

Non-Small Cell

Lung Cancer

NCCN

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NCCN Guidelines for Patients®



Turning Tragedy into Action

Deborah Morosini, MD, is a third generation physician, a pathologist, and an oncology researcher, but until her sister, Dana Reeve, was diagnosed with lung cancer, she didn't fully comprehend how hard it can be for patients to find good information about their treatment options.

"There is a tremendous ignorance of lung cancer and about its treatments. Even I, as a physician, who works in research every day was unaware—until I had to face Dana's tragedy."

Dana Reeve had it all. She was a beautiful woman, an actress, who married "Superman," actor Christopher Reeve. They had a son, Will. Then, in 1995, Reeve suffered a catastrophic injury in a riding accident and was paralyzed from the neck down. Dana cared for him for almost 10 years, becoming a tireless crusader for research on paralysis and stem cells. Reeve died in October, 2004 but Dana continued to press forward with her foundation and with raising her son, by then an adolescent. Then, just a few months later, this vibrant, healthy, non-smoking young woman was diagnosed with stage IV lung cancer. She lived for seven months.

Shortly after Dana's death, Morosini began working with lung cancer advocacy groups to raise awareness of the needs of lung cancer patients. "My first thought when I was asked to speak about Dana's experience, was 'why do you need me?'" But then, I began to realize that

the overall understanding of lung cancer is really naive. People just don't understand the breadth and scope of the problem."

In 2009, Sam Donaldson asked Morosini to join the Roundtable discussion that opens the NCCN Annual Conference each year. Her first acquaintance with NCCN as she says, "struck a strong chord."



Dana Reeve,
sister of Deborah Morosini

When Donaldson, as Chair of the newly formed NCCN Foundation Board, asked her to join, she accepted. In September, 2010, she agreed to have the NCCN Guidelines for Patients®: Non-Small Cell Lung Cancer named in honor and memory of her sister.

"NCCN has played a critical role in translating really complicated information into a high-quality resource. I have used the clinical guidelines on many occasions. There is a tremendous need for these new patient-friendly guidelines. The more this kind of information gets into the hands of patients, the more they will feed it back to their doctors and make informed decisions for themselves. These guidelines are extremely powerful."

About this booklet



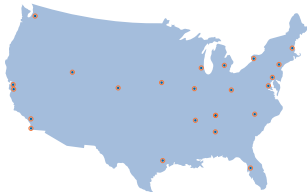
Its purpose

Learning that you have cancer can be overwhelming. The goal of this booklet is to help you get the best cancer treatment. It explains which cancer tests and treatments are recommended by experts of non-small cell lung cancer.



Supported by the NCCN Foundation®

The NCCN Foundation supports the mission of the National Comprehensive Cancer Network® (NCCN®) to improve the care of patients with cancer. One of its aims is to raise funds to create a library of booklets for patients. Learn more about the NCCN Foundation at www.nccn.com/nccn-foundation.



The source of the information

NCCN is a not-for-profit network of 23 of the world's leading cancer centers. Experts from NCCN have written treatment guidelines for lung cancer doctors. These treatment guidelines suggest what the best practice is for cancer care. The information in this booklet is based on these guidelines.



For more information

This booklet focuses on the treatment of lung cancer. NCCN also offers a booklet on lung cancer screening. Visit **NCCN.com** for the full library of booklets.

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How to use this booklet

Who should read this booklet?

The information in this booklet is about cancer of the non-small cells of the lung. About 85 out of 100 people with lung cancer have non-small cell lung cancer. This booklet may be helpful for patients, caregivers, family, and friends dealing with this cancer. Reading this booklet at home may help you absorb what your doctors have said and prepare for treatment.

Does the whole booklet apply to me?

Part 1 reviews some basics about non-small cell lung cancer that may help you understand the cancer better. If you're unsure if you should be tested for lung cancer, read Part 2. The tests used to find lung cancer are described in Part 3. Parts 4 through 8 have information for people who have lung cancer. This information covers many situations. Thus, you will likely not get every test and treatment listed. Your treatment team can point out what applies to you and give you more information.

As you read through this booklet, you may find it helpful to create a list of questions to ask your doctors. The recommendations in this booklet include what the NCCN doctors feel is the most useful based on science and their experience. However, these recommendations may not be right for you. Your doctors may suggest other tests or treatments based on your medical history and other factors. This booklet does not replace the knowledge and recommendations of your doctors.

Help! I don't know these words!

In this booklet, many medical words are included that describe cancer, tests, and treatments. These are words that you will likely hear your treatment team use in the months and years ahead. Most of the information may be new to you, and it may be a lot to learn. Don't be discouraged as you read. Keep reading and review the information.

Words that you may not know are defined in the text or the sidebar. Words with sidebar definitions are underlined when first used on a page. All definitions are listed in the Dictionary in Part 9. Acronyms are also listed in the text or the sidebar. Acronyms are words formed from the first letters of other words. One example is CT for **computed tomography**.

Part 1: About lung cancer

You've learned that you have or may have lung cancer. It's common to feel shocked and confused. Part 1 reviews some basics about lung cancer that may help you start to cope. These basics may also help you start planning for treatment.



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1.1 Parts of the lungs

Explains the structures of the lungs.

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1.2 How lung cancer starts

Describes the types of lung cells where cancer begins.

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1.3 How lung cancer spreads

Explains the body systems by which lung cancer spreads.

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Tools

Lists webpages with basics about lung cancer.

Part 1: About lung cancer

1.1 Parts of the lungs

The lungs are the main organs of the respiratory system. They transfer oxygen—a gas that cells need to live—from the air into the blood. The blood then carries oxygen to all the cells in the body. The lungs also remove carbon dioxide—a gas made by cells—from the blood. Carbon dioxide is then exhaled from the lungs into the air. The transfer of these gases in and out of the body is called respiration.

When you inhale, air enters the mouth or nose and travels down the throat into the trachea. See Figure 1. Air then enters the lungs through the bronchi. Within the lung, the bronchi branch off to each part (lobe) of the lung. The right lung has three lobes and the left lung has only two lobes to make space for the heart.

Within the lobes, the bronchi divide into smaller airways called bronchioli. At the end of each bronchioli are bunches of alveoli wrapped in blood vessels. The transfer of gases in and out of the blood occurs in the alveoli.

The lungs are protected by tissue called the pleura. Pleura covers each lung and helps the lungs safely rub against other organs. Pleura is made of two layers. The outer layer is known as the parietal pleura. The inner layer is called the visceral pleura. The space in between the two layers is called the pleural cavity. It is filled with a small amount of fluid called pleural fluid.

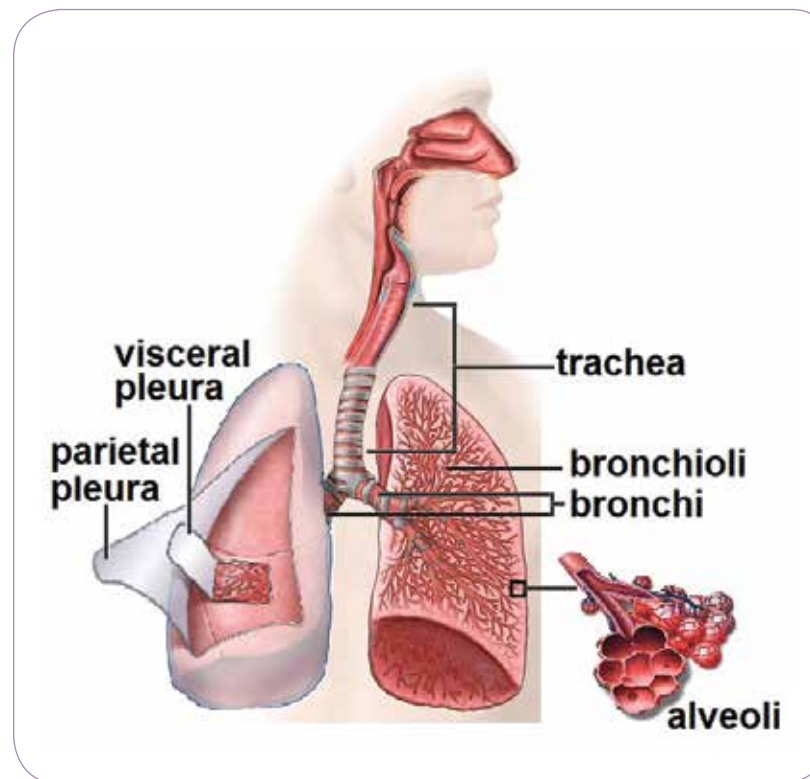


Figure 1. Airways and the lungs

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www.nucleusinc.com

Part 1: About lung cancer

1.2 How lung cancer starts

Cancer is a disease of cells—the building blocks of tissue in the body. Inside of cells are coded instructions, called genes, for building new cells and controlling how cells behave. Changes in genes cause normal lung cells to become cancer cells. Gene changes that are linked to lung cancer aren't passed down from parents to children (inherited) but are caused by other factors.

Almost all lung cancers are carcinomas. Carcinomas are cancers that start in cells that line the inner or outer surfaces of the body. Lung carcinomas start in cells that line the airways of the lungs.

Lung carcinomas are divided into two groups based on how the cells look. One group is called small cell lung cancers and the other group is called non-small cell lung cancers. The second group is much more common and is the focus of this booklet.

1.3 How lung cancer spreads

The changes in genes cause cancer cells to make too many copies of themselves. Normal cells grow and then divide to form new cells when needed. They also die when old or damaged. Cancer cells don't do this. Cancer cells make new cells that aren't needed and don't die quickly when old or damaged.

Over time, cancer cells form a mass called the primary tumor. If not treated, the primary tumor can grow large and invade other tissue like a bronchus or pleura. Cancer cells can replace so many normal cells that it is hard to breathe.

Cancer cells can also break away from the primary tumor and form new tumors. This process is called metastasis. These secondary tumors may form in nearby sites, such as another lobe of the lung. Secondary tumors can also form in distant sites, such as the other lung or the brain.

Definitions:

Alveoli: Tiny sacs in the lungs where gases are transferred in and out of blood

Bronchioli: Branches of small airways within the lungs

Bronchi: The two airways extending from the trachea into the lungs

Lobe: A clearly seen division in a lung

Respiratory system: The group of organs that transfers gases in and out of the body

Trachea: The air passage between the throat and bronchi; also called the windpipe

Part 1: About lung cancer

Cancer cells spread through blood or lymph vessels in the lungs. Lymph is a clear fluid that gives cells water and food and helps to fight germs. It travels in vessels like blood does. Lymph nodes are small groups of cells that remove germs from lymph. Lung cancer often first spreads to the lymph nodes in the lungs and then to the lymph nodes between the lungs. See Figure 2.

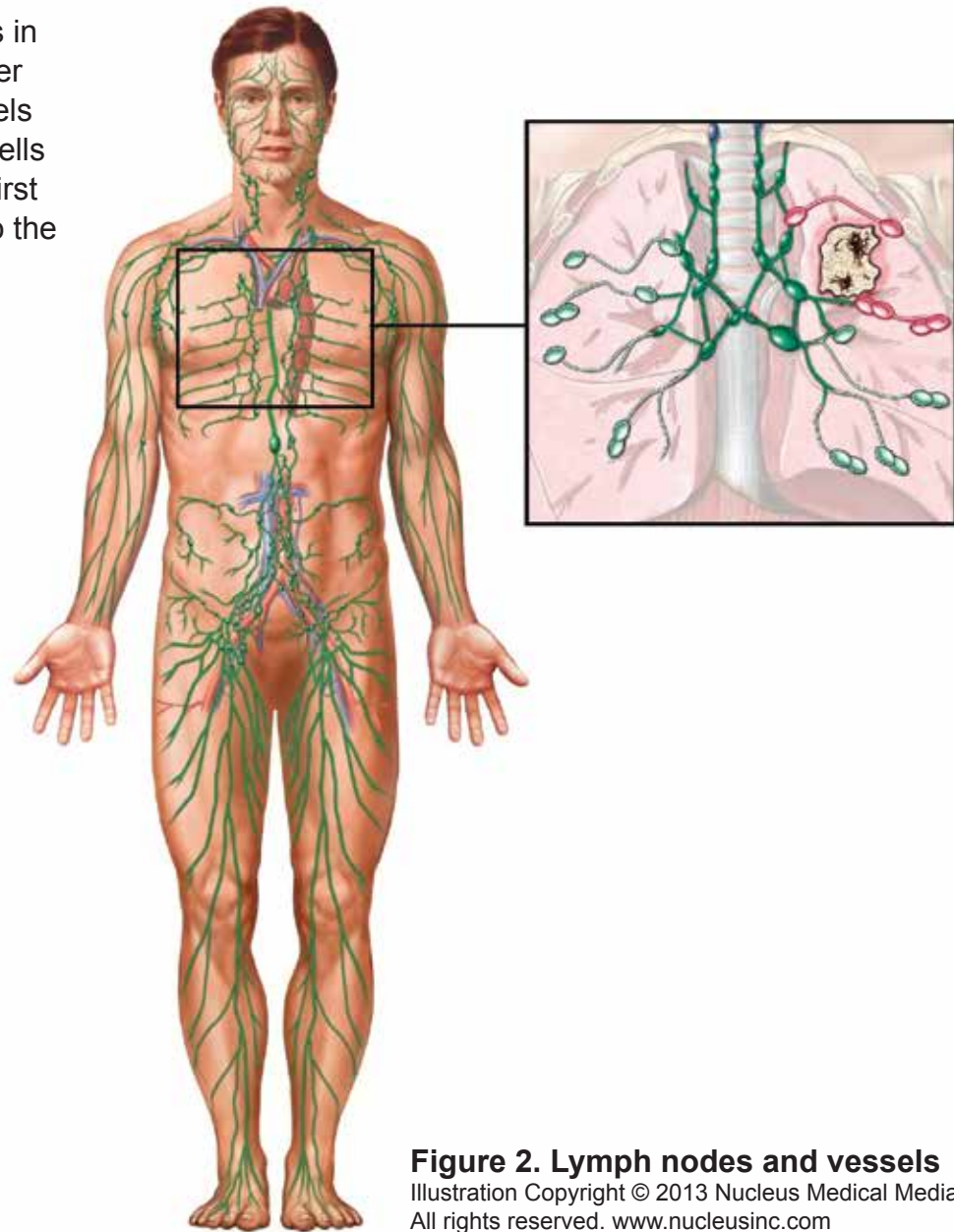


Figure 2. Lymph nodes and vessels
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Part 1: Tools



Webpages

American Cancer Society

www.cancer.org/cancer/lungcancer-non-smallcell/index

Lung Cancer Alliance

www.lungcanceralliance.org/get-information/what-is-lung-cancer

National Cancer Institute

www.cancer.gov/cancertopics/pdq/treatment/non-small-cell-lung/Patient

NCCN

www.nccn.com/type-of-cancer/lung-cancer/1301.html

Review of Part 1

- The lungs help the body get the air it needs to live.
- The lungs are made of many small airways and sacs.
- Lung cancer often starts in the cells that line the airways.
- Cancer cells form a tumor since they don't die as they should.
- Cancer cells can spread to other body parts through lymph or blood.

Part 2: Lung nodules

Many people have small masses of tissue in their lungs. These small masses are called nodules. Nodules can be caused by cancer, infections, scar tissue, or other conditions. Most nodules are benign—not cancer.

Part 2 discusses how doctors decide if a nodule is likely cancer and the next steps of care. If you take part in a lung cancer screening program, read the NCCN Guidelines for Patients®: Lung Cancer Screening for related information. If you aren't in a screening program, the information in Part 2 is for you.



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2.1 Am I at risk?

Describes what increases your chances for lung cancer.

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2.2 Lung imaging results

Explains the test results that suggest a nodule is cancer.

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2.3 Lung cancer screening

Discusses the next steps of care when a lung nodule may be cancer.

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Tools

Lists webpages with information on lung cancer screening.

Part 2: Lung nodules

2.1 Am I at risk?

If a test shows a nodule in your lung, your doctors will need to decide if it is likely cancer. They will assess your risk factors for lung cancer, how the nodule looks, and other factors. Your doctors will likely include a pulmonologist—an expert of lung diseases, and a thoracic radiologist—an expert of imaging tests of the chest.

Risk factors

Some people are more likely to develop lung cancer than others. Anything that increases your chances of lung cancer is called a risk factor. Risk factors can be activities that people do, things in the environment, or personal traits. If one or more risk factors apply to you, it doesn't mean you have lung cancer. Likewise, lung cancer occurs in some people who have no known risk factors. If you have a nodule, the risk factors doctors use to help decide if the nodule may be cancer are:

| | |
|-------------------------------|--|
| Being older in age | Contact with cancer-causing agents |
| Tobacco smoking | <u>Infectious diseases</u> of the lung |
| Having had cancer | Having had other lung diseases |
| Family who've had lung cancer | |

Definitions:

Imaging test: A test that makes pictures of the insides of the body

Infectious disease: An illness caused by germs

Part 2: Lung nodules

Older age

As you get older, you are more likely to get cancer, including lung cancer. Half of the people who were diagnosed with lung cancer in recent years were 70 years old or older. Only 12 out of 100 people with lung cancer were younger than age 55.

Tobacco smoking

Tobacco smoking is the biggest risk factor for lung cancer. There are more than 50 compounds in tobacco smoke known to cause cancer. Any smoking increases your risk for lung cancer, but the more you smoke, the higher your risk. If you quit smoking, your risk will decrease. However, the risk for lung cancer is higher for former smokers than for people who never smoked. Thus, current or past tobacco smoking is a risk factor for lung cancer.

If you smoke tobacco, ask your doctor about counseling and drugs to help you quit.

In 1981, a link between second-hand smoke and lung cancer was first suggested. Since then, many studies have found that second-hand smoke can cause lung cancer in people who don't smoke. The more contact you have with second-hand smoke, the higher your risk for lung cancer.

Having had cancer

Your risk for lung cancer may be increased if you've had cancer. Having had any type of lung cancer increases your risk for other types of lung cancer. Likewise, if you've had a smoking-related cancer, like head and neck cancer, your risk for lung cancer is increased. The risk for lung cancer increases after receiving radiation therapy in the chest for other cancers, especially if you smoke. Treatment of Hodgkin's lymphoma with an alkylating agent—a type of cancer drug—increases the risk for lung cancer too.

