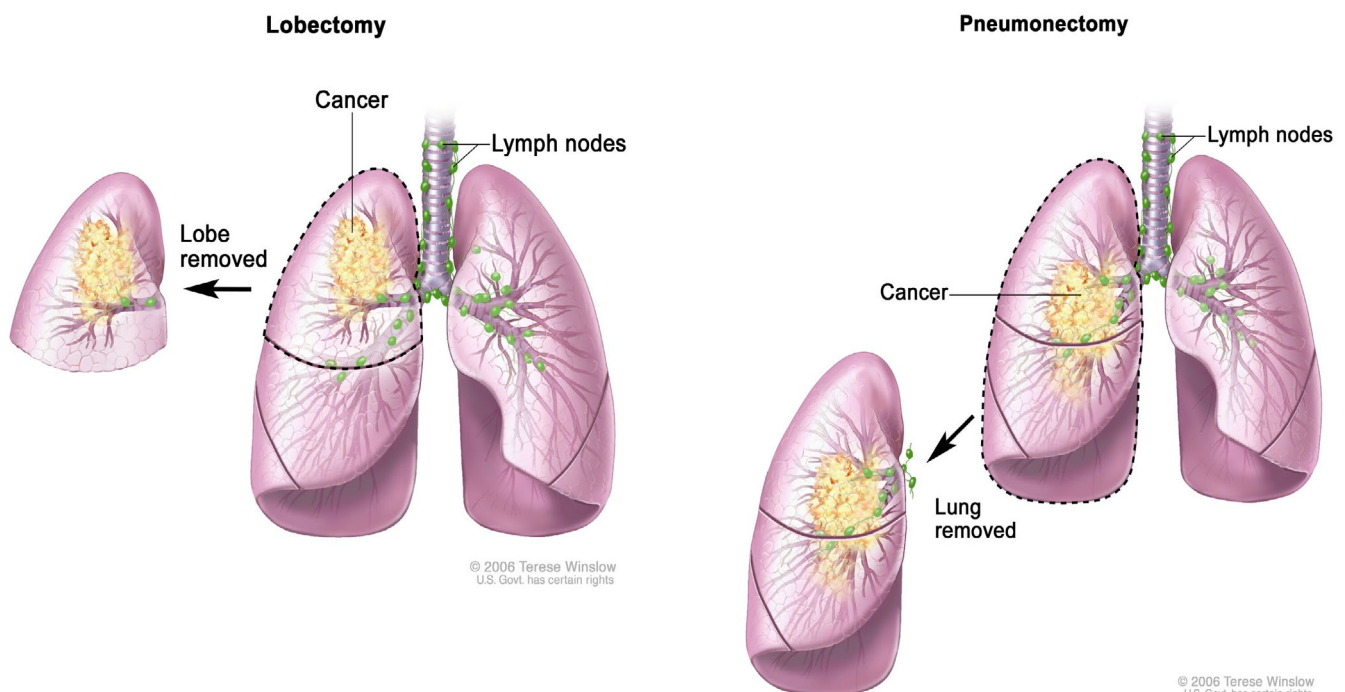
Types of lung surgery

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.

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.



- **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

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 that 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 (RATS)**.

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 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.

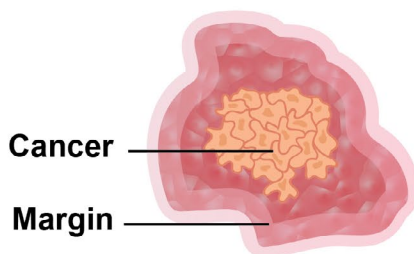
Your care team will plan treatment based on several factors, including:

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

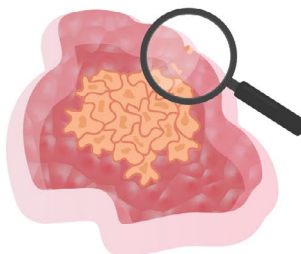
Surgical margin

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.

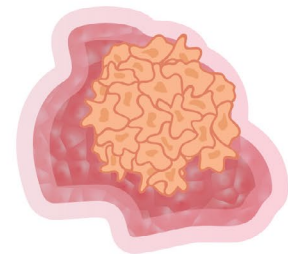
R0 margin
No cancer in margin



R1 margin
Cancer is found in margin with lab tests



R2 margin
Cancer is easily seen in margin



Cancer-free margins (R0)

Even if margins are cancer-free, adjuvant therapy is needed for some cancers. Platinum-doublet chemotherapy is used, but if it's not an option, osimertinib (Tagrisso) may be received if the cancer has *EGFR* biomarkers. See Guide 11 on page 39 for a list of chemotherapy regimens.