Family who've had lung cancer

If a close blood relative has had lung cancer, your risk for lung cancer is higher than a person with no family history. Your risk is even higher if your relative had cancer at a young age or if more than one relative has had lung cancer.

Cancer-causing agents

Uranium is a substance found in rocks and soil. As it decays, a gas called radon is made and gets into air and water. Miners of uranium have a high risk for developing lung cancer. Some studies of radon found in the home have linked radon to lung cancer, while other studies have not. The risk for lung cancer may depend on how much radon is in the home. For people who've had contact with radon, such as uranium miners, the risk for lung cancer is higher for those who smoke than for those who don't smoke.

Part 2: Lung nodules

Besides radon, there are 10 other agents known to cause lung cancer. Five are metallic metals: arsenic, beryllium, cadmium, chromium, and nickel. The others are asbestos, coal smoke, soot, silica, and diesel fumes. Among people who've had contact with these agents, the risk for lung cancer is higher for those who've smoked than for those who've never smoked.

Infectious diseases

Some infectious diseases have been linked to lung cancer. Tuberculosis is an infection caused by bacteria. If you've had tuberculosis, you are more likely to get lung cancer than someone who's never had tuberculosis. The same is true if you've had a fungal infection in the lungs.

Other lung diseases

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

Definitions:

Diagnose: To identify a disease

Hogkin's lymphoma: Cancer that starts in white blood cells

Radiation therapy: The use of radiation to treat cancer

Risk factor: Something that increases the chance of getting a disease

Second-hand smoke: Inhaled smoke from a lit smoking product or that was exhaled by a smoker

Part 2: Lung nodules

2.2 Lung imaging results

Imaging tests make pictures of the insides of the body. CT (computed tomography) and PET (positron emission tomography) are imaging tests used to make pictures of the insides of the lungs. You may have had one or both of these tests. The test results that doctors use to help decide if the nodule may be cancer are:

| Test results |
|------------------------|
| Features of the nodule |
| Abnormal lung tissue |
| PET hot spots |

Features of the nodule

Nodules caused by cancer have specific traits. First, they aren't likely to have calcium buildup. Second, they often have rough edges and odd shapes. Third, they often grow faster and are larger in size than nodules without cancer. Thus, nodules that are large are more likely to be cancer than small nodules.

The density of the nodule is also assessed to decide if the nodule may be cancer. Non-solid nodules have low density. Solid nodules have high density. Part-solid nodules have both high and low areas of density. Part-solid nodules are found less often than solid nodules, but more of them are caused by cancer. On the other hand, solid nodules that are cancer grow faster than part-solid nodules that are cancer.

Abnormal lung tissue

Besides nodules, your doctors will look at your imaging results for other abnormal findings. The imaging tests may show tissue inflammation, tissue scarring, or both. The nodule is more likely to be cancer if there's inflammation or scarring than if neither is present.

PET hot spots

PET shows how your cells are using a simple form of sugar. To create the pictures, a sugar radiotracer is put into your body. The radiotracer emits a small amount of energy that is detected by the imaging machine. Cancer appears brighter ("hotter") in the pictures, because cancer cells use sugar more quickly than normal cells. Hot spots suggest that cancer is present.



Figure 3. Computed tomography

Part 2: Lung nodules

2.3 Lung cancer screening

Often, the use of one imaging test detects a nodule but it isn't clear whether the nodule is cancer. Thus, tests need to be repeated to look for increases in nodule size or density over time. Such changes are likely signs of cancer. Based on the imaging results, the recommendations for screening are:

| Imaging results | Recommendations |
|---|---|
| Small nodule | Follow NCCN lung cancer screening guidelines |
| Medium-sized non-solid or part-solid nodule | Get LDCT (low-dose computed tomography) in 3–6 months |
| Medium-sized solid nodule | Consider getting PET/CT |
| Large nodule | See a surgeon |

For small nodules, the lung cancer screening guidelines recommended by NCCN should be followed. The NCCN Guidelines for Patients®: Lung Cancer Screening can be found on **NCCN.com**. Tests repeated over time will help your doctors know if the nodule is cancer.

A medium-sized non-solid or part-solid nodule should be tested again in 3 to 6 months with a spiral LDCT of the chest. This imaging test takes many pictures of the insides of your body from different angles using x-rays. The amount of radiation used is much lower

than standard doses of a CT scan. Getting a LDCT scan is much like getting the imaging test you've had before. A picture of a CT machine is shown in Figure 3.

For a medium-sized solid nodule, think about getting PET with CT instead of LDCT. A PET/CT scan may find if there's cancer quicker than LDCTs repeated over a period of time. It may also show signs of cancer spreading in the body.

Nodules that are large are likely cancer. In this case, you should see a surgeon. The surgeon can remove the nodule and test it for cancer.

Definitions:

Inflammation: Redness and swelling from injury or infection

Nodule: A small mass of tissue

Radiotracer: A substance that releases a small amount of radiation

Part 2: Lung nodules

Care after LDCT

| LDCT results | Recommended care | Next steps |
|--------------|--|---|
| No increase | LDCT in 6–12 months, Biopsy, or Consider surgery | Follow NCCN screening guidelines Follow NCCN screening guidelines if no lung cancer is found |
| Increase | Surgery | Continue reading this booklet if lung cancer is found |

Three options are suggested if there were no increases in the size and density of the nodule. First, another LDCT could be done. If cancer is present, the nodule will likely be larger or denser in 6 to 12 months. Instead of waiting, a biopsy to remove tissue samples could be done to

test for cancer. The biopsies used for lung cancer are described in Part 3. The third option is surgery to remove the whole nodule. If the LDCT shows that the nodule has increased, the nodule is very likely cancer. Surgery to remove the nodule is recommended.

Part 2: Lung nodules

Care after PET/CT

| PET/CT results | Recommended care | Next steps |
|---------------------|-----------------------|--|
| Not likely cancer → | LDCT in 3 months → | Follow NCCN screening guidelines |
| May be cancer → | Biopsy, or Surgery | Follow NCCN screening guidelines if no lung cancer is found Continue reading this booklet if lung cancer is found |

If the PET/CT scan suggests the nodule is not likely cancer, a LDCT in 3 months followed by NCCN recommendations for lung cancer screening is an option. When the PET/CT scan suggests the nodule is cancer, a biopsy to remove tissue samples to test for cancer is one option. The biopsies used for lung cancer are described in Part 3. The other option is surgery to remove the whole nodule.

Acronyms:

LDCT = low-dose computed tomography

PET/CT = positron emission tomography/computed tomography

Part 2: Tools



Webpages

Lung Cancer Alliance

www.screenforlungcancer.org

NCCN

www.nccn.com/type-of-cancer/lung-cancer/1303.html

www.nccn.com/type-of-cancer/lung-cancer/1310.html

www.nccn.com/type-of-cancer/lung-cancer/1311.html

www.nccn.com/files/cancer-guidelines/lung_screening/index.html

Review of Part 2

- Many people have lung nodules, some of which are cancer.
- Tobacco smoking is the biggest risk factor for lung cancer.
- Imaging tests help doctors decide if a nodule is cancer.
- Nodules that grow fast in size or density are likely cancer.

Part 3: Testing for lung cancer

To test for cancer, tissue or fluid must be removed from your body. A biopsy is a medical procedure that removes small samples of tissue or fluid for testing. The samples are then sent to a lab and examined with a microscope for cancer cells. Part 3 discusses the types of biopsies recommended for lung cancer.

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3.1 Biopsies of lung tissue

Describes ways to remove lung tissue.

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3.2 Biopsies of lymph nodes

Describes ways to remove tissue from lymph nodes.

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3.3 Biopsies of pleural fluid

Describes ways to remove fluid from around the lungs.

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Tools

Lists webpages with information on biopsies.



Part 3: Testing for lung cancer

If your doctors think a lung nodule is cancer, their choice of a biopsy instead of surgical treatment is based on many factors. You may have a biopsy at the time of surgery if your doctors strongly think that the nodule is cancer and hasn't spread far. Otherwise, you will have a biopsy to plan which treatment is best for you. The types of biopsies for cancer in or near the lung are described next. If there's likely lung cancer that has spread to distant sites, a biopsy of the distant site should be done if possible.

You may have more than one biopsy to collect enough cells to test for cancer and for changes in genes for which there are treatments.

You will be given instructions to prepare for the biopsy. You may be asked to stop eating, drinking, and taking some medicines for a short period of time. If you smoke, it is important to stop. Most biopsies are done within 30 to 60 minutes and don't require staying overnight in a hospital.

3.1 Biopsies of lung tissue

| Type of biopsy |
|---|
| Standard bronchoscopy |
| Radial EBUS (endobronchial ultrasound) bronchoscopy |
| Navigational bronchoscopy |
| TTNA (transthoracic needle aspiration) |
| Open surgical biopsy |

Standard bronchoscopy

This biopsy uses a standard bronchoscope to collect samples. The part of the bronchoscope that is inserted into the body looks like a thin, long tube about as thick as a pencil. There are two types of standard bronchoscopes. A rigid bronchoscope is straight and doesn't bend. A flexible bronchoscope is thinner and longer and can bend. It can reach the smaller airways of the lung. General anesthesia is needed for a rigid bronchoscopy. Local anesthesia is used for a flexible bronchoscopy.

Standard bronchoscopes have a light, camera, and open channel. The light and camera allow your doctor to guide the tube down your nose or mouth and see inside your lungs. A small brush, needle, or tongs can be inserted into the open channel to collect samples. Also, liquid may be sprayed into the airway and then suctioned back up. After the biopsy, you may feel some swelling and sound hoarse.

Part 3: Testing for lung cancer

Radial EBUS bronchoscopy

For this biopsy, a flexible bronchoscope is fitted with an ultrasound device and guided to the cancer site. An ultrasound uses high-frequency sound waves to make pictures of the insides of the body. Your doctor will move the device back and forth to see a 360-degree view of the area on a computer. The ultrasound device will then be removed so that the sampling tool can be inserted.

Navigational bronchoscopy

The airways of the lungs get smaller as they extend toward the sides of the body. Flexible bronchoscopes are often too large to travel through these small airways. A navigational bronchoscopy uses a flexible bronchoscope that is fitted with a second open channel that is thinner and longer. For this biopsy, your doctor will first plan how to reach the cancer site using a CT image. Your doctor will then guide the bronchoscope to the site with a sensor that will be inserted through an open channel. When the site is in reach, the sensor will be removed and the sampling tool will be inserted.

TTNA

This biopsy is also called a percutaneous needle biopsy. It uses a very thin needle that is inserted through the chest wall to get a tissue sample. It is recommended that an imaging test be used to insert the needle to the right spot. Before inserting the needle, your skin will be cleaned and numbed with local anesthesia. Next, a small cut will be made into your skin. The needle will be inserted through the cut and into the nodule. During the biopsy, you may be asked to stay still and hold your breath at times. After the biopsy, the cut will be bandaged and you will be given a chest x-ray to check the results. After TTNA, you may feel sore and have some redness at the needle site.

Definitions:

Chest wall: The layer of muscles and ribs that covers the chest area

CT: A test that makes pictures using many x-rays

General anesthesia: A controlled loss of wakefulness from drugs

Imaging test: A test that makes pictures of the insides of the body

Local anesthesia: A loss of feeling in a small area of the body caused by drugs

Nodule: A small mass of tissue

Acronyms:

CT = computed tomography

Part 3: Testing for lung cancer

Open surgical biopsy

You may have an open surgical biopsy when other biopsies won't work or a larger piece of tissue is needed. Larger pieces of tissue are often needed for molecular testing. Read Part 5.4 for more information on molecular testing.

An open surgical biopsy requires staying overnight in the hospital. General anesthesia is used. To obtain tissue, a large cut is made between the ribs. The surgeon removes tissue with a surgical knife. The cut is then closed with stitches and a chest tube may be left in place for a few days.

3.2 Biopsies of lymph nodes

| Type of biopsy |
|--|
| Mediastinoscopy |
| EBUS-TBNA (endobronchial ultrasound-guided transbronchial needle aspiration) |
| EUS-FNA (endoscopic ultrasound-guided fine needle aspiration) |

Mediastinoscopy

This biopsy accesses lymph nodes in the middle of the chest with a mediastinoscope. A mediastinoscope is very much like a bronchoscope. A cut right above or alongside the breastbone is made to insert the mediastinoscope into the body. When a cut alongside the breastbone is made, the biopsy is called a Chamberlain

mediastinoscopy. It allows access to lymph nodes on the left side of the chest. General anesthesia is used during mediastinoscopy. These biopsies may cause some pain and swelling and will leave a small scar.

EBUS-TBNA

Like a radial EBUS, a flexible bronchoscope fitted with an ultrasound device is guided down the trachea. However, for this biopsy, the device doesn't need to be removed in order to insert the sampling tool. Once the bronchoscope is in place, a needle is inserted through the bronchus and into a lymph node to obtain a sample. EBUS-TBNA requires local anesthesia.

EUS-FNA

Food passes from the mouth into the stomach through the esophagus. The esophagus extends further down into the body than the trachea and bronchi. Thus, lymph nodes below the bronchi can be accessed through the esophagus. EUS-FNA is performed just like EBUS-TBNA except that the bronchoscope is guided down the esophagus.

Part 3: Testing for lung cancer

3.3 Biopsies of pleural fluid

| Type of biopsy |
|----------------|
| Thoracentesis |
| Thoracoscopy |

Thoracentesis

Excess fluid may build up in the pleural cavity if cancer is in the pleura. This excess fluid is called pleural effusion. However, other medical conditions can cause pleural effusion, so a biopsy is done to rule out cancer. For thoracentesis, a needle is inserted between the ribs into the chest cavity to remove fluid. The cells from the fluid are then looked at with a microscope to see if there are cancer cells.

Thoracoscopy

If cancer isn't found by thoracentesis, a thoracoscopy may be done. This biopsy requires general anesthesia since a thoracoscope is inserted through a cut between the ribs. Thoroscopes work much like bronchoscopes allowing doctors to see any abnormal tissue. Samples can be collected with different types of tools. This surgery may cause some pain and swelling and will leave a small scar. This test is also called a VATS (video-assisted thoracic surgery) biopsy.

Definitions:

Bronchoscope: A thin, long tool used to do work in the airways

Bronchus: The airway that enters the lung

General anesthesia:

A controlled loss of wakefulness from drugs

Local anesthesia: A loss of feeling in a small area of the body caused by drugs

Lymph node: A small group of disease-fighting cells

Pleura: The two layers of tissue lining around the lungs

Pleural cavity: The space between the two layers of pleura

Trachea: The air passage between the throat and bronchi

Ultrasound: Use of sound waves to make pictures

Part 3: Tools



Webpages

American Cancer Society

www.cancer.org/cancer/lungcancer-non-smallcell/detailedguide/non-small-cell-lung-cancer-diagnosis

National Cancer Institute

www.cancer.gov/cancertopics/pdq/treatment/non-small-cell-lung/Patient#Keypoint5

Review of Part 3

- A biopsy removes small samples of tissue or fluid to test for cancer.
- A biopsy may be done before any treatment or at the time of surgery.
- Samples are removed either with a needle or scope inserted through the skin or by a scope guided down the trachea or esophagus.

Part 4: Lung cancer staging

If you have lung cancer, your doctors will want to know the extent of its growth. Cancer staging is a rating by your doctors of the extent of the cancer based on tests. Cancer staging is used by doctors to plan which tests and treatments are best for you.

Cancer is often staged twice. The first rating is done before treatment and is called the clinical stage. The second rating is done after surgery and is called the pathologic stage. Part 3 describes the tests used for clinical staging and defines the stages of lung cancer.

28

4.1 Clinical staging tests

Lists the clinical staging tests for lung cancer.

30

4.2 TNM scores

Defines scores for tumor growth and spread.

33

4.3 Stages of lung cancer

Presents the five stages of lung cancer.

34

Tools

Lists webpages about lung cancer staging.



Part 4: Lung cancer staging

4.1 Clinical staging tests

| Staging tests |
|-----------------------------------|
| Pathologic review |
| Medical history and physical exam |
| CT scans of chest and belly area |
| CBC (complete blood count), and |
| Blood chemistry test |

Pathologic review

A pathologist is a doctor who's an expert in testing cells to find disease. If the pathologist finds cancer cells, more tests are done on the biopsy samples or surgical tissue. All of the test results are recorded in a pathology report. It's a good idea to get a copy of your pathology report since it's used to plan treatment.

The parts of the cells will be studied to classify the disease. This is called histologic typing. The pathology report will state if the cancer started in the lung or elsewhere. If the cancer started in the lung, the report will also list the type of lung cancer. Histologic subtypes of non-small cell lung cancer include squamous cell carcinoma, adenocarcinoma, large-cell lung carcinoma, and other rare types. Squamous cells are thin and flat and line the airways of the lung. Adenocarcinoma is a cancer of epithelial cells that make fluids to keep the lungs moist. Large-cell lung carcinomas lack features to classify them as any other carcinoma.

Medical history and physical exam

Your medical history includes any health events in your life and any medications you've taken. Your doctor will ask about symptoms that may be related to lung cancer. Such symptoms include cough, trouble breathing, chest pain, and weight loss. Knowing which symptoms you have can help your doctors stage the cancer. Since some health problems run in families, your doctor may also ask about the medical history of your blood relatives.

Doctors often give a physical exam along with taking a medical history. A physical exam is a review of your body for signs of disease. During this exam, your doctor will listen to your lungs, heart, and gut. Parts of your body will likely be felt to see if organs are of normal size, are soft or hard, or cause pain when touched. Your lymph nodes may feel large if the cancer has spread to them.

CT scans

In addition to a CT of the chest, a CT scan of your upper abdomen is needed. The CT scan of your upper abdomen may show if the cancer has spread to the adrenal glands, liver, or other sites. Lung cancer often spreads to the adrenal glands, liver, or both if not treated. These scans should use standard doses of radiation instead of low doses used for screening. CT scans used for screening are described in Part 2.3.

Part 4: Lung cancer staging

CBC

A CBC measures the number of white blood cells, red blood cells, and platelets in a sample of blood. It is important to know if you have enough red blood cells to carry oxygen to your tissues, white blood cells to fight infections, and platelets to clot blood in open wounds. Your blood counts may be low because the cancer has spread into your bones or because of another health problem.

Blood chemistry test

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



Definitions:

Abdomen: The belly area between the chest and pelvis

Adrenal gland: A small organ on top of each kidney that makes hormones

Acronyms:

CT = computed tomography

Part 4: Lung cancer staging

4.2 TNM scores

The AJCC (**A**merican **J**oint **C**ommittee on **C**ancer) staging system is used to stage lung cancer. In this system, the letters T, N, and M describe different areas of cancer growth. Your doctors will assign a score to each letter. These scores will be combined to assign the cancer a stage.

T = Tumor

The T score tells how large or where the primary tumor has grown. Figure 4 shows areas of tumor growth. In medicine, tumors are measured in cm (**centimeters**). About 0.4 inch equals 1 cm. T scores for lung cancer include:

- **TX** tumors are too small for testing or can't be found with tests.
- **Tis** means there are abnormal cells in the bronchi that haven't invaded tissue.
- **T1** tumors are in the lungs only and are not larger than 3 cm.
 - **T1a** tumors are 2 cm or smaller.
 - **T1b** tumors are more than 2 cm but not larger than 3 cm.
- **T2** tumors: a) are larger than 3 cm but not larger than 7 cm; b) have grown into the bronchus but not closer than 2 cm to the carina; c) have grown into the visceral pleura; or d) have caused atelectasis or pneumonitis in part of the lung.
 - **T2a** tumors are larger than 3 cm but not larger than 5 cm with or without other features, or are smaller in size with other features.
 - **T2b** tumors are larger than 5 cm but not larger than 7 cm with or without other features.
- **T3** tumors: a) are larger than 7 cm; b) have grown into the bronchus within 2 cm of the carina; c) have grown into the parietal pleura, chest wall, diaphragm, phrenic nerve, mediastinal pleura, or outer pericardium; d) have caused atelectasis or pneumonitis in the whole lung; or e) there are secondary tumors in the same lobe as the primary tumor.
- **T4** tumors are scored based on invasion or the presence of secondary tumors. They: a) have grown into the mediastinum, heart or its major blood vessels, trachea, recurrent laryngeal nerve, esophagus, spine, or carina; or (b) there are secondary tumors in the lung with the primary tumor but in a different lobe.

Part 4: Lung cancer staging

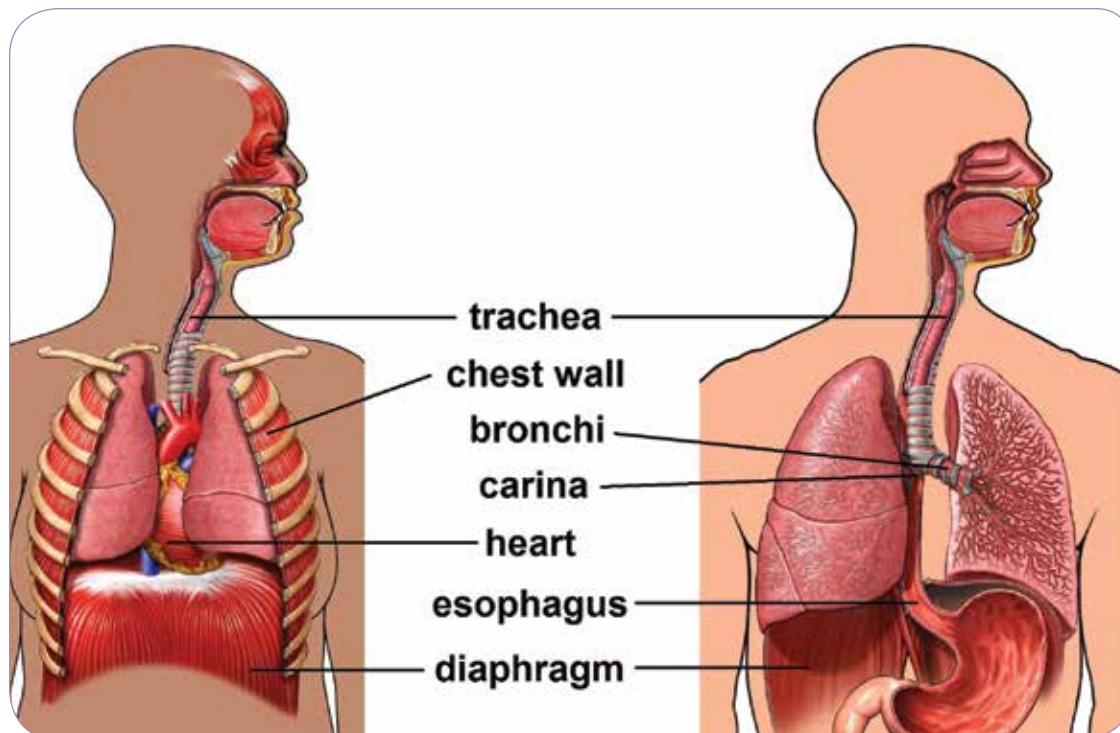


Figure 4. Areas of tumor growth

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Definitions:



Read page 8 for definitions of the parts of the lungs.

Atelectasis: Lung collapse

Carina: Supportive tissue at the base of the windpipe

Diaphragm: Muscles that help a person to breathe

Esophagus: The organ between the mouth and stomach

Mediastinum: The chest area between the lungs

Pericardium: Tissue lining around the heart

Phrenic nerve: A bundle of fibers that sends signals between the spine and the muscles used to breathe

Pneumonitis: Swelling of the air sacs in a lung

Recurrent laryngeal nerve: A bundle of fibers that sends signals between the spine and voice box

Part 4: Lung cancer staging

N = Nodes

Cancer cells can spread throughout the body by traveling in lymph as explained in Part 1. Lymph in the lung tissue first travels to the intrapulmonary and peribronchial lymph nodes inside the lungs. From these nodes, lymph then travels to the hilar nodes. Hilar lymph nodes are found right outside the lungs where the bronchi attach.

From the hilar nodes, lymph travels to lymph nodes in the mediastinum. The mediastinum is the center of the chest where the heart is located. Subcarinal nodes are located right below the windpipe. Lymph also travels about the collarbone to the supraclavicular nodes and to the scalene nodes within the neck.

Nearby lymph nodes are shown in Figure 5. The N category reflects how far lung cancer has spread within these lymph nodes. N scores for lung cancer include:

- **N0** means that there is no cancer in nearby lymph nodes.
- **N1** means that the cancer has spread to the peribronchial nodes and/or to the hilar and intrapulmonary nodes of the lung with the primary tumor.
- **N2** means that the cancer has spread to mediastinal nodes, which include subcarinal nodes, near the lung with the primary tumor.
- **N3** means that the cancer has spread to the mediastinal or hilar nodes near the lung without the primary tumor, or to any supraclavicular or scalene lymph nodes.

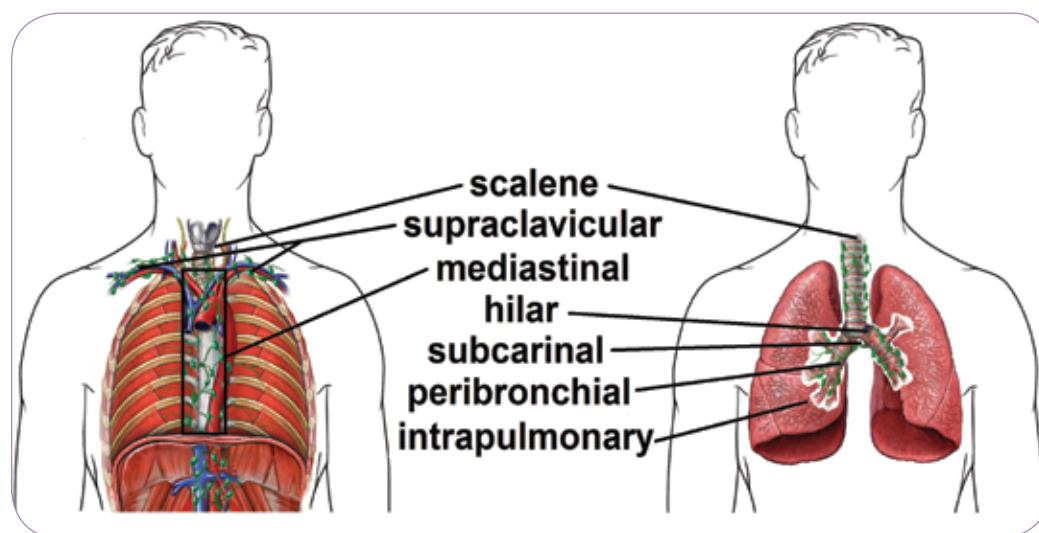


Figure 5. Nearby lymph nodes

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Part 4: Lung cancer staging

M = Metastasis

The M category tells you if there are metastases to distant sites. Lung cancer tends to spread to the brain, adrenal gland, and to the lung without the primary tumor.

M scores for lung cancer include:

- **M0** means the cancer hasn't spread to distant sites.
- **M1** means the cancer has spread to distant sites.
 - **M1a** means the cancer has spread: a) from one lung into the other lung; b) into the lung's lining (pleura) and has formed secondary tumors; or c) into the fluid within the tissue lining around the lungs or the heart.
 - **M1b** means the cancer has spread to areas outside the chest area.

4.3 Stages of lung cancer

Table 1 shows the staging groups labeled by Roman numerals 0–IV. Occult carcinoma is also included. In general, earlier cancer stages have better outcomes. However, doctors define cancer stages with information from thousands of patients, so a cancer stage gives an average outcome. It may not tell the outcome for one person. Some people will do better than expected. Others will do worse. Other factors not used for staging cancer are also very important. Some of these factors include your general health, type of lung cancer, and molecular test results.

Table 1

| Anatomic stage/prognostic groups | | | |
|----------------------------------|-------|-------|-----|
| Occult carcinoma | TX | N0 | M0 |
| Stage 0 | Tis | N0 | M0 |
| Stage IA | T1a | N0 | M0 |
| | T1b | N0 | M0 |
| Stage IB | T2a | N0 | M0 |
| Stage IIA | T2b | N0 | M0 |
| | T1a | N1 | M0 |
| | T1b | N1 | M0 |
| | T2a | N1 | M0 |
| Stage IIB | T2b | N1 | M0 |
| | T3 | N0 | M0 |
| Stage IIIA | T1a | N2 | M0 |
| | T1b | N2 | M0 |
| | T2a | N2 | M0 |
| | T2b | N2 | M0 |
| | T3 | N1 | M0 |
| | T3 | N2 | M0 |
| | T4 | N0 | M0 |
| | T4 | N1 | M0 |
| Stage IIIB | T1a | N3 | M0 |
| | T1b | N3 | M0 |
| | T2a | N3 | M0 |
| | T2b | N3 | M0 |
| | T3 | N3 | M0 |
| | T4 | N2 | M0 |
| | T4 | N3 | M0 |
| Stage IV | Any T | Any N | M1a |
| | Any T | Any N | M1b |

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Part 4: Tools



Webpages

American Cancer Society

www.cancer.org/Cancer/LungCancer-Non-SmallCell/DetailedGuide/non-small-cell-lung-cancer-staging

Lung Cancer Alliance

www.lungcanceralliance.org/get-information/what-is-lung-cancer/staging-nsclc.html

National Cancer Institute

www.cancer.gov/cancertopics/pdq/treatment/non-small-cell-lung/Patient/page2

National Cancer Institute

www.nccn.com/type-of-cancer/lung-cancer/1307.html

Review of Part 4

- Lung cancer is grouped into stages to help plan treatment.
- Cancer stages are defined by the growth and spread of the tumor.
- The clinical stage is based on tests given before any treatment.
- The pathologic stage is based on the results of surgery.

Part 5: Tests by cancer stage

Part 5 describes the recommended tests based on the clinical stage of the cancer. The tests in Part 5 help your doctors assess if surgery is an option, how far the cancer has spread, and treatment options for widespread lung cancer. If you have had these tests recently, they are not needed again.



- 36** | **5.1 Pulmonary function tests**
Describes the tests used to assess how well your lungs work.
- 36** | **5.2 Imaging tests**
Describes the tests used to see how far the cancer has spread.
- 37** | **5.3 Biopsy tests**
Describes the tests used to confirm if cancer is present.
- 38** | **5.4 Molecular tests**
Describes the tests of gene changes for widespread lung cancer.
- 40** | **Tools**
Lists helpful webpages along with questions to ask your doctor about tests.

Part 5: Tests by cancer stage

5.1 Pulmonary function tests

| Cancer stage | Test name |
|---|---------------------|
| I, II, III, and IV tumors that may be treated with surgery or radiation therapy | Spirometry |
| | Gas diffusion |
| | Body plethysmograph |

Lung surgery and radiation therapy are treatment options for stage I and II, and some stage III and IV tumors. To assess if you can have these treatments, your doctors will need to know how well your lungs work. There are three pulmonary function tests. A common side effect of pulmonary function tests is shortness of breath.

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

5.2 Imaging tests

| Cancer stage | Test name |
|--------------------------|---|
| I, II, and III | PET/CT scan |
| IB, II, III, and some IV | Brain MRI (magnetic resonance imaging) |
| Some IIB and IIIA tumors | MRI of spine and thoracic inlet |

PET/CT scan

PET/CT was described in Parts 2.1 and 2.2. It is recommended for stages I, II, and III, if not done for clinical staging. Stage IV is often found with a CT scan and often the cancer has spread to more than one site. In these cases, a PET scan is not needed. For earlier stages, PET/CT may show cancer in the lymph nodes within the chest and in other tissues. PET/CT findings of distant metastases need to be confirmed with a biopsy or another imaging test.

Brain MRI

MRI may find small tumors in the brain that aren't causing symptoms. It is recommended for stages IB, II, and III. If you have stage IV cancer, you may receive a brain MRI only if you have symptoms suggesting the cancer has spread to the brain. Such symptoms include unusual headaches or weakness in a specific part of the body. MRI uses radio waves and powerful magnets to take pictures inside the body. A contrast dye may be used to make the pictures clearer. An MRI may cause your body to feel a bit warm.

Part 5: Tests by cancer stage

MRI of spine and thoracic inlet

Some stage IIB and III lung cancers are superior sulcus tumors. This type of tumor starts at the top of the lung and easily grows into the chest wall. If this tumor has grown next to your spine or nearby blood vessels, an MRI of your spine and thoracic inlet is suggested. The thoracic inlet is the center of a ring of bones at the top of the ribcage.

5.3 Biopsy tests

| Cancer stage | Test name |
|------------------------|--|
| I, II, IIIA | Bronchoscopy |
| I, II, and III | Mediastinal biopsy |
| IIIB tumors | Supraclavicular or scalene biopsy |
| IV with effusion (M1a) | Thoracentesis or pericardiocentesis ± thoracoscopy |

Bronchoscopy

Bronchoscopy is recommended for stages I, II, and IIIA tumors. However, your doctors may wait to do a bronchoscopy until surgical treatment if they strongly think your lung nodule is cancer. A bronchoscopy is very rarely done if there is stage IV disease. Types of bronchoscopy are described in Part 3.1.

Mediastinal biopsy

The larger the tumor and the closer it is to the center of the chest, the more likely the cancer has spread to mediastinal lymph nodes. A mediastinal biopsy is recommended for stages IB, II, and III. This biopsy may not be needed if you have a stage IA tumor that likely hasn't spread to the mediastinal nodes. There is more than one way to access mediastinal nodes. Examples are a mediastinoscopy, EBUS-TBNA, and EUS-FNA. Read Part 3.2 for a description of these biopsies.

Definitions:

Biopsy: Removal of small amounts of tissue or fluid to be tested for disease

Imaging test: A test that makes pictures of the insides of the body

Lymph node: A small group of disease-fighting cells

Metastases: Cancer that has spread from the first site

Nodule: A small mass of tissue

Oxygen: A gas that cells need to live

Radiation therapy: The use of radiation to treat cancer

Acronyms:

CT = computed tomography

PET/CT = positron emission tomography/computed tomography

Part 5: Tests by cancer stage

Supraclavicular or scalene biopsy

Stage IIIB lung cancer may have spread to the supraclavicular or scalene lymph nodes. These nodes should be tested to confirm if cancer is present. There is more than one way to access these nodes. A mediastinoscopy, fine needle aspiration, or other methods may be used. A mediastinoscopy was described on page 24. A fine needle aspiration inserts a needle through skin that has been numbed and into the node to remove tissue.

Pericardiocentesis

Thoracentesis and thoracoscopy were described in Part 3.3 on page 25. Pericardiocentesis is much like thoracentesis. Like the lungs, the heart has a tissue lining around it called the pericardium. There is fluid between the two layers of the pericardium. Excess fluid may build up if cancer invades it. This excess fluid is called pericardial effusion. Pericardiocentesis removes the excess fluid with a needle inserted through the chest to test for cancer cells.

5.4 Molecular tests

| Cancer stage | Test name |
|---|---|
| Non-squamous and some squamous widespread IV (M1b) tumors | EGFR (e pidermal g rowth f actor r eceptor) mutation |
| | ALK (a naplastic l ymphoma k inase) gene rearrangement |

If the cancer has spread to more than one area outside the chest, treatment depends on the histologic subtype and results of molecular testing. As discussed in Part 4.1, the histologic subtypes are squamous cell carcinoma, adenocarcinoma, large-cell lung carcinoma, and other rare types. Molecular testing looks for known changes in genes for which there are treatments.

Very few people with squamous cell carcinoma have known gene changes for which treatments are available. Therefore, molecular testing of widespread squamous cell carcinoma is recommended only for people who never smoked. Molecular testing is recommended for all other histologic subtypes. Molecular testing is done with biopsy samples, so you may have more than one biopsy to collect enough cells. Molecular testing looks for the following gene changes:

EGFR mutation

EGFR is a surface receptor. A surface receptor is a protein in the membrane of cells that starts changes within the cell when turned on. Changes (mutations) in the gene that controls EGFR cause the receptors to be overactive, which in turn causes new cancer cells to form quickly.

Part 5: Tests by cancer stage

ALK gene rearrangement

For some lung cancers, the growth of the cancer cells is caused in part by an ALK gene rearrangement. A gene rearrangement is the fusion of one gene with another gene to create a new gene. In some lung cancers, ALK fuses with EML4 (echinoderm microtubule associated protein like 4). The ALK-EML4 fusion gene makes proteins that help the lung cancer cells grow.