NCCN experts recommend adjuvant therapy for larger stage 1B and stage 2A cancers that are highly likely to return. A larger tumor is at least 4 cm in size. Adjuvant therapy is recommended for stage 2B and stage 3 cancers unless you had chemotherapy before surgery.

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

- Alectinib (Alecensa) is an option for stage 2 or stage 3 cancer with *ALK* biomarkers.
- Osimertinib (Tagrisso) is an option for stage 1B, stage 2, or stage 3 cancer with *EGFR* biomarkers.
- Atezolizumab (Tecentriq) is an option for stage 2 or stage 3 cancer with a PD-L1 level of 1 percent (1%) or higher and no *EGFR* and *ALK* biomarkers.
- Pembrolizumab (Keytruda) 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)

Adjuvant therapy is needed when cancer is in the surgical margins.

A second surgery may be done for early cancers. It is the preferred option for stage 1 and stage 2A. After surgery, chemotherapy is an option for stage 1B and 2A cancers but is recommended for stage 2B cancers.

Radiation therapy is an option for stage 1 and stage 2A cancers when surgery is likely to cause complications. Stereotactic ablative radiotherapy (SABR) is commonly used. After radiation therapy, stage 2A cancers may be treated with chemotherapy. More information on radiation therapy is in Chapter 6.

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. More information on chemoradiation is in Chapter 7.

Key points

- The goal of surgery 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 before or after surgery.
- There are several 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 a few 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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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
- 49 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.

- It is combined with chemotherapy, called chemoradiation, as described in Chapter 7.
- It is used as 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.

Uses of radiation therapy

Radiation therapy uses high-energy x-rays or particles to treat lung cancer. The x-rays or particles damage cancer cells, which 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):

- It is used after surgery as described in Chapter 5.

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.

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 the tumor 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 chemotherapy may be received after definitive radiation therapy. It is an option for stage 2 cancer that is highly likely to return.

Adjuvant chemotherapy treats 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—you'll feel nothing at all—and does not make you radioactive.

But 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.

Side effects differ by the type of radiation therapy. Most people have no side effects from SABR. Proton therapy may cause skin changes but IMRT rarely does.

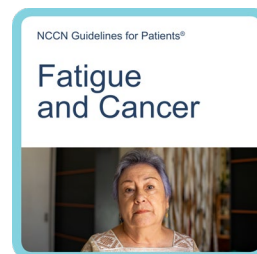
Adding chemotherapy to radiation therapy often causes more side effects.

- Fatigue is a common side effect of radiation therapy.
- Skin changes in the treatment area may occur. 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.

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.

The library of NCCN Guidelines for Patients has a book about cancer-related fatigue. Cancer-related fatigue is a lack of energy that is distressing, does not improve with normal rest or sleep, and disrupts life.

Learn about treatment of cancer-related fatigue at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.



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

- 51 Uses of chemoradiation
- 52 Types of chemotherapy
- 52 Curing lung cancer
- 54 Consolidation treatment
- 54 Side effects
- 55 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.

The ways chemoradiation is used to treat locally advanced non-small cell lung cancer (NSCLC) are:

- ▶ Chemoradiation is sometimes received before or after surgery as described in Chapter 5.
- ▶ Chemoradiation may also be the main (also called primary) treatment of locally advanced lung cancer when surgery is not an option. When the goal is to cure cancer, it is called definitive chemoradiation.

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.



Types of chemotherapy

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

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

For NSCLC, more than one type of chemotherapy is often received. Often, cisplatin or carboplatin is used with another cancer drug. These regimens are called platinum-doublet chemotherapy.

You will not receive chemotherapy every day. Instead, it will be given in cycles of treatment days followed by days of rest. These cycles give 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.

Curing lung cancer

Definitive chemoradiation is a treatment option for some stage 2B and stage 3 NSCLCs.

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.

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

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 around 15 higher-dose fractions.

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	●	
Concurrent chemoradiation		
Carboplatin, pemetrexed	●	
Cisplatin, pemetrexed	●	
Carboplatin, paclitaxel	●	
Cisplatin, etoposide	●	
Carboplatin, paclitaxel		●
Cisplatin, etoposide		●

● Preferred regimen because it works better, is safer, or costs less than other options or there are better data supporting its use

Consolidation treatment

The goals of consolidation are to bolster the results of treatment and improve the chance of a cure. There are two options for consolidation treatment after definitive sequential chemoradiation:

- Durvalumab (Imfinzi)
- Osimertinib (Tagrisso) for lung cancer with an *EGFR* exon 19 deletion or exon 21 L858R mutation

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.

Osimertinib is an EGFR kinase inhibitor. EGFR is a cell protein that helps start cell growth.

Osimertinib stops the activity of EGFR and, in turn, lowers the number of new cancer cells being made. It is a pill that can be taken at home.

Side effects

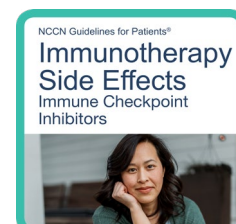
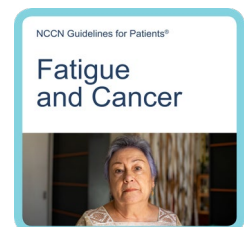
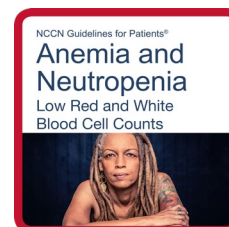
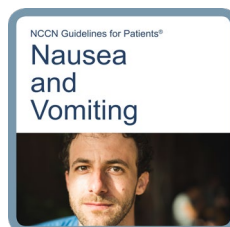
Side effects are unwanted health problems caused by treatment. They differ between people based on the type and length of treatment as well as the person.

- Side effects from chemotherapy are caused by the death of fast-growing normal cells and are typically worse with concurrent chemoradiation compared with sequential chemoradiation.
- Immune checkpoint inhibitors can cause your immune cells to attack healthy cells in your body.

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

Supportive care resources

The library of NCCN Guidelines has books on some common side effects of cancer treatment. Learn about management of nausea and vomiting, low blood counts, fatigue, and immune-related side effects at [NCCN.org/patientguidelines](https://www.nccn.org/patientguidelines) and on the [NCCN Patient Guides for Cancer](#) app.



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 or osimertinib 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

- 57 Cancer tests
- 58 Managing side effects
- 59 Disease prevention
- 59 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 13** for a schedule of tests.

Guide 13

Surveillance after treatment of NSCLC

Stage 1 or stage 2 cancers that were not treated with radiation therapy

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

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

If test results are normal, then repeat every year:

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

Stage 1 or stage 2 cancers that were treated with 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

All stage 3 cancers

If test results remain normal, then repeat every year:

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

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

Your risk increases as you age. If you smoke, your chance of getting another 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. You may enroll in a screening program if you have a high risk for certain cancers.

Cancer screening is routine testing for cancer before cancer symptoms start.

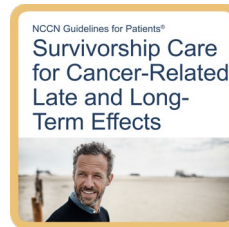
Not every type of cancer has a screening program. There are cancer screening programs for:

- Prostate cancer
- Breast and cervical cancers
- 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

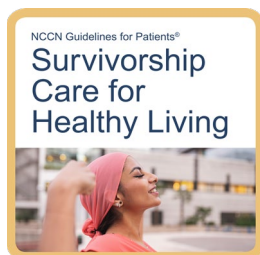
Another part of survivorship care is to prevent diseases. Such care can include getting immunization shots for the flu, herpes, shingles, and other diseases. Dental cleaning and exams on a regular basis can prevent disease, too. Ask your care team what health care you need.

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 care 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 and limiting drinking alcohol
- Achieving and maintaining a healthy body weight
- Not using tobacco
- Avoiding infections and 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.

9

Making treatment decisions

- 61 It's your choice
- 61 Questions to ask
- 68 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 care team share information, discuss the options, and agree on a treatment plan. It starts with an open and honest conversation between you and your care team.

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

care team. If you take the time to build a relationship with your care team, 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 care team are listed on the following pages. Feel free to use these questions or come up with your own.

Resources

American Lung Association

lung.org/lung-health-diseases/lung-disease-lookup/lung-cancer

Bag It Cancer

bagitcancer.org

CancerCare

[Cancercares.org](https://cancercares.org)

Cancer Hope Network

cancerhopenetwork.org

Caring Ambassadors Program, Inc.

LungCancerCAP.org

Free Me from Lung Cancer

freemefromlungcancer.org

Go2 Foundation for Lung Cancer

go2foundation.org

Imerman Angels

imermanangels.org

LiveLung (Dusty Joy Foundation)

dustyjoy.org

Lung Cancer Action Network (LungCAN)

lungcan.org

Lung Cancer Research Foundation

lungcancerresearchfoundation.org

LUNgevity

lungevity.org

National Coalition for Cancer Survivorship

canceradvocacy.org

Triage Cancer

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.