Definitions:

Biopsy: Removal of small amounts of tissue or fluid to be tested for disease

Genes: Coded instructions within cells for creating new cells and controlling how cells behave

Scalene: Within the neck

Supraclavicular: Above the collarbone

Part 5: Tools

Questions about testing to ask your doctor

- What tests will I have?
- Where will the tests take place? Will I have to go to the hospital?
- How long will it take? Will I be awake?
- Will it hurt? Will I need anesthesia?
- What are the risks? What are the chances of infection or bleeding afterward?
- How do I prepare for testing? Should I not take aspirin? Should I not eat beforehand?
- Should I bring a list of my medications?
- Should I bring someone with me?
- How long will it take for me to recover? Will I be given an antibiotic or other drug afterward?
- How soon will I know the results and who will explain them to me? If a biopsy is done, will I get a copy of the results?
- Who will talk with me about the next steps? When?

Part 5: Tools



Webpages

NCCN

www.nccn.com/type-of-cancer/lung-cancer/1309.html

www.nccn.com/type-of-cancer/lung-cancer/1313.html

Review of Part 5

- Pulmonary function tests help doctors assess if surgery or radiation therapy is a treatment option.
- Imaging tests and biopsies are used to assess how far the cancer has spread.
- Molecular testing looks for changes in genes for which there are treatments.

Part 6: Overview of cancer treatments

There is more than one treatment for lung cancer. The main types are described on the next pages. This information may help you understand Part 7. It may also help you know what to expect during treatment. Not every person with lung cancer will receive every treatment listed. Surgery and radiation therapy are local treatments for lung cancer and are described first. Chemotherapy and targeted therapy, which are systemic treatments for cancer throughout the body, are described next.



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6.1 Surgery

Describes the operations used for lung cancer.

47

6.2 Radiation therapy

Describes the uses of radiation to treat lung cancer.

49

6.3 Chemotherapy

Describes chemotherapy drugs for lung cancer.

51

6.4 Targeted therapy

Describes targeted drugs for lung cancer.

53

Tools

Lists helpful webpages along with questions to ask your doctor about treatments.

Supportive care (also called palliative care) doesn't aim to treat cancer but aims to improve quality of life. However, supportive care given with cancer treatment has been shown not only to improve quality of life and mood but also to extend life among people newly diagnosed with stage IV lung cancer. Supportive care can address many needs. Examples include treatment for physical and emotional symptoms, help with treatment decisions, and coordination of care between health providers. Talk with your treatment team to plan the best supportive care for you.

Part 6: Overview of cancer treatments

6.1 Surgery

Removal of the tumor by surgery is the time-honored way to try to cure lung cancer. It is commonly used to treat stages I, II, and some III cancers but is rarely used to treat stage IV cancers. Surgery is preferred over other local treatments. If you will have surgery, a board-certified thoracic surgeon who often treats lung cancer should be on your treatment team.

Lung surgery methods

Removal of a lung tumor can sometimes be done with one of two methods. The classic method is thoracotomy. Thoracoscopy, also called VATS, is a newer method. It is also used to do biopsies as described in Part 3.3. Not enough research has been done to know if one method is better than the other.

Before either surgery, you will be asked to stop eating, drinking, and taking some medicines for a short period of time. If you smoke, it is important to stop. General anesthesia is used for both surgeries.

Definitions:

Board-certified: A status to identify doctors who finished training in a specialized field of medicine

General anesthesia: A controlled loss of wakefulness from drugs

Thoracic surgeon: A doctor who's an expert in surgery within the chest

Acronyms:

VATS = video-assisted thoracic surgery

Part 6: Overview of cancer treatments

With thoracotomy, a large cut is made from the front of the chest to the back passing under the armpit and shoulder blade. The cut is made between the ribs and through the chest wall. The ribs are spread apart with retractors to allow the surgeon to work. Sometimes, a part of the rib is removed. During surgery, the lung with the tumor is deflated and a breathing tube is inserted down the throat to assist the other lung. After surgery the cut is sewn closed, but chest tubes are left in place for a few days to drain fluid and air. The surgery can take between 2 and 6 hours to complete. You may stay in the hospital for a few days to recover.

With VATS, three or four small cuts are made between the ribs on the side of the chest. A small camera and surgical tools are inserted through the cuts. Video from the camera is shown on a screen so that the surgeon can clearly see your organs. Tissue is removed through the small cuts rather than a large opening as done for thoracotomy. During surgery, the lung with the tumor is deflated and a breathing tube is inserted down the throat to assist the other lung. After surgery, the cuts are sewn closed, but chest tubes are left in place for a few days to drain fluid and air. The surgery can take between 2 and 3 hours to complete. You may stay in the hospital for a few days to recover.

Lung surgery types

As shown in Figure 6, how much lung tissue is removed during surgery can differ. Some surgeries for lung cancer remove only part rather than the whole lung. Names of common lung surgeries are:

- Wedge resection – Removal of a small part of a lobe,
- Segmentectomy – Removal of a large part of a lobe,
- Lobectomy – Removal of an entire lobe,
- Sleeve lobectomy – Removal of an entire lobe and part of the bronchus, and
- Pneumonectomy – Removal of the entire lung

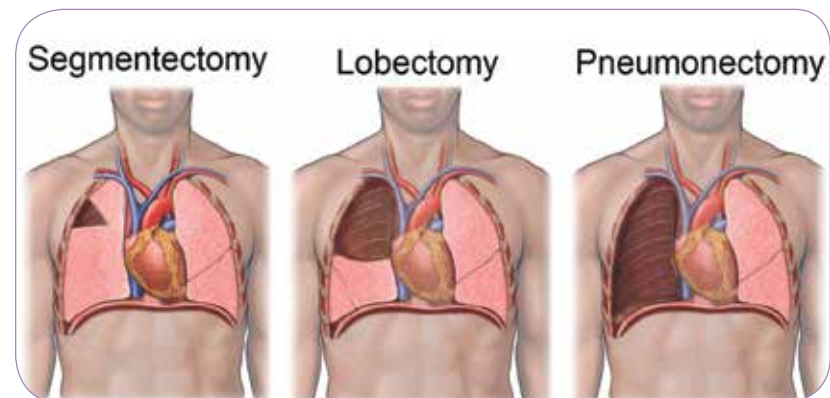


Figure 6. Lung tumor surgeries

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Part 6: Overview of cancer treatments

The goal of surgery is to remove all the cancer from the body. To do so, the tumor is removed along with some normal-looking tissue around its rim, called the surgical margin. Thus, which surgery you will have depends on where the tumor has grown and how well your lungs work.

The preferred surgery for most lung cancers is a pneumonectomy or lobectomy. If a sleeve lobectomy and pneumonectomy are options, a sleeve lobectomy is preferred because it saves most of the lung. You may qualify for a segmentectomy and wedge resection if a lobectomy would seriously threaten your health or if you have a very small tumor that hasn't likely spread. If you can have either surgery, a segmentectomy is the preferred choice.

Lymph node surgery

During the surgery to remove the tumor, lymph nodes with cancer and those that may have cancer are removed. Lymph nodes may be removed by lymph node dissection or systematic lymph node sampling. For sampling, some lymph nodes in the lung and some mediastinal nodes are removed. A lymph node dissection removes as many lymph nodes as possible from the lung and mediastinum. To remove nodes, some organs may need to be moved or cut. If you have N0 or N1 disease, either type of surgery is an option. Lymph node dissection of the mediastinal nodes is recommended for stage IIIA tumors with N2 disease that are treated with surgery.

Side effects of surgery

Side effects are unhealthy or unpleasant physical or emotional responses to treatment. You may experience side effects from the general anesthesia, lung tumor surgery, or the lymph node surgery. Side effects of general anesthesia include a sore throat from the breathing tube, nausea with vomiting, confusion, muscle aches, itching, and crying right after you wake up.

Definitions:



Read pages 30–33 for definitions of TNM scores.

General anesthesia:

A controlled loss of wakefulness from drugs

Lymph node: A small group of disease-fighting cells

Mediastinal: The chest area between the lungs

Retractors: A tool that holds back the edges of a surgical cut

Part 6: Overview of cancer treatments

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

Not all side effects of surgery are listed here. Please ask your treatment team for a complete list of common and rare side effects. If a side effect bothers you, tell your treatment team. There may be ways to help you feel better.

Order of treatments

Most people with lung cancer will have more than one treatment. When and why treatments are given can be hard to understand. Part 7 gives full details. Here, the terms that describe the order of treatments are explained.

Neoadjuvant treatment

Neoadjuvant treatment is used to shrink large tumors before surgery.



Primary treatment

The main treatment used to rid your body of cancer is called the primary treatment.



Adjuvant treatment

Adjuvant treatment is given to kill any cancer cells left behind after primary treatment given to cure the disease.

Part 6: Overview of cancer treatments

6.2 Radiation therapy

Radiation therapy uses high-energy rays to treat cancer. The rays damage the genes of a cell. This either kills the cancer cells or stops new cancer cells from being made. Radiation can also harm normal cells. As a result, new methods keep being made that target the tumor more precisely. The current standard of radiation therapy is described next. It is suggested that a board-certified radiation oncologist who often treats lung cancer be on your treatment team if you may have radiation therapy.

Radiation methods

Radiation therapy can be given with either one of two methods. The first method is called EBRT (**e**xternal **b**eam **r**adiation **t**herapy). For EBRT, a machine outside the body delivers radiation. Radiation is often given in a series of sessions for about 6 weeks. This is the more common method used to treat lung cancer.

The other method is internal radiation therapy (also called brachytherapy). Internal radiation therapy involves placing a radioactive object in or near the tumor. For lung cancer, internal radiation can shrink a tumor blocking an airway. Radiation is given through a plastic tube that is inserted into the airway. The tube is removed after the treatment session.

Receiving EBRT

To receive radiation therapy, you first must have a simulation session. For simulation, pictures of the tumor are taken. CT scans are suggested for simulation, but 4D-CT (four-**d**imensional **c**omputed **t**omography) is ideal to account for tumor movement from breathing. Contrast can improve scans of tumors in the inner two-thirds of the lung or of lymph nodes with cancer. A PET/CT scan can help to aim radiation beams when the lung has collapsed or contrast can't be used. PET/CT scans within 4 weeks of treatment are suggested. If your breathing causes large movements, motion control methods during the scans may be used.

Definitions:

Board-certified: A status to identify doctors who finished training in a specialized field of medicine

Contrast: A dye used to make clearer images

Gene: Coded instructions within cells for creating new cells and controlling how cells behave

Pneumonia: Swelling of the lung's air sacs

Pneumothorax: A collapsed lung

Radiation oncologist: A doctor who's an expert in treating cancer with radiation

Acronyms:

CT = computed tomography

PET/CT = positron emission tomography/computed tomography

Part 6: Overview of cancer treatments

Using the scans, your treatment team will plan the best radiation dose, number and shape of radiation beams, and number of treatment sessions. Beams are shaped with computer software and hardware added to the radiation machine. Radiation beams are aimed at the tumor with help from ink marks on the skin or marker seeds in the tumor.

During treatment, you will lie on a table in the same position as done for simulation. Devices may be used to keep you from moving. You will be alone while the technician operates the machine from a nearby room. He or she will be able to see, hear, and speak with you. As treatment is given, you may hear noises. One session takes less than 10 minutes. The types of EBRT include:

- 3D-CRT (three-dimensional conformal radiation therapy) – Treatment is completed in about 6 weeks and uses photon beams that match the shape of the tumor,
- IMRT (intensity-modulated radiation therapy) – Treatment is completed in about 6 weeks and uses photon beams of different strengths based on the thickness of the tumor,
- SABR (stereotactic ablative radiotherapy) – Treatment is completed in 1 to 2 weeks and uses precise, high-dose photon beams,
- Hadron therapy – Treatment is completed in about 6 weeks and uses proton beams that deliver radiation mostly within the tumor,

- SRS (stereotactic radiosurgery) – Treatment is completed in 1 to 2 weeks and uses precise, high-dose photon beams to treat brain tumors, and
- WBRT (whole brain radiation therapy) – Treatment is completed in 2 weeks and uses small amounts of radiation to treat the entire brain.

A lung tumor is harder to target than some other tumors in the body. This is because breathing causes the tumor to move. IGRT (image-guided radiation therapy) can improve how well the radiation beam targets the tumor. IGRT uses a machine that delivers radiation and also takes pictures of the tumor. Pictures can be taken right before or during treatment. These pictures are compared to the ones taken during simulation. If needed, changes will be made to your body position or the radiation beams.

Side effects of radiation

The most common side effects of radiation therapy are changes in skin. Your treated skin will look and feel as if it has been sunburned. It will likely become red and may also become dry, sore, and feel painful when touched. You may also have hair loss. Other side effects of radiation include swelling of the lungs or esophagus, extreme tiredness despite sleep, and loss of appetite.

Not all side effects of radiation are listed here. Please ask your treatment team for a complete list of common and rare side effects. If a side effect bothers you, tell your treatment team. There may be ways to help you feel better.

Part 6: Overview of cancer treatments

6.3 Chemotherapy

Chemotherapy, or “chemo,” is the use of drugs to treat cancer. Chemotherapy stops the growth process of cells in an active growth phase. It does not work on cells in a resting phase. Cancer cells grow fast, so chemotherapy works well to stop new cancer cells from being made.

Chemotherapy is given alone or sometimes with radiation to treat lung cancer. When only one drug is used, it is called a single agent. However, these drugs differ in the way they work, so often more than one drug is used. A combination regimen is the use of two or more chemotherapy drugs.

Most chemotherapy drugs for lung cancer are liquids that are slowly injected into a vein. Some are a pill that is swallowed. The drugs travel in the bloodstream to treat cancer throughout the body.

Chemotherapy is given in cycles of treatment days followed by days of rest. This allows the body to recover before the next cycle. Cycles vary in length depending on which drugs are used. Often, a cycle is 14, 21, or 28 days long.

Side effects of chemotherapy

The reactions to chemotherapy differ. Some people have many side effects. Others have few. Some side effects can be very serious while others can be unpleasant but not serious.

Side effects of chemotherapy depend on the drug type, amount taken, length of treatment, and the person. In general, side effects are caused by the death of fast-growing cells. These cells are found in the gut, mouth, and blood. Thus, common side effects of chemotherapy include low blood cell counts, not feeling hungry, nausea, vomiting, diarrhea, hair loss, and mouth sores.

Not all side effects of chemotherapy are listed here. Please ask your treatment team for a complete list of common and rare side effects. If a side effect bothers you, tell your treatment team. There may be ways to help you feel better.

Definitions:

Esophagus: The organ between the mouth and stomach

Photon beam: A stream of particles that have no mass or electric charge

Proton beam: A stream of positively charged particles that emit energy within a short distance

Side effect: An unhealthy or unpleasant physical or emotional response to treatment

Acronyms:

EBRT = external beam radiation therapy

Part 6: Overview of cancer treatments

Systemic drugs for non-small cell lung cancer

| Generic name | Brand name (sold as) | Type of treatment |
|-------------------------------|------------------------------|-------------------|
| Bevacizumab | Avastin® | Targeted therapy |
| Carboplatin | – | Chemotherapy |
| Cetuximab | Erbix® | Targeted therapy |
| Cisplatin | Platinol® and Platinol® AQ | Chemotherapy |
| Crizotinib | Xalkori® | Targeted therapy |
| Docetaxel | Taxotere® and Tarceva® | Chemotherapy |
| Erlotinib hydrochloride | Tarceva® | Targeted therapy |
| Etoposide/etoposide phosphate | Etopophos® Preservative Free | Chemotherapy |
| Gemcitabine hydrochloride | Gemzar® | Chemotherapy |
| Ifosfamide | – | Chemotherapy |
| Irinotecan hydrochloride | Camptosar® | Chemotherapy |
| Mitomycin, mitomycin C | – | Chemotherapy |
| Paclitaxel | Taxol® | Chemotherapy |
| Paclitaxel albumin-bound | Abraxane® | Chemotherapy |
| Pemetrexed | Alimta® | Chemotherapy |
| Vinorelbine tartrate | Navelbine® | Chemotherapy |

Part 6: Overview of cancer treatments

6.4 Targeted therapy

Targeted therapy is the use of drugs to treat cancer. These drugs stop the growth process that is very specific to cancer cells. They are less likely to harm normal cells than chemotherapy, which stops any cells in a growth phase. The targeted therapy drugs used for lung cancer include:

- Bevacizumab – Stops the growth of new blood vessels that feed cancer cells,
- Cetuximab – Attaches to EGFRs—like a key into a lock—to stop cell growth,
- Crizotinib – Blocks the signals from ALKs that tell the cell to grow, and
- Erlotinib – Blocks the signals from EGFRs that tell the cell to grow.

Targeted therapy is used alone to treat some lung cancers or is used with chemotherapy. It is received either as an injection into a vein or as a pill to be swallowed. The drugs travel in the bloodstream to treat cancer throughout the body.

Side effects of targeted therapy

Like chemotherapy, the side effects of targeted therapy depend on the drug and dose. Bevacizumab may cause diarrhea, high blood pressure, headache, tiredness, and mouth sores. Cetuximab has similar side effects, such as skin rash and feeling tired and weak. Common side effects of crizotinib include not feeling hungry, nausea, vomiting, diarrhea, vision problems, and ‘cold’-like symptoms. Common side effects of erlotinib include skin rash, diarrhea, feeling tired, not feeling hungry, and nausea. The rash may appear on the face, neck, or trunk of the body within the first 2 weeks of treatment.

Definitions:



Read page 38 for information on testing of ALK and EGFR.

ALK: A protein on the edge of a cell that send signals for the cell to grow

EGFR: A protein on the edge of a cell that send signals for the cell to grow

Side effect: An unhealthy or unpleasant physical or emotional response to treatment

Acronyms:

ALK = anaplastic lymphoma kinase

EGFR = epidermal growth factor receptor

Part 6: Overview of cancer treatments

Complementary and alternative medicine

You may hear about other treatments from your family and friends. They may suggest using CAM (complementary and alternative medicine). CAM is a group of treatments that aren't often given by doctors. There is much interest today in CAM for cancer, and many CAMs are being studied to see if they are truly helpful.