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.

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 cell.

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.

robot-assisted thoracoscopic surgery (RATS)

A method to perform a surgery called thoracoscopy.

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 well-being 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.

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 thoracoscopic surgery (VATS)

A method to perform a surgery 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 7.2024. It was adapted, reviewed, and published with help from the following people:

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Abramson Cancer Center

at the University of Pennsylvania
Philadelphia, Pennsylvania
800.789.7366 • penmedicine.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
CC Taussig Cancer Institute
866.223.8100 • my.clevelandclinic.org/departments/cancer
Case CCC
216.844.8797 • case.edu/cancer

City of Hope National Medical Center

Duarte, California
800.826.4673 • cityofhope.org

Dana-Farber/Brigham and Women's Cancer Center |

Mass General Cancer Center

Boston, Massachusetts
877.442.3324 • youhaveus.org
617.726.5130 • massgeneral.org/cancer-center

Duke Cancer Institute

Durham, North Carolina
888.275.3853 • dukecancerinstitute.org

Fox Chase Cancer Center

Philadelphia, Pennsylvania
888.369.2427 • foxchase.org

Fred & Pamela Buffett Cancer Center

Omaha, Nebraska
402.559.5600 • unmc.edu/cancercenter

Fred Hutchinson Cancer Center

Seattle, Washington
206.667.5000 • fredhutch.org

Huntsman Cancer Institute at the University of Utah

Salt Lake City, Utah
800.824.2073 • healthcare.utah.edu/huntsmancancerinstitute

Indiana University Melvin and Bren Simon

Comprehensive Cancer Center

Indianapolis, Indiana
888.600.4822 • www.cancer.iu.edu

Johns Hopkins Kimmel Cancer Center

Baltimore, Maryland
410.955.8964
www.hopkinskimmelcancercenter.org

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

Memorial Sloan Kettering Cancer Center

New York, New York
800.525.2225 • mskcc.org

Moffitt Cancer Center

Tampa, Florida
888.663.3488 • moffitt.org

O'Neal Comprehensive Cancer Center at UAB

Birmingham, Alabama
800.822.0933 • uab.edu/onealcancercenter

Robert H. Lurie Comprehensive Cancer Center of Northwestern University

Chicago, Illinois
866.587.4322 • cancer.northwestern.edu

Roswell Park Comprehensive Cancer Center

Buffalo, New York
877.275.7724 • roswellpark.org

Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine

St. Louis, Missouri
800.600.3606 • siteman.wustl.edu

St. Jude Children's Research Hospital/ The University of Tennessee Health Science Center

Memphis, Tennessee
866.278.5833 • stjude.org
901.448.5500 • uthsc.edu

Stanford Cancer Institute

Stanford, California
877.668.7535 • 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

The UChicago Medicine Comprehensive Cancer Center

Chicago, Illinois
773.702.1000 • uchicagomedicine.org/cancer

The University of Texas MD Anderson Cancer Center

Houston, Texas
844.269.5922 • mdanderson.org

UC Davis Comprehensive Cancer Center

Sacramento, California
916.734.5959 • 800.770.9261
health.ucdavis.edu/cancer

UC San Diego Moores Cancer Center

La Jolla, California
858.822.6100 • cancer.ucsd.edu

UCLA Jonsson Comprehensive Cancer Center

Los Angeles, California
310.825.5268 • uclahealth.org/cancer

UCSF Helen Diller Family Comprehensive Cancer Center

San Francisco, California
800.689.8273 • cancer.ucsf.edu

University of Colorado Cancer Center

Aurora, Colorado
720.848.0300 • coloradocancercenter.org

University of Michigan Rogel Cancer Center

Ann Arbor, Michigan
800.865.1125 • rogelcancercenter.org

University of Wisconsin Carbone Cancer Center
Madison, Wisconsin
608.265.1700 • uwhealth.org/cancer

UT Southwestern Simmons
Comprehensive Cancer Center
Dallas, Texas
214.648.3111 • utsouthwestern.edu/simmons

Vanderbilt-Ingram Cancer Center
Nashville, Tennessee
877.936.8422 • vicc.org

Yale Cancer Center/Smilow Cancer Hospital
New Haven, Connecticut
855.4.SMILOW • yalecancercenter.org



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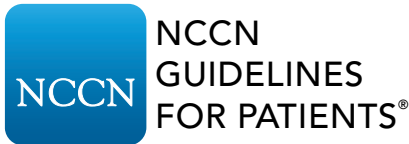
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