Complementary medicines are treatments given along with usual medical treatments. While CAMs aren't known to kill cancer cells, they may improve your comfort and well-being. Two examples are acupuncture for pain management and yoga for relaxation.

Alternative medicine is used in place of usual medicine. Some alternative medicines are sold as cures even though they haven't been proven to work. If there was good proof that CAMs or other treatments cured cancer, they would be included in this booklet.

It is important to tell your treatment team if you are using any CAMs. They can tell you which CAMs may be helpful and which CAMs may limit how well treatments work.

Part 6: Tools

Questions about treatment to ask your doctor

- What are the available treatments for lung cancer?
- What are the risks and benefits of each treatment for lung cancer?
- Will my age, general health, stage of lung cancer, and other medical conditions limit my treatment choices?
- Do I have to get treated?
- Where will I be treated? Will I have to stay in the hospital or can I go home after each treatment?
- What can I do to prepare for treatment? Should I stop taking my medications? Should I store my blood in case I need a transfusion?
- How many lung tumor surgeries have you done? How many of your patients have had complications?
- Is lung cancer surgery a major part of your practice?
- How soon should I start treatment? How long does treatment take?
- How much will the treatment cost? How can I find out how much my insurance company will cover?
- How likely is it that I'll be cancer-free after treatment?
- What symptoms should I look out for while being treated for lung cancer?
- When will I be able to return to my normal activities?
- What is the chance that my cancer will come back and/or spread?
- What should I do after I finish treatment?
- Are there supportive services that I can get involved in? Support groups?

Part 6: Tools



Webpages

American Cancer Society

www.cancer.org/Treatment/TreatmentsandSideEffects/GuidetoCancerDrugs/index

www.cancer.org/Cancer/LungCancer-Non-SmallCell/DetailedGuide/non-small-cell-lung-cancer-treating-general-info

Lung Cancer Alliance

www.lungcanceralliance.org/get-information/what-if-i-am-diagnosed/understanding-treatment-options

National Cancer Institute

www.cancer.gov/drugdictionary

www.cancer.gov/cancertopics/pdq/treatment/non-small-cell-lung/Patient/page4#Keypoint18

NCCN

www.nccn.com/type-of-cancer/lung-cancer/1300.html

www.nccn.com/type-of-cancer/lung-cancer/1305.html

www.nccn.com/type-of-cancer/lung-cancer/1312.html

Review of Part 6

- Surgery and radiation are often used to treat lung cancer where it started.
- Lung surgery removes the tumor with some normal tissue around its edge.
- Lymph node surgery removes nodes with cancer and nodes that may have cancer.
- Radiation kills cancer cells or stops new cancer cells from being made.
- Drugs can be used to kill cancer cells anywhere in the body.
- Chemotherapy drugs stop the growth process of cells in a growth phase.
- Targeted therapy drugs stop cancer cells from getting food or signals to grow.

Part 7: Treatment by cancer stage

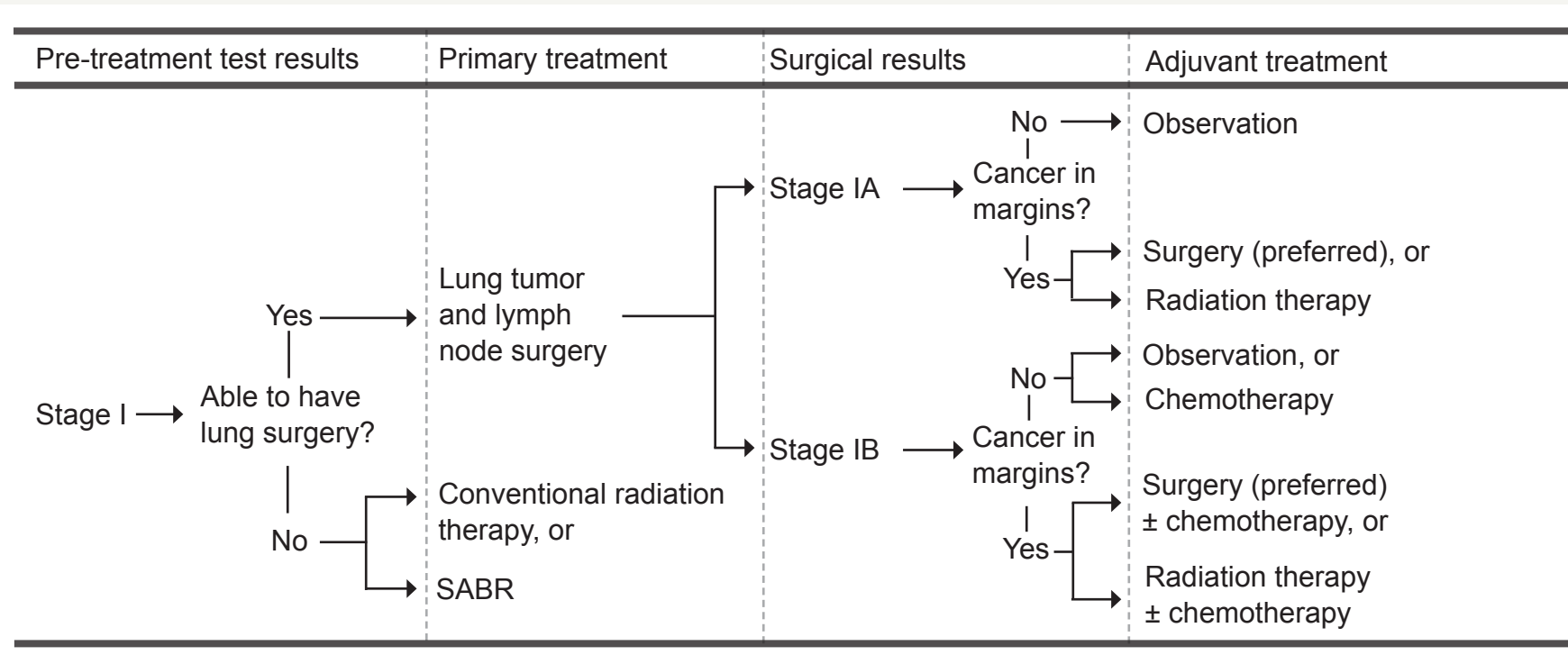
Part 7 is a guide to the treatment options for people with non-small cell lung cancer. It shows what treatments are recommended for each cancer stage. This information is taken from the treatment guidelines written by NCCN experts for lung cancer doctors. However, your doctors may suggest other treatments based on your health and personal wishes.

Much effort has been made to make Part 7 easy to read. Charts are used to list treatment options and map the steps through the treatment process. This information is also described in the text. Some words that you may not know are defined on the page and in the Dictionary in Part 9. More information about the treatments in this guide can be found in Part 6.

- 56** | **7.1 Stage I treatments**
Presents the treatment options for stage I lung cancer.
- 58** | **7.2 Stage II treatments**
Presents the treatment options for stage II lung cancer.
- 61** | **7.3 Stage III treatments**
Presents the treatment options for stage III lung cancer.
- 64** | **7.4 Multiple primary tumors**
Presents the treatment options for when there is more than one primary tumor.
- 66** | **7.5 Stage IV treatments**
Presents the treatment options for stage IV lung cancer.
- 72** | **7.6 Survivorship care plan**
Presents the next steps of care after the cancer is cured.
- 74** | **Tools**
Lists webpages about the timing of treatments.

Part 7: Treatment by cancer stage

7.1 Stage I treatments



You may have stage I lung cancer based on tests given before treatment. In stage IA, the lung tumor is 3 cm or smaller. A stage IB tumor can be as large as 5 cm or may have grown into the bronchus or visceral pleura.

Which primary treatment you will have depends on if you are able to have surgery. If lung surgery is an option,

removal of the tumor and lymph nodes is recommended. If you are unable to have surgery, you may be treated with radiation therapy. Conventional radiation therapy or SABR is recommended. Conventional radiation therapy gives radiation in small doses for weeks and targets both the tumor and some normal tissue. One example is 3D-CRT.

Part 7: Treatment by cancer stage

During surgery, your doctors may find more cancer than first thought. This may change the stage of the cancer. If the cancer is upstaged, go back to page 55 to find out which pages to read for adjuvant treatment.

If the cancer remains stage I, you may receive adjuvant treatment depending on the surgical results. Treatment options differ whether the cancer is stage IA or IB. Cancer in the surgical margin also affects treatment options.

A cancer-free surgical margin is often a sign that all the cancer was removed. In this case, observation is recommended. However, the chance of remaining cancer cells is higher for some stage IB cancers. In these cases, chemotherapy may be received.

When cancer is found in the surgical margins, a second surgery is the preferred treatment. Radiation therapy is another option. If you have stage IB cancer, chemotherapy may be added to surgery or radiation therapy.

Definitions:



Read Part 6 for a full description of lung cancer treatments.

Bronchus: The airway that enters the lung

Lymph node: A group of disease-fighting cells

Observation: A period of testing for signs of cancer

Surgical margin: The normal-looking tissue around a tumor

Visceral pleura: The inner layer of the tissue lining that covers the lungs

Acronyms:

3D-CRT = three-dimensional conformal radiation therapy

SABR = stereotactic ablative radiotherapy

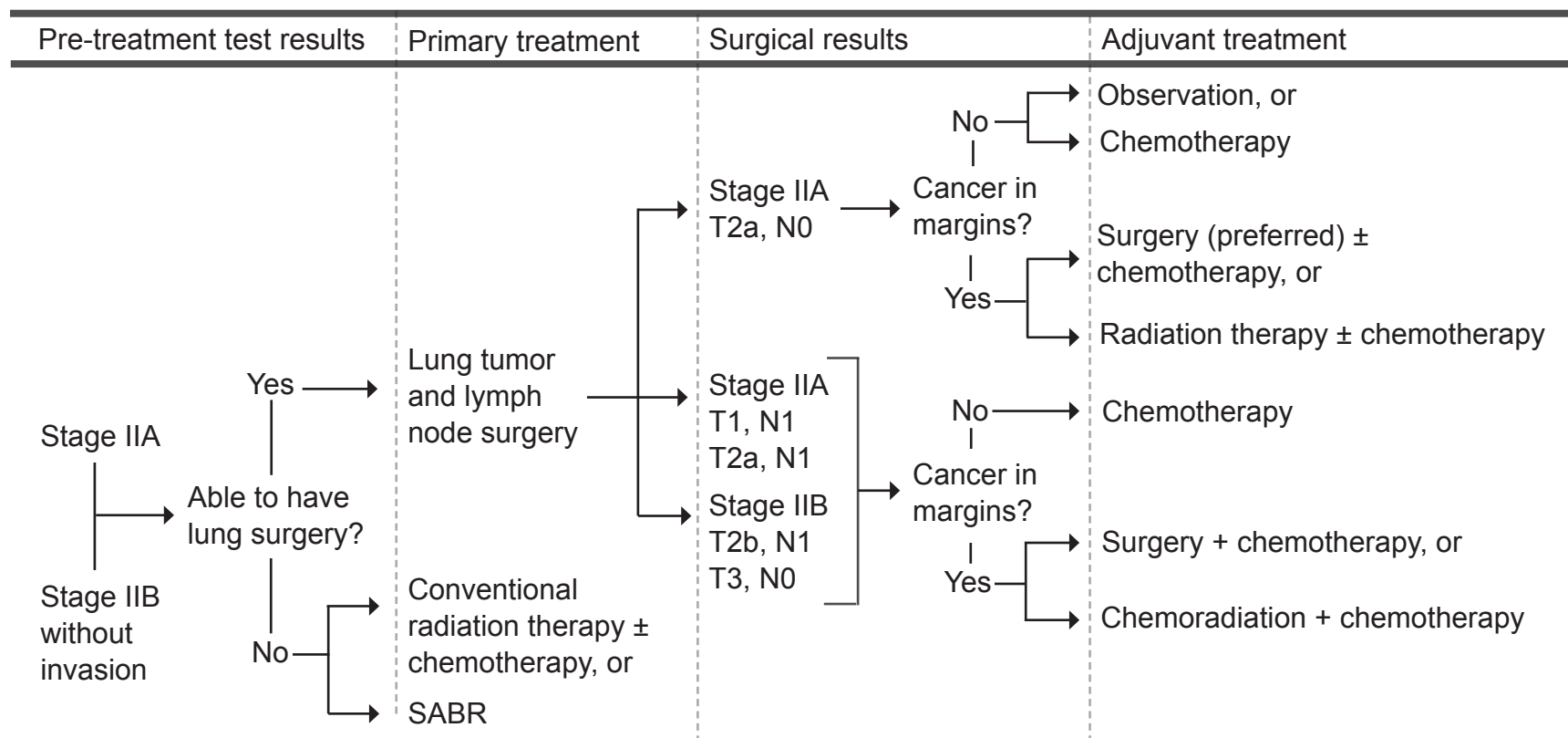
Part 7: Treatment by cancer stage

7.2 Stage II treatments

You may have stage II lung cancer based on tests given before treatment. Or you may have been upstaged to stage II cancer after surgery. A stage IIA tumor is 3 cm or smaller with cancer in the lung's lymph nodes. Larger stage IIA tumors are between 5.1 and 7 cm but the cancer hasn't spread to any nodes.

A stage IIB tumor can also be as large as 7 cm but the lung's nodes have cancer. Stage IIB tumors also include those larger than 7 cm without cancer in the lymph nodes, those that have invaded the chest wall or bronchus, or those with secondary tumors in the same lobe.

Stage IIA and IIB tumors without invasion



Part 7: Treatment by cancer stage

The chart on the left maps the treatment for stage IIA cancer and stage IIB cancer without invasion. These stage IIB tumors have not grown into nearby structures, such as the chest wall. There may be secondary tumors in the lobe with the primary tumor.

Which primary treatment you will have depends on if you are able to have surgery. If lung surgery is an option, removal of the tumor and lymph nodes is recommended. If you are unable to have surgery, you may be treated with radiation therapy. Conventional radiation therapy or SABR is recommended. Conventional radiation therapy gives radiation in small doses for weeks and targets both the tumor and some normal tissue. One example is 3D-CRT. Chemotherapy may be given with conventional radiation.

During surgery, your doctors may find more cancer than first thought. This may change the stage of the cancer. If the cancer is upstaged, go back to page 55 to find out which pages to read.

If the cancer remains stage II, adjuvant treatment is based on the surgical results. For stage IIA cancer, treatment options depend on whether the cancer has spread to your lymph nodes. Lymph nodes without cancer are scored N0 and lung nodes with cancer are scored N1. Cancer in the surgical margin also affects treatment options for stages IIA and IIB.

For stage IIA with N0 disease, a cancer-free margin is often a sign that all the cancer was removed. In this case, observation is recommended. However, the chance of remaining cancer cells is higher for some stage IIA cancers. In these cases, chemotherapy may be received. When the margins have cancer, a second surgery is preferred, but radiation therapy is another option. Chemotherapy may be added to either surgery or radiation.

For stage IIA with N1 disease and stage IIB cancer, chemotherapy is recommended when the margins are cancer-free. When the margins have cancer, a second surgery followed by chemotherapy is one option. The other option is chemoradiation followed by chemotherapy alone. Sequential chemoradiation—chemotherapy followed by radiation therapy—is given when the cancer cells can't be seen. Concurrent chemoradiation is given when the cancer can be seen without a microscope.

Definitions:



Read Part 6 for a description of lung cancer treatments.

Bronchus: The airway that enters the lung

Chest wall: A layer of muscles and ribs

Lobe: A clearly seen division in a lung

Lymph node: A group of disease-fighting cells

Observation: A period of testing for signs of cancer

Surgical margin: The normal-looking tissue around a tumor

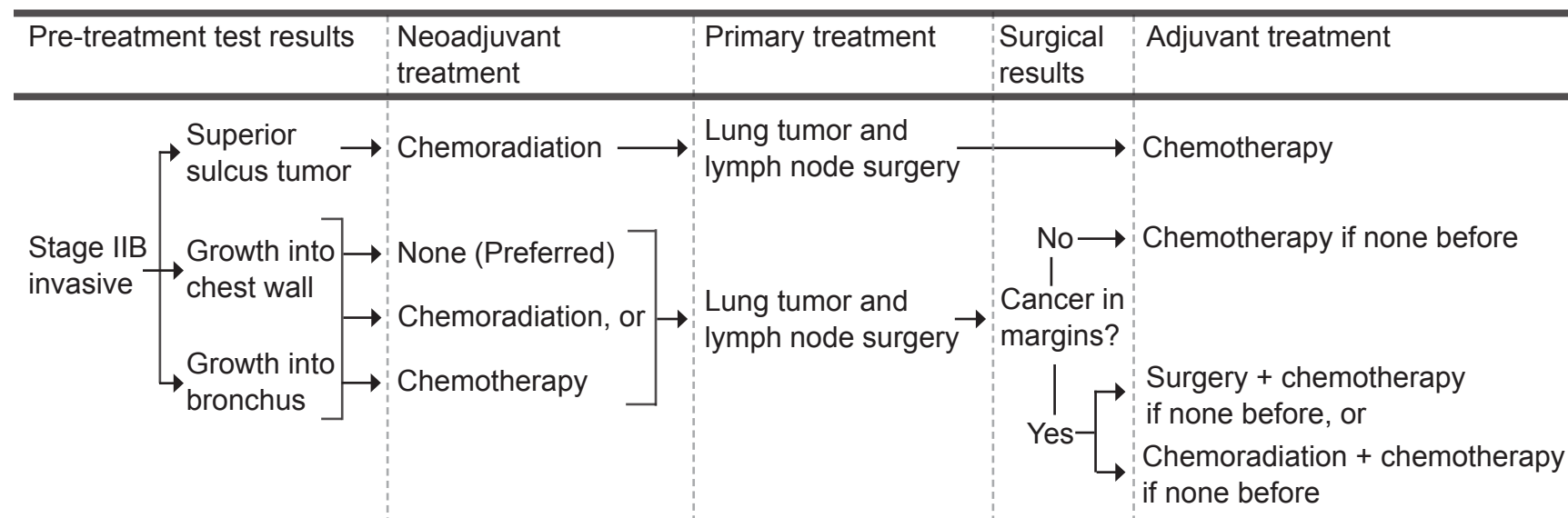
Acronyms:

3D-CRT = three-dimensional conformal radiation therapy

SABR = stereotactic ablative radiotherapy

Part 7: Treatment by cancer stage

Stage IIB invasive tumors



This chart maps the treatment for stage IIB invasive tumors. These tumors have grown into the chest wall or bronchus, but the cancer hasn't spread to lymph nodes. Treatment options depend on into which tissues the primary tumor has grown.

A superior sulcus tumor starts at the top of the lung and easily grows into the chest wall. For these tumors, concurrent chemoradiation is used to shrink the tumor to make surgery easier. Concurrent chemoradiation is chemotherapy given at the same time as radiation therapy. After surgery, chemotherapy is recommended.

No treatment before surgery is the preferred option for other tumors that have grown into the chest wall or

bronchus. Other options are concurrent chemoradiation or chemotherapy alone followed by surgery. Adjuvant treatment is based on the surgical results. If the surgical margins are cancer-free, chemotherapy is needed unless you had it before surgery.

When the margins have cancer, one option is to have a second surgery followed by chemotherapy unless you had it before surgery. The second option is to have chemoradiation and then chemotherapy unless you had it before surgery. Sequential chemoradiation—chemotherapy followed by radiation therapy—is given when the cancer cells can't be seen. Concurrent chemoradiation is given when the cancer can be seen without a microscope.

Part 7: Treatment by cancer stage

7.3 Stage III treatments

You may have stage III lung cancer based on the staging tests. Or you may have been upstaged to stage III after surgery. Stage IIIA is often defined by cancer spread to mediastinal nodes, presence of secondary tumors, or tumor

growth into the mediastinum, neck, or spine. Stage IIIB is often defined by cancer that has spread to lymph nodes in or near the other lung or above the collarbone.

Stage III tumors without invasion

| Pre-treatment test results | Neoadjuvant treatment | Primary treatment | Surgical results | Adjuvant treatment |
|----------------------------|----------------------------------|---|---------------------------------|---|
| T3, N1 T4, N0 T4, N1 | | Lung tumor and lymph node surgery | No Cancer in margins? Yes | Chemotherapy + radiation therapy Chemoradiation + chemotherapy |
| | | (Prior surgery) | N2 disease | |
| T1, N2 T2, N2 T3, N2 | Chemotherapy ± radiation therapy | Chemoradiation (preferred) Surgery if no cancer growth If local growth, radiation therapy if none before ± chemotherapy | | Radiation therapy if none before ± chemotherapy |
| T4, N2 T1 – T4, N3 | | Chemoradiation | | |

This chart maps the treatment for stage III tumors without invasion. These tumors have not grown into nearby structures, such as the chest wall. There may be secondary tumors in the lung with the primary tumor.

Surgery is an option for T3 and T4 tumors without cancer spread to the mediastinal nodes (N0 or N1). Adjuvant treatment is based on the surgical results. If the surgical margins are cancer-free, chemotherapy with radiation therapy is recommended. When the margins have cancer, chemoradiation followed by chemotherapy is recommended.

Part 7: Treatment by cancer stage

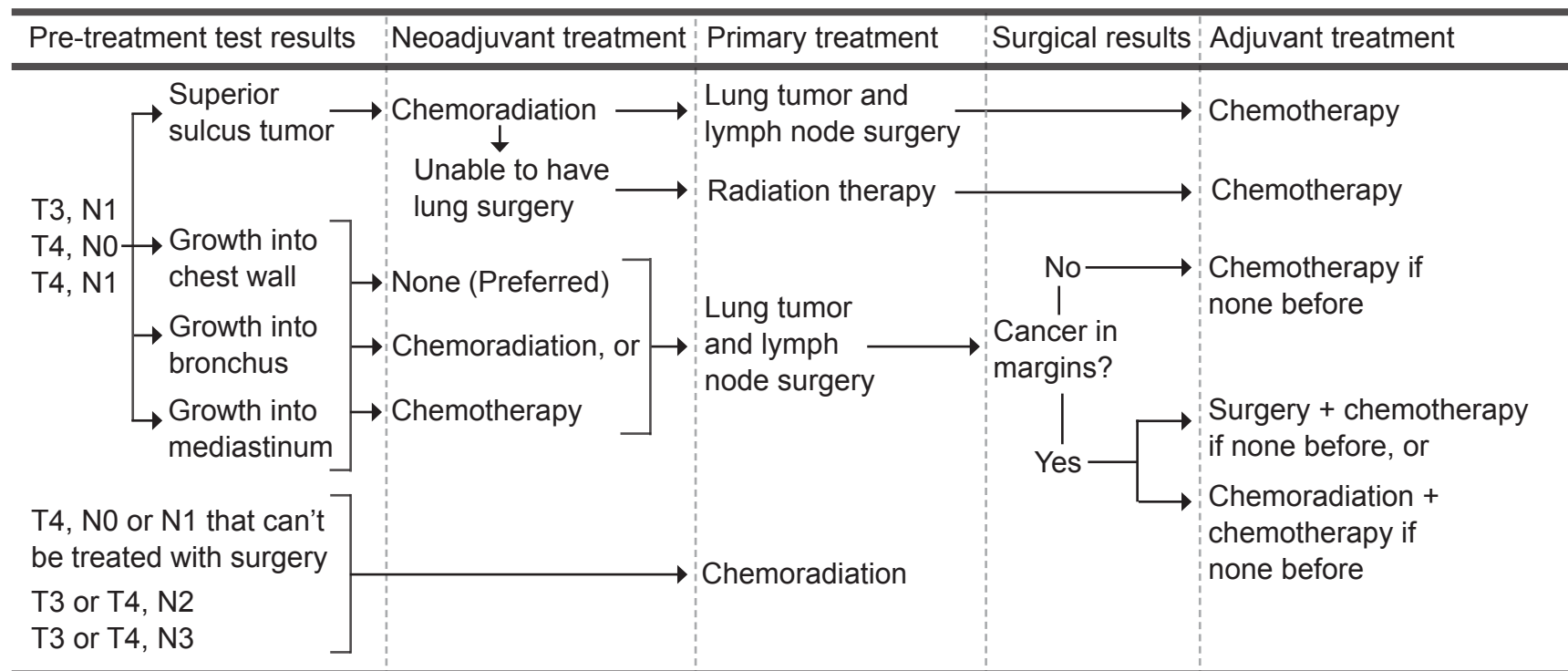
Cancer spread to the mediastinal lymph nodes is scored N2. N2 disease may be found only after surgery for stage I, II, or III (T3, N1) cancer. In this case, adjuvant treatment is the same as for T3, N1 disease.

N2 disease may be found by tests given before treatment. In this case, concurrent chemoradiation is strongly recommended. If surgery is desired, another option is to have chemotherapy with or without radiation therapy. If this treatment stops cancer growth, surgery

can be done. After surgery, you may have chemotherapy followed by radiation therapy if you didn't have it before. If there's cancer growth in or near the lung, radiation therapy (if you didn't have it before) with or without chemotherapy is recommended.

Stage IIIB includes T4 tumors with N2 disease and any tumor with N3 disease. Surgery is hardly ever an option for stage IIIB cancers. Instead, concurrent chemoradiation is strongly recommended.

Stage III invasive tumors



Part 7: Treatment by cancer stage

The chart on the left maps the treatment for stage III invasive tumors. These tumors have grown into the chest wall, bronchus, or mediastinum. The cancer may or may not have spread to lymph nodes.

A superior sulcus tumor starts at the top of the lung and easily grows into the chest wall. For these tumors, concurrent chemoradiation is used to shrink the tumor to make surgery easier. If chemoradiation works, surgery followed by chemotherapy can be done. If the tumor didn't shrink enough or grew, you should receive more radiation therapy to try to cure the disease. Afterward, chemotherapy is recommended.

No treatment before surgery is the preferred option for other tumors that have grown into the chest wall, bronchi, or mediastinum. Other options are concurrent chemoradiation and chemotherapy alone. Which treatment is given after surgery is based on the surgical results.

If the surgical margins are cancer-free, chemotherapy is needed unless you had chemotherapy before surgery. When the margins have cancer, one option is to have a second surgery. The second option is to have chemoradiation. Chemotherapy should follow the second surgery or chemoradiation if you didn't have it before.

Some T4 tumors with N0 or N1 disease can't be removed by surgery because of their size or extent of invasion. Surgery is also not recommended for invasive T3 tumors with N2 disease and all stage IIIB tumors. In these cases, concurrent chemoradiation is recommended.

Definitions:



Read Part 6 for a full description of lung cancer treatments.

Bronchus: The airway that enters the lung

Chest wall: A layer of muscles and ribs

Concurrent chemoradiation: Chemotherapy given at the same time as radiation therapy

Lymph node: A group of disease-fighting cells

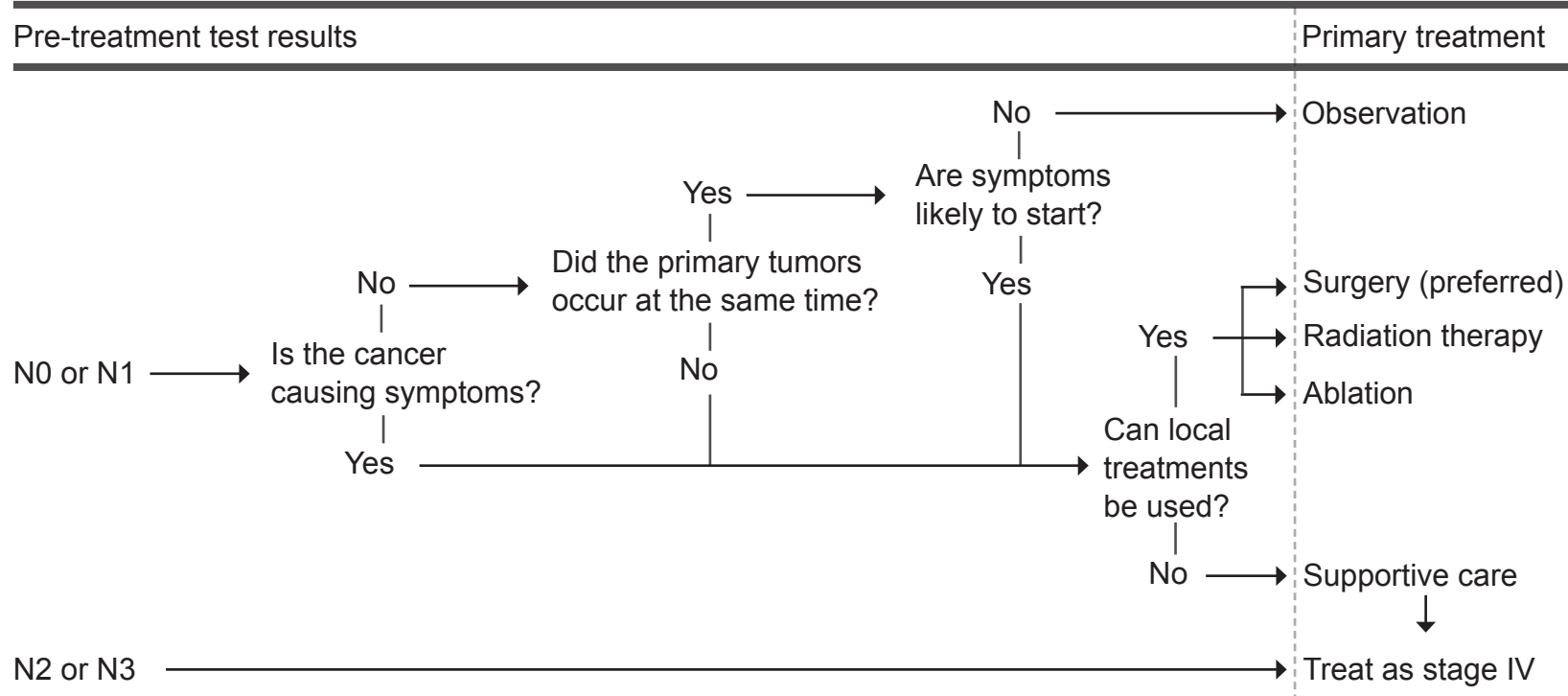
Mediastinal: The chest area between the lungs

Surgical margin: The normal-looking tissue around a tumor

Part 7: Treatment by cancer stage

7.4 Multiple primary tumors

Stage I, II, III, and IV-M1a



Based on biopsy results or prior lung cancer, your doctors may think you have more than one primary tumor. Multiple primary tumors may occur at the same time. Or you may have been treated for one primary tumor and now have a second primary tumor. Multiple primary tumors may be the same or a different histologic subtype.

This chart maps the treatment for multiple primary tumors that haven't spread outside the chest. Treatment options depend on which, if any, lymph nodes have cancer. For N0 or N1 disease, multiple primary tumors that 1) aren't causing symptoms, 2) occurred at the same time, and 3) won't likely cause symptoms don't need treatment at this time. See page 76 for follow-up care.

Part 7: Treatment by cancer stage

All other tumors with N0 or N1 disease should be treated. If local treatments can be received, surgery that spares as much as the lung as possible is preferred. Otherwise, radiation therapy or ablation is suggested. If local treatment isn't possible, supportive care may be given. Tumors that can't be treated with local treatment and those with N2 or N3 disease should be treated as described in Part 7.5 for widespread stage IV lung cancer.

Definitions:



Read Part 6 for a full description of lung cancer treatments.

Histologic subtype: The type of cancer based on the traits of the cells

Lymph node: A group of disease-fighting cells

Primary tumor: The first mass of cancer cells in the body

Supportive care:
Treatment for symptoms of a disease

Part 7: Treatment by cancer stage

7.5 Stage IV treatments

You may have stage IV lung cancer based on tests given before treatment. Or you may have been upstaged to stage IV after surgery. **If you have stage IV cancer, talk with your treatment team about starting supportive care early since it has been shown to extend and enhance life.**

For M1a disease, the cancer has spread from one lung to the other, into the pleura, or into the fluid around the lung or heart. Some of these cancers may be able to be treated with surgery, radiation therapy, or both. For M1b disease, the lung cancer has spread to sites beyond the chest area. Very rarely, lung cancer spreads to only one site beyond the chest. Examples of such sites are the adrenal gland or brain. In these cases, it may be possible to treat the lung tumor and the distant metastasis with surgery, radiation therapy, or both. However, these treatments aren't suggested if there is N2 or N3 disease.

Part 7.5 covers stage IV cancers that can't be treated with surgery or radiation therapy. This includes lung cancer that has spread to more than one site beyond the chest. In these cases, treatment depends on the histologic subtype and results of molecular testing.

Chemotherapy is often used for stage IV disease. Since it can cause severe side effects, it is only given if your health hasn't seriously limited your activities. The ECOG (**E**astern **C**ooperative **O**ncology **G**roup) Performance Scale is used by doctors to decide who is able to have chemotherapy.

The definition of each performance score is:

- A **score of 0** means you are fully active.
- A **score of 1** means you are able to do all self-care activities but are unable to do hard physical work.
- A **score of 2** means you are able to do all self-care activities and spend most of waking time out of bed but are unable to do any work.
- A **score of 3** means you are unable to do all self-care activities and any work and spend most of waking time in bed.
- A **score of 4** means you are fully disabled.

Definitions:



Read pages 38–39 for information on molecular testing of EGFR and ALK.

Adrenal gland: A small organ on top of each kidney that makes hormones

Histologic subtype: The type of cancer based on the traits of the cells

Metastasis: Cancer that has spread from the first site

Pleura: The tissue lining around the lungs

Part 7: Treatment by cancer stage

First-line treatment for stage IV

| Histologic subtype | Performance status score | First-line treatment |
|--|--------------------------|--|
| Squamous cell carcinoma | 0 or 1 | Single-agent or doublet chemotherapy, or Cetuximab with cisplatin and vinorelbine |
| | 2 | Single-agent or doublet chemotherapy |
| | 3 or 4 | Best supportive care |
| Non-squamous subtypes with no known gene changes | 0 or 1 | Doublet chemotherapy Cetuximab with cisplatin and vinorelbine Bevacizumab with platinum-doublet chemotherapy Cisplatin and pemetrexed |
| | 2 | Single-agent or doublet chemotherapy |
| | 3 or 4 | Best supportive care |
| | Any | Crizotinib |
| Non-squamous subtypes with EGFR mutation | Any | Erlotinib |

This chart lists first-line treatments that include chemotherapy, targeted therapy, or both. Treatment options for cancers without EGFR and ALK gene changes are based on performance status. You may be treated with chemotherapy if your performance score is between 0 and 2. Your doctors will choose a regimen based on how well it will stop cancer growth compared to how harmful it could be. A performance score of 3 or 4 suggests that

chemotherapy will be too harmful. Therefore, the best supportive care is recommended. Supportive care treats the symptoms caused by the cancer but not the cancer itself.

There are many chemotherapy drugs that are useful. These drugs include cisplatin, carboplatin, paclitaxel, docetaxel, vinorelbine, etoposide, pemetrexed, and gemcitabine. The use of two drugs, call doublet chemotherapy, works better than a single agent.

Part 7: Treatment by cancer stage

However, doublet chemotherapy will likely cause more side effects. Often, cisplatin or carboplatin—chemotherapy drugs made with platinum—is used with another drug. These regimens are called platinum-doublet chemotherapy.

Research has found that adding cetuximab to cisplatin and vinorelbine slightly improved cancer treatment. This regimen can be used for any histologic subtype. Bevacizumab can be used with platinum-doublet chemotherapy, such as carboplatin and paclitaxel, for non-squamous lung cancers. To receive this treatment, you should not have a recent history of coughing up blood (hemoptysis).

Chemotherapy with cisplatin and pemetrexed was found to work better than cisplatin and gemcitabine for non-squamous subtypes. It also had less serious side effects. However, cisplatin and gemcitabine worked better for squamous cell carcinomas.

After two cycles of chemotherapy, the cancer's response to treatment will be tested. If there's no cancer growth, a total of 4 to 6 chemotherapy cycles are recommended. Afterward, the treatment response will be tested again. If the cancer grows during first-line treatment, read *Treatments after first line* on page 70.

First-line treatments for cancers with known gene changes aren't based on performance status. Instead, any cancer with ALK gene rearrangements should be treated with crizotinib. If the cancer grows while taking crizotinib, read *Treatments after first line* on page 70.

Any cancer with a gene mutation that causes overactive EGFRs should be treated with erlotinib. If the EGFR mutation is found while on first-line chemotherapy, you may be switched to erlotinib. Another option is that erlotinib may be added to the first-line chemotherapy. Symptoms caused by cancer in the brain or by cancer in one other area may be treated with local treatments while continuing erlotinib. However, cancer that is widespread and causing symptoms may be treated with systemic treatment with or without erlotinib. If the cancer keeps growing, read *Treatments after first line* on page 70.

Part 7: Treatment by cancer stage

Maintenance therapy for stage IV

| Histologic subtype | First-line treatment | Continuation maintenance |
|--------------------|---|--------------------------|
| Any | Any regimen | Stay on all drugs |
| Squamous | Cetuximab + cisplatin and vinorelbine | Cetuximab |
| | Cisplatin and gemcitabine | Gemcitabine |
| Non-squamous | Cetuximab + cisplatin and vinorelbine | Cetuximab |
| | Bevacizumab + carboplatin and paclitaxel | Bevacizumab |
| | Bevacizumab + pemetrexed and a platinum chemotherapy drug | Bevacizumab + pemetrexed |
| | Cisplatin and pemetrexed | Pemetrexed |
| | Cisplatin and gemcitabine | Gemcitabine |
| Histologic subtype | First-line treatment | Switch maintenance |
| Squamous | Platinum-doublet chemotherapy | Erlotinib or docetaxel |
| Non-squamous | Platinum-doublet chemotherapy | Erlotinib or pemetrexed |

If there's no cancer growth during the chemotherapy cycles, you may stay on all or some of your first-line treatments. This is called continuation maintenance. Another option is changing to a drug that you didn't take as a first-line treatment. This is called switch maintenance. Maintenance treatments supported by

research are listed in the chart above. A third option is to start close observation. Observation is a period of testing to watch for cancer growth. If the cancer grows during maintenance or observation, read *Treatments after first line* on the next page.

Part 7: Treatment by cancer stage

Treatments after first line

| Histologic subtype | Performance status score | Treatment options if cancer grows during or after first-line treatments | |
|--------------------|--------------------------|---|--------------------------------|
| Non-squamous | 0, 1, or 2 | Docetaxel, | |
| | | Pemetrexed, | |
| | | Erlotinib, | |
| | | Platinum-doublet chemotherapy ± bevacizumab if given erlotinib or crizotinib for first-line treatment | |
| | | Best supportive care, or | |
| | | Clinical trial | |
| Non-squamous | 3 or 4 | Erlotinib if EGFR mutation, or | |
| | | Best supportive care | |
| Squamous | 0, 1, or 2 | Docetaxel, | |
| | | Erlotinib, | |
| | | Best supportive care, or | |
| | | Clinical trial | |
| | Squamous | 3 or 4 | Erlotinib if EGFR mutation, or |
| | | | Best supportive care |

Part 7: Treatment by cancer stage

During or after first-line treatment, the cancer may grow. The chart on the left lists treatment options that can be used after first-line treatments. Treatment options are based on histologic subtypes and performance scores.

If your performance score is 0, 1, or 2, docetaxel or erlotinib is recommended for any histologic subtype. Erlotinib can be given whether the EGFR mutation is present or not. Two other drug regimens are listed for non-squamous histologic subtypes. Pemetrexed can be taken. Another option is to start platinum-doublet chemotherapy with or without bevacizumab if you took erlotinib or crizotinib for first-line treatment.

Besides these cancer drugs, you may be treated with best supportive care. Supportive care treats the symptoms caused by the cancer but not the cancer itself. The last option for a performance score between 0 and 2 is joining a clinical trial. A clinical trial is a type of research that studies how well a treatment works. Because of clinical trials, the treatments in this booklet are now widely used to help patients.

If your performance score is 3 or 4, most drugs for lung cancer are likely to seriously harm your health. Thus, best supportive care is recommended. Erlotinib can only be taken if the EGFR mutation is present. EGFR mutation is very rare in squamous cell carcinoma.

Definitions:



Read page 66 for definitions of performance scores.

Histologic subtype: The type of cancer based on the traits of the cells

Mutation: An abnormal change in the coded instructions within cells for creating new cells and controlling how cells behave

Platinum-doublet chemotherapy: A drug regimen that consists of a chemotherapy drug made with platinum and the use of another drug

Acronyms:

EGFR = epidermal growth factor receptor

Part 7: Treatment by cancer stage

7.6 Survivorship care plan

Follow-up cancer tests

- Medical history and physical exam every 6 to 12 months for 2 years, then if normal, every year
- Chest CT scan ± contrast every 6 to 12 months for 2 years, then if normal, every year without contrast

General health tests

- Blood pressure
- Cholesterol, glucose
- Bone density

Prevention of other diseases

- Cancer screening,
- Immunization shots, and
- Dental cleaning and exams

Healthy lifestyle

- Healthy diet and weight,
- Exercise,
- Sun protection,
- Limit alcohol use, and
- No smoking

The time period during cancer treatment can be very busy. Afterward, you may wonder what to do. It is important to follow a survivorship care plan. Talk with your doctor about making a plan together.

Follow-up cancer tests are given to find any new lung tumors early. A medical history, physical exam, and chest CT scan with or without contrast are recommended every 6 to 12 months for 2 years. If results are normal, it is suggested that you have these tests once a year. The yearly chest CT scan should be done without contrast.

Besides follow-up tests, tests of your general health are recommended. After going through treatment for cancer, it may be hard to think about taking care of “less important” issues. However, your general health can have a big impact on your well-being.

Likewise, take steps to prevent other diseases. Such steps can include getting immunization shots for the flu, herpes, and other diseases. Getting screening tests for other cancers is also very important.

The third recommendation is to start or keep a healthy lifestyle. There is proof that healthy behaviors can improve your treatment results. Limiting your use of alcohol, protecting yourself from the sun, and being a healthy weight are important.

Part 7: Treatment by cancer stage

Healthy eating includes eating a balanced diet, eating the right amount of food, and drinking enough fluids. However, you may have special food needs during and after treatment. A nutritionist—an expert in creating a healthy diet—can help.

Many patients benefit from some exercise. Exercise tones muscles, lowers stress, and improves health. Exercise programs differ between people based on their needs. Talk with your treatment team about which exercises would be best for you.

Being hooked on nicotine is one of the hardest addictions to stop. The stress of lung cancer may make it harder or easier to quit. Quitting is important since smoking can limit how well cancer treatment works. Talk with your treatment team about ways to quit.

Notes:



Read page 28 for descriptions of cancer tests.

Part 7: Tools



Webpages

American Cancer Society

www.cancer.org/cancer/lungcancer-non-smallcell/detailedguide/non-small-cell-lung-cancer-treating-by-stage

National Cancer Institute

www.cancer.gov/cancertopics/pdq/treatment/non-small-cell-lung/Patient/page5

NCCN

www.nccn.com/type-of-cancer/lung-cancer.html

List of clinical trials

American Cancer Society Lung Cancer Alliance

www.lungcanceralliance.org/get-help-and-support/lca-services/clinical-trials-matching-service.html

National Cancer Institute

www.cancer.gov/clinicaltrials | 1.800.4.CANCER (1.800.422.6237)

Review of Part 7

- Surgery or radiation therapy is used to cure stage I cancer.
- Treatment for stage II and III cancers depends on if the tumor is invasive.
- Chemoradiation is used to cure lung cancers that are too invasive or spread too far within the chest.
- Widespread lung cancers can be treated with chemotherapy, targeted therapy, or both.
- A survivorship care plan should be followed after lung cancer has been cured.

Part 8: Accepting a treatment plan

Having cancer is very stressful. While absorbing the fact that you have cancer, you have to learn about tests and treatments. In addition, the time you have to accept a treatment plan feels short. Parts 1 through 7 aimed to teach you about lung cancer, its tests, and treatment options. Part 8 aims to help you get a treatment plan that meets all your needs.



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Explains how a treatment plan can help.

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8.2 – Parts of a treatment plan
Presents the information found in a treatment plan.

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Describes how you can take part in treatment planning.

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8.4 – Getting a 2nd opinion
Addresses getting another treatment plan from another treatment team.

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Tools
Lists webpages about treatment planning.

Part 8: Accepting a treatment plan

8.1 Benefits of a treatment plan

Learning you have cancer starts an unplanned journey to an unknown place. A treatment plan is like having a roadmap for your journey. It is a written course of action through treatment and beyond. It can help you, your loved ones, and your treatment team. A treatment plan is useful for:

- Starting and guiding talks about treatment,
- Teaching what the treatment choices are,
- Informing everyone of the decisions made,
- Reminding everyone of the decisions made,
- Pinpointing who is in charge of each part of care,
- Controlling stress,
- Knowing what to expect,
- Changing from one doctor to another,
- Improving contact among your doctors, and
- Providing care for all issues.

8.2 Parts of a treatment plan

A treatment plan addresses all cancer care needs while respecting your beliefs, wishes, and values. It is likely to change and expand as you go through treatment. The plan will include the role of your doctors and how you can help yourself. A treatment plan often has the following parts:

Cancer information

Cancer can greatly differ even when people have a tumor in the same organ. Test results that describe the cancer are reported in the treatment plan. Such test results include the cancer site, cell type, and cancer stage. If done, molecular test results are also included. See Parts 3, 4, and 5 for the tests used for lung cancer.

Your treatment team

Cancer care is a team effort. Who is on your team depends on the treatments you choose. Surgeons and radiation oncologists give local treatments. Medical oncologists give systemic treatments. Your primary care doctor can also be part of your team. He or she can help you express your feelings about treatments to the team. Treatment of other medical problems may be improved if your primary care doctor is informed about your cancer care. Besides doctors, you may receive care from nurses, social workers, and other health experts. Ask to have the names and contact information of your health care providers included in the treatment plan.

Cancer treatment

There is no single treatment practice that is best for all patients. There is often more than one treatment option along with clinical trial options. Treatment planning takes many factors into account, such as:

- The cancer stage,
- Location of the tumor,

Part 8: Accepting a treatment plan

- Your general health,
- Treatment side effects,
- Costs of treatment,
- Changes to your life,
- What you want from treatment, and
- Your feelings about side effects.

A guide to treatment options can be found in Part 7. The cancer treatment that you agree to have should be reported in the treatment plan. It is also important to note the goal of treatment and the chance of a good treatment response. In addition, all known side effects should be listed and the time required for treatment should be noted. See Part 6 for a list of many of the side effects of treatment.

Your treatment plan may change because of new information. You may change your mind about treatment, tests may find new results, or how well the treatment is working may change. Any of these changes may require a new plan.

Stress and symptom control

For most patients with cancer, their main concern is that their treatment works. However, having cancer is complex and brings many physical and emotional challenges. Cancer or its treatment can cause bothersome symptoms. Such symptoms include pain, skin rashes, and nausea. The stress of having cancer can also cause symptoms. Helping you to be comfortable and stay active are key goals of the treatment plan. There are ways to treat many symptoms, so tell your treatment team about any symptoms you have. Some of the challenges you may face are addressed on the next page.

Definitions:

Medical oncologist: A doctor who's an expert in cancer drugs

Radiation oncologist: A doctor who's an expert in treating cancer with radiation

Surgeon: A doctor who's an expert in operations to remove or repair a part of the body

Part 8: Accepting a treatment plan

Becoming a “cancer patient”

Hearing “you have cancer” is likely to be life-changing. Some challenges may include managing doctor visits, figuring out how to care for your kids, missing work, and feeling a loss of control. Some people try to keep their life as normal as they can. Others change their life a lot. However, many cancer survivors will tell you that during the active treatment period, being a patient is your job. It’s a job that requires much time and energy. This can be hard.

Use your strengths, talents, and resources to help you cope. Maintain warm relationships with family and friends. Accept the support offered to you and reach out for more help if you need it. Most people would be happy to hear what you need. Make a list for them of things that would help you. If you are a person of faith, your personal beliefs and faith community can help. There are also professionals in mental health, social work, and pastoral services who are able to assist you. You can also start attending support groups to receive help from other cancer survivors.

You may have already lost some nights of sleep. This is common. The stress of learning that you have cancer and deciding a treatment plan takes its toll. You may lose more sleep while waiting to have treatment and during recovery. Getting less sleep can affect your mood, conversations, and ability to do things. If possible, allow yourself to rest, let people do things for you, and talk with your doctor about sleep medication. Behavioral sleep medicine—a type of talk therapy—may also help.

Feelings of anxiety and depression are common among patients with cancer. You may feel anxious before testing and while waiting for the results. Likewise, you may have a passing depression during a hard part of treatment. Feeling distressed may be a minor problem or it may be more serious. Serious or not, tell your treatment team so

that you can get help if needed. Help can include support groups, talk therapy, or medication. Some people also feel better by exercising, talking with loved ones, or relaxing. Your treatment team has information to help you.

Having cancer may cause you to feel helpless, fearful, alone, or overwhelmed. There are ways to manage this stress. At your cancer center, cancer navigators, social workers, and other experts can help. There may also be helpful community resources, such as support groups and wellness centers.

Some people blame themselves for getting cancer. However, what causes lung cancer is unknown. Smoking does increase the chances of getting lung cancer, but about 18 out of 100 patients with lung cancer weren’t

Part 8: Accepting a treatment plan

smokers. Even if you are a smoker, you don't deserve cancer. Instead of blaming yourself, try to focus on getting better. Undergoing cancer treatment can be hard. You'll have a lot to deal with without the blame.

After treatment, some people dislike their looks because of side effects. Common concerns are hair loss from chemotherapy and scars from surgery. It can be difficult to adapt to these changes. You may also be concerned with what your partner thinks. Partners may stop showing their love because they are unsure of what to do. They may also think of themselves as more of a caregiver than a partner during treatment. Sharing what you need and want can help your partner and yourself.

Financial stress is common. You may be unemployed or miss work during treatment. You may have too little or no health insurance. Talk with your treatment team about work, insurance, or money problems. They will include information in the treatment plan to help you control your finances.

Survivorship care

Cancer survivorship begins on the day you learn of having lung cancer. For many survivors, the end of active treatment signals a time of celebration but also of great anxiety. This is a very normal response. You may need support to address issues that arise from not having regular visits with your treatment team. In addition, your treatment plan should include a schedule of follow-up cancer tests, treatment of long-term side effects, and care of your general health.

Notes:

Notes section with 15 horizontal lines for writing.

Part 8: Accepting a treatment plan

Advance care

Talking with your doctor about your prognosis can help with treatment planning. A prognosis is the expected pattern and outcome of the cancer based on tests. If the cancer can't be cured, a care plan for the end of life can be made. However, such talks often happen too late or not at all. Your doctor may delay these talks for fear that you may lose hope, become depressed, or have a shorter survival. Studies suggest that these fears are wrong. Instead, there are many benefits to advance care planning. It is useful for:

- Knowing what to expect,
- Making the most of your time,
- Lowering the stress of caregivers,
- Having your wishes followed,
- Having a better quality of life, and
- Getting good care.

Advance care planning starts with an honest talk between you and your doctors. You don't have to know the exact details of your prognosis. Just having a general idea will help with planning. With this information, you can decide at what point you'd want to stop chemotherapy, if at all. You can also decide what treatments you'd want for symptom relief, such as surgery or drugs.

Another part of the planning involves hospice care. Hospice care doesn't include treatment to fight the cancer but rather to reduce symptoms caused by cancer. Hospice care may be started because you aren't interested in more cancer treatment, no other cancer treatment is available, or because you may be too sick for cancer treatment.

Hospice care allows you to have the best quality of life possible. Care is given all day, every day of the week. You can choose to have hospice care at home or at a hospice center. One study found that patients and caregivers had a better quality of life when hospice care was started early.

An advance directive describes the treatment you'd want if you weren't able to make your wishes known. It also can name a person whom you'd want to make decisions for you. It is a legal paper that your doctors have to follow. It can reveal your wishes about life-sustaining machines, such as feeding tubes. It can also include your treatment wishes if your heart or lungs were to stop working. If you already have an advance directive, it may need to be updated to be legally valid.

Part 8: Accepting a treatment plan

8.3 Your role in planning

The role patients want in treatment planning differs. Some patients want to be involved as little as possible. Others want to know everything and share decision making with their doctors. These two roles are described as passive and active. Tell your treatment team which role you want or if you want a role somewhere in the middle.

Passive role

In a passive role, a person often doesn't seek out information, speak up for him/herself, or think through treatment options. This may be due to a high level of stress. It may be hard to hear or know what others are saying. Stress, pain, and drugs can limit your ability to make good decisions. You may also want a passive role because you don't know much about cancer. You've never heard the words used to describe lung cancer, tests, or treatments. Likewise, you may think that your judgement isn't any better than your doctors'.

Letting others decide your treatment may make you feel more at ease. But, who do you want to make the decisions? You may rely on your doctors alone to make the right decisions. You can also have loved ones help. They can gather information, speak on your behalf, and share decision making with your doctors. Even if others decide your treatment, you still have to agree to treatment by signing a consent form.

Active role

In an active role, a person often searches for all information, prepares for all outcomes, and speaks up for him/herself. He or she may take the lead or share in decision making. Taking this role may make you feel more certain and hopeful. You'll likely get the treatment you want, at the place you want, and by the doctors you want.

There are four key steps to making a shared treatment decision. First, know what you want from treatment. Do you want a cure or symptom relief? What hardships are you willing to accept to meet your goal? Second, know your test results. This information can pinpoint what's important for you on websites and in books and brochures. Test results can also clarify which treatments are needed.

Third, strive to have helpful talks with your doctor. Prepare questions before your visit and ask questions if your doctor isn't clear. You can also record your talks and get copies of your medical records. Fourth, accept help from others. An active role doesn't mean going through it alone. Others can help you be active by finding information, taking notes, asking questions, and helping you talk through your options.

Part 8: Accepting a treatment plan

Caring for caregivers

No one experiences cancer alone. Having cancer can affect your loved ones, especially those who provide care. This care can take many forms. It can range from giving emotional support to giving medical services in the home. Caregivers often take on extra duties to keep life normal for the family. They also play a central role in explaining what is happening to you to others, like friends and doctors.

It is natural for caregivers to focus on you. Don't feel guilty. However, caregivers need to meet their own needs as well. Cancer treatment can last from months to years. Caregivers often get too tired from the physical and mental challenges related to the cancer. It isn't easy, but caregivers need to take care of themselves. If they don't, they won't be able to take good care of anyone.

8.4 Getting a 2nd opinion

The time around a cancer diagnosis is very stressful. People with cancer often want to get treated as soon as possible. They want to make their cancer go away before it spreads farther. While cancer can't be ignored, there is time to think about and choose which treatment plan is best for you.

You may wish to have another doctor review your test results and the treatment plan your doctor has recommended. This is called getting a 2nd opinion. Lung cancer is a serious disease, and new information may have been published about which treatments are most effective and safe. You may completely trust your doctor, but a 2nd opinion on which treatment is right for you can help.

Copies of the pathology report, a DVD of the imaging tests, and other test results need to be sent to the doctor giving the 2nd opinion. Some people feel uneasy asking for copies from their doctors. However, a 2nd opinion is a normal part of cancer care. When doctors have cancer, most will talk with more than one doctor before choosing their treatment. What's more, some health plans require a 2nd opinion. If your health plan doesn't cover the cost of a 2nd opinion, you have the choice of paying for it yourself. Choosing your cancer treatment is a very important decision. It can affect your length and quality of life.

Part 8: Tools



Webpages

American Cancer Society

www.cancer.org/Treatment/FindingandPayingforTreatment/index

National Cancer Institute

www.cancer.gov/cancertopics/factsheet/Therapy/doctor-facility

National Coalition for Cancer Survivorship

www.canceradvocacy.org/toolbox

Review of Part 8

- A treatment plan can help you through treatment and beyond.
- It covers many issues—test results, treatments, and supportive programs.
- You can choose how active a role to have in planning your treatment.
- You may wish to get a 2nd opinion on your treatment plan.

Part 9: Dictionary

Adenocarcinoma

Cancer of cells that make fluids or hormones.

Adjuvant treatment

A treatment given after the main treatment used to cure disease.

Adrenal gland

A small organ on top of each kidney that makes hormones.

Alkylating agent

A type of cancer-killing drug.

Alternative medicine

Treatments used in place of standard treatments.

Alveoli

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

Anaplastic lymphoma kinase (ALK)

Proteins on the edge of a cell that send signals for the cell to grow.

Anesthesia

Loss of feeling with or without loss of wakefulness that is caused by drugs.

Arsenic

A very toxic metallic chemical.

Atelectasis

Collapse of a lung.

Asbestos

A mineral fiber used in housing and commercial materials.

Benign

Tissue without cancer cells.

Beryllium

A hard, gray metallic chemical.

Biopsy

Removal of small amounts of tissue or fluid to be tested for disease.

Blood chemistry test

Measurement of the amount of chemicals in the blood.

Board certified

A status to identify doctors who finished training in a specialized field of medicine.

Body plethysmograph

A test done in a small room with a small tube to measure how much air is in your lungs after inhaling or exhaling.

Brachytherapy

Radiation received from a radioactive object placed near or in the tumor.

Bronchi

The two airways extending from the windpipe into the lungs.

Bronchioli

Branches of small airways within the lungs.

Bronchoscope

A thin, long tube fitted with tools that is guided down the mouth.

Bronchoscopy

Use of a thin tool guided down the mouth into the lungs.

Bronchus

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

Part 9: Dictionary

Cadmium

A heavy metallic chemical.

Cancer screening

The use of tests to find cancer before signs of cancer appear.

Cancer stages

Ratings of the growth and spread of tumors.

Carbon dioxide

A gas that is released from the body during breathing.

Carcinoma

Cancer of cells that form the lining of structures or form glands.

Carina

Firm, flexible, supportive tissue at the base of the windpipe.

Cells

The “building blocks” of tissues in the body.

Chemotherapy

Drugs that stop the growth process of cells in an active growth phase.

Chemotherapy cycle

Days of treatment followed by days of rest.

Chemoradiation

Treatment that combines chemotherapy with radiation therapy.

Chest wall

The layer of muscles and bones under the skin that covers the chest area.

Chromium

A hard, semi-gray metallic chemical.

Chronic obstructive pulmonary disease (COPD)

Trouble with breathing due to lung damage or too much mucus.

Clinical stage

Rating the extent of a tumor based on tests before treatment.

Clinical trial

Research on a test or treatment to assess its safety or how well it works.

Combination regimen

The use of two or more drugs.

Complete blood count (CBC)

A test of the number of blood cells.

Complementary medicine

Treatment given along with standard treatment.

Computed tomography (CT)

A test that uses x-rays to view body parts.

Concurrent chemoradiation

Chemotherapy given at the same time as radiation therapy.

Continuation maintenance

One or more first-line drugs is continued.

Contrast

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

Conventional radiation therapy

Radiation that is given in small doses for weeks and targets both the tumor and some normal tissue.

Diaphragm

A sheet of muscles below the ribs that helps a person to breathe.

Part 9: Dictionary

Diesel fumes

Gases from thick, heavy fuel made from crude oil.

Distant metastasis

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

Doublet chemotherapy

Treatment with two chemotherapy drugs.

Eastern Cooperative Oncology Group (ECOG) Performance Scale

A rating scale of one's ability to do daily activities.

Electromagnetic

A force that attracts or repels and is produced by an electric current.

Endobronchial ultrasound–guided transbronchial needle aspiration (EBUS-TBNA)

Removal of fluid with a needle guided with imaging into the main airway into the lung.

Endoscopic ultrasound–guided fine needle aspiration (EUS-FNA)

Removal of fluid with a needle guided with imaging into the long organ between the mouth and stomach.

Epidermal growth factor receptor (EGFR)

Proteins on the edge of a cell that send signals for the cell to grow.

Epithelial cells

Cells that form the lining of structures or form glands.

Esophagus

The tube-shaped organ between the mouth and stomach.

External beam radiation therapy (EBRT)

Radiation therapy received from a machine outside the body.

First-line treatment

The first set of treatments given to treat a disease.

Fusion gene

A gene made from parts of two other genes.

Gas diffusion

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

General anesthesia

A controlled loss of wakefulness from drugs.

Genes

Instructions in cells for making and controlling cells.

Hadron therapy

Radiation therapy that uses protons to treat a disease.

Hemoptysis

Coughing up blood.

Hilar nodes

Groups of disease-fighting cells where the main airways enter the lungs.

Hives

Itchy, swollen, and red skin caused by the body ridding itself of an invader.

Hodgkin's lymphoma

A cancer of white blood cells.

Part 9: Dictionary

Image-guided radiation therapy (IGRT)

Radiation therapy that uses imaging tests during treatment to better target the tumor.

Intensity-modulated radiation therapy (IMRT)

Radiation therapy that uses small beams of different strengths based on the thickness of the tissue.

Internal radiation therapy

Radiation received from a radioactive object placed near or in the tumor.

Intrapulmonary nodes

Groups of disease-fighting cells in the lungs around the small airways.

Invasive tumor

A mass of cancer cells that has grown from one structure into another.

Large-cell lung carcinoma

A lack of features to classify the cancer as any other carcinoma.

Lobe

A clearly seen division in the lungs.

Lobectomy

Surgical removal of an entire lobe.

Local metastasis

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

Low-dose computed tomography (LDCT)

A test that uses little amounts of radiation to make pictures of inside the body.

Lymph

A clear fluid containing white blood cells.

Lymph node

Small groups of special disease-fighting cells located throughout the body.

Lymph node dissection

All groups of disease-fighting cells are removed from a cluster.

Lymph node sampling

One group of disease-fighting cells is removed from a cluster.

Lymph vessels

Tube-shaped ducts that carry lymph throughout the body.

Magnetic resonance imaging (MRI)

A test that uses radio waves and powerful magnets to see the shape and function of body parts.

Maintenance treatment

Treatment given to continue good treatment results.

Mediastinal nodes

Groups of disease-fighting cells in the middle of the chest.

Mediastinal pleura

The lining of the lung at the center of the chest.

Mediastinoscope

A thin, long tube fitted with tools to work inside the chest.

Mediastinoscopy

Use of a thin tool inserted above the breastbone to do work in the middle of the chest.

Part 9: Dictionary

Mediastinotomy

A surgery done through a cut into the chest along the breastbone.

Mediastinum

The area of the chest between the lungs.

Medical history

All health events and medications taken to date.

Metastasis

The spread of cancer cells from the first tumor to another body part.

Microscope

A tool that uses lenses to see things the eyes can't.

Molecular tests

Tests of changes in the instructions within cells for making and controlling cells.

Mucus

A sticky, thick liquid that moisturizes or lubricates.

Multiple primary tumors

One or more unrelated masses of cancer cells.

Navigational bronchoscopy

Use of a thin tool guided down the mouth into the smallest airways of the lung.

Nickel

A silvery-white metal.

Nodule

A small mass of tissue.

Neoadjuvant treatment

The treatment given before the main treatment used to cure disease.

Noninvasive tumor

A mass of cancer cells that hasn't grown into another structure.

Non-solid nodule

A small mass of tissue of low density.

Observation

A period of testing for cancer growth.

Occult carcinoma

The finding of cancer cells in the absence of a tumor.

Oxygen

A gas in the air that the body needs to live.

Parietal pleura

The outer layer of the lining around the lungs.

Part-solid nodule

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

Pathologic stage

Rating the extent of a tumor based on tests after treatment.

Pathologist

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

Percutaneous needle biopsy

Insertion of a needle through the skin into a mass to remove tissue for testing.

Performance status

A rating of one's ability to do daily activities.

Part 9: Dictionary

Peribronchial nodes

Groups of disease-fighting cells in the lung around the main airway.

Pericardial effusion

Excess fluid between the two tissue layers of the heart's lining.

Pericardiocentesis

Use of a needle inserted between the ribs to remove fluid around the heart.

Pericardium

The tissue lining around the heart.

Phrenic nerve

A bundle of fibers that sends signals between the spine and muscles used to breathe.

Physical exam

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

Platinum doublet

Treatment with two chemotherapy drugs one of which is platinum-based.

Pleura

The tissue lining around the lungs.

Pleural cavity

The space between the two layers of the lung's lining.

Pleural effusion

Excess fluid between the two tissue layers of the lung's lining.

Pleural fluid

The liquid in the space between the two layers of the lung's lining.

Pneumonectomy

Surgical removal of the entire lung.

Pneumonitis

Swelling of the air sacs in a lung.

Positron emission tomography (PET)

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

Primary treatment

The main treatment used to rid the body of cancer.

Primary tumor

The first mass of cancer cells in the body.

Pulmonary fibrosis

Major scarring of lung tissue.

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.

Radiation oncologist

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

Radiation therapy

The use of radiation to treat cancer.

Radiologist

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

Radiotracer

Matter with energy that is put into the body to make pictures clearer.

Radon

A gas without odor, taste, or color that is made from uranium as it decays.

Part 9: Dictionary

Recurrence

The return of cancer after treatment.

Recurrent laryngeal nerve

A bundle of fibers that sends signals between the spine and voice box.

Respiration

The transfer of gases in and out of the body.

Respiratory system

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

Retractors

A tool that holds back the edges of a surgical cut.

Risk factor

Something that increases the chance of getting a disease.

Scalene nodes

Groups of disease-fighting cells in the neck.

Second-hand smoke

Inhaled smoke from a lit smoking product or that was exhaled by a smoker.

Second-line treatment

The next treatment(s) given when first-line treatment fails.

Secondary tumor

A mass of cancer cells that formed from the first mass of cancer cells.

Sedative

A drug that helps a person to relax or go to sleep.

Segmentectomy

Surgical removal of a large part of a lobe.

Sequential chemoradiation

Chemotherapy followed by radiation therapy.

Side effects

An unplanned physical or emotional response to treatment.

Silica

A natural mineral mostly found in sand.

Simulation

The steps needed to prepare for radiation therapy.

Single agent

The use of one drug.

Sleeve lobectomy

Surgical removal of an entire lobe and part of the bronchus.

Small cell lung cancer

Lung cancer of small, round 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 cells

Thin, flat cells that line many surfaces of the body.

Stereotactic ablative radiotherapy (SABR)

Radiation therapy that uses precise, high-dose beams.

Stereotactic radiosurgery (SRS)

Radiation therapy that uses precise, high-dose photon beams to treat brain tumors.

Part 9: Dictionary

Subcarinal nodes

Groups of disease-fighting cells below the windpipe.

Superior sulcus tumor

A mass of cancer cells at the top of the lung that has grown into the chest wall.

Supportive care

Treatment for symptoms of a disease.

Supraclavicular nodes

Groups of disease-fighting cells above the collarbone.

Surgical margin

The normal tissue around the tumor removed during surgery.

Switch maintenance

All first-line drugs are stopped and a new drug is started.

Targeted therapy

Drugs that stop the growth process specific to cancer cells.

Thoracentesis

Use of a needle inserted between the ribs to remove fluid around the lungs.

Thoracic inlet

The center of a ring of bones at the top of the ribcage.

Thoracic surgeon

A doctor who's an expert in surgery within the chest.

Thoracoscopy

Use of thin tools inserted between the ribs to do work in the chest.

Thoracotomy

Surgery done through a large cut to remove all or part of the lungs.

Three-dimensional conformal radiation therapy (3D-CRT)

Radiation therapy that uses beams that match the shape of the tumor.

Trachea

The airway between the throat and bronchi; also called the windpipe.

Tumor

An overgrowth of cells.

Ultrasound

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

Uranium

A silvery-white metallic chemical.

Video-assisted thoracic surgery (VATS)

Use of thin tools inserted between the ribs to do work in the chest.

Visceral pleura

The inner layer of the lining around the lungs.

Wedge resection

Surgical removal of a small part of a lobe.

Credits

NCCN aims to improve the care given to patients with cancer. NCCN staff work with experts to create helpful programs and resources for many stakeholders. Stakeholders include health providers, patients, businesses, and others. One resource is the series of booklets for patients called the NCCN Patient Guidelines. Each booklet presents the standard of care for a type of cancer.

NCCN abbreviations and acronyms

NCCN®

National Comprehensive Cancer Network®

NCCN Patient Guidelines®

NCCN Guidelines for Patients®

NCCN Guidelines®

NCCN Clinical Practice Guidelines in Oncology®

The patient booklets are based on guidelines written for doctors. These guidelines are called the NCCN Guidelines. They give a step-by-step course of care that many cancer doctors follow. Panels of experts create the NCCN Guidelines. Most of the experts are from the 23 NCCN Member Institutions. Panelists may include surgeons, radiation oncologists, medical oncologists, and patient advocates. Recommendations in the NCCN Guidelines are based on clinical trials and the experience of the panelists.

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New York, New York
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mskcc.org

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Tampa, Florida
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moffitt.org

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Columbus, Ohio
800.293.5066
cancer.osu.edu

Roswell Park Cancer Institute

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

NCCN Member Institutions

**St. Jude Children's
Research Hospital/
The University of Tennessee
Health Science Center**
Memphis, Tennessee
888.226.4343 • stjude.org
877.988.3627 • utcancer.org

Stanford Cancer Institute
Stanford, California
877.668.7535
cancer.stanfordhospital.com

**University of Alabama at
Birmingham Comprehensive
Cancer Center**
Birmingham, Alabama
800.822.0933
ccc.uab.edu

**UC San Diego
Moore's Cancer Center**
La Jolla, California
858.657.7000
cancer.ucsd.edu

**UCSF Helen Diller Family
Comprehensive Cancer Center**
San Francisco, California
800.888.8664
cancer.ucsf.edu

**University of Colorado
Cancer Center**
Aurora, Colorado
720.848.0300
coloradocancercenter.org

**University of Michigan
Comprehensive Cancer Center**
Ann Arbor, Michigan
800.865.1125
mcancer.org

**UNMC Eppley Cancer Center at
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Omaha, Nebraska
800.999.5465
unmc.edu/cancercenter

**The University of Texas
MD Anderson Cancer Center**
Houston, Texas
877.632.6789
mdanderson.org

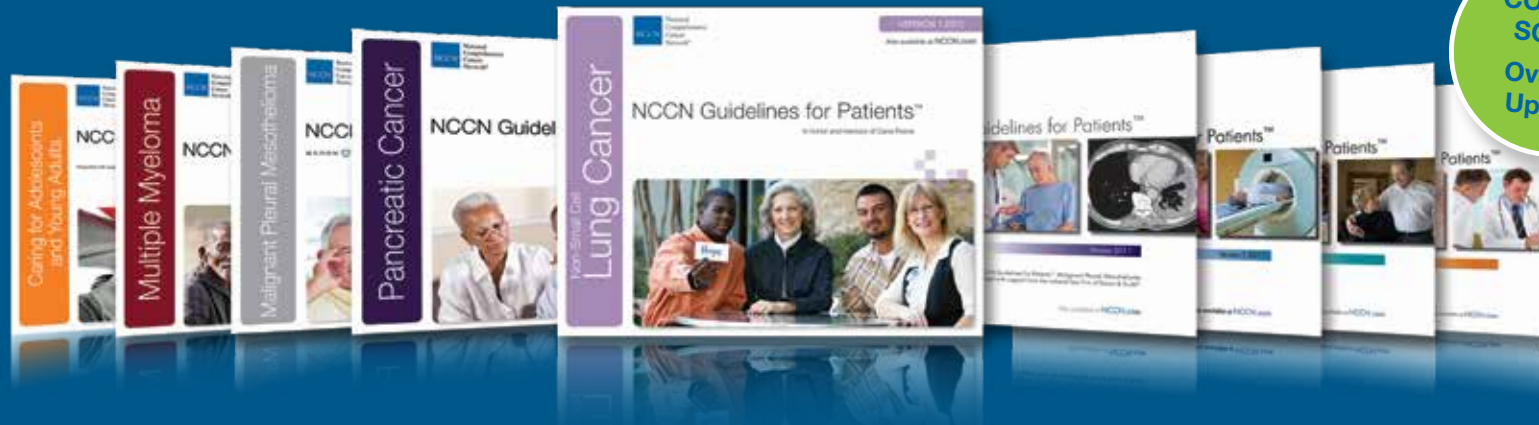
Vanderbilt-Ingram Cancer Center
Nashville, Tennessee
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