



LUNG CANCER ALLIANCE

UNDERSTANDING
NON-
SMALL
CELL
LUNG
CANCER

1-800-298-2436

LungCancerAlliance.org

A GUIDE FOR THE PATIENT

ANATOMY OF THE LUNGS

The following image shows different parts that make up the lungs. Please use this picture to help guide you through the topics discussed in this brochure.

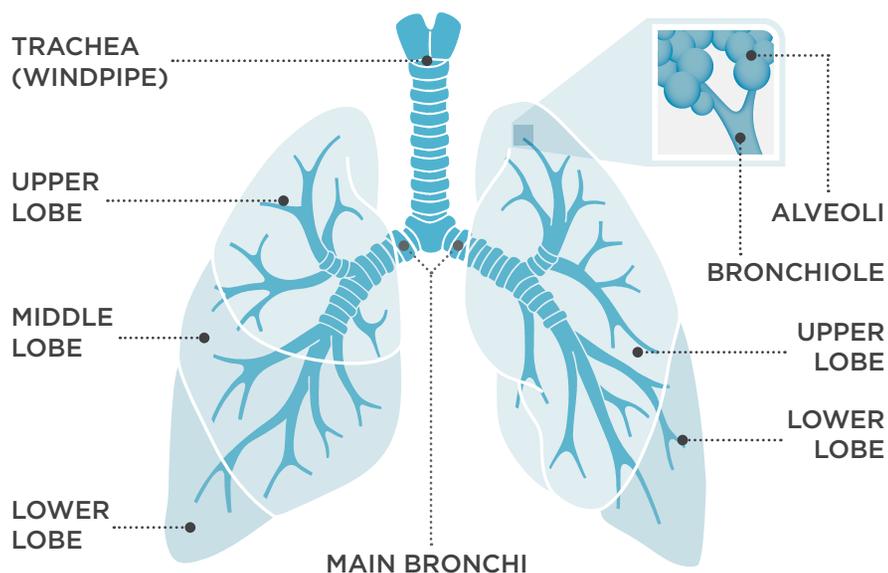


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NON-SMALL CELL LUNG CANCER

Cancer is a group of diseases in which normal cells change, grow and divide out of control.

Cancer that begins in the lungs – lung cancer – is one of the most commonly diagnosed cancers in the United States. There are two main types: non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). NSCLC makes up about 85% of lung cancer diagnoses.

WHAT CAUSES LUNG CANCER?

A **history of smoking is the main risk factor for developing lung cancer.** Cigarettes contain many carcinogens, which are substances that cause lung cancer. However, there is so much we don't know.

Other risk factors include:



Exposure to radon (an invisible, odorless, tasteless radioactive gas that occurs naturally in soil and rocks)



A family history of lung cancer



Radiation therapy to the chest area



Other lung illnesses (such as emphysema, chronic obstructive pulmonary disease [COPD] or tuberculosis)



Exposure to industrial chemicals including arsenic, asbestos, beryllium and uranium



Exposure to secondhand smoke (or passive smoking)



DIAGNOSING NSCLC: IMAGING

A number of tests provide information on areas of the lungs that do not appear normal. Doctors sometimes refer to these areas as tumors, spots, lesions, nodules or masses. Imaging can help doctors learn if a suspicious area is cancerous (malignant) or not (benign). Some imaging tools include the following:

CT (computed tomography) or “CAT” scanning can show tumors that may not be visible on a normal chest X-ray.

PET (positron emission tomography) scanning shows how a tumor is using glucose (also known as sugar). Since tumors typically use more glucose than surrounding tissue, they appear as “hot spots” (bright areas) in these images.

MRI (magnetic resonance imaging) creates detailed images of the body and can help determine whether a tumor has spread beyond its original location. Used in NSCLC to check for cancer in the brain.

The lymphatic system is a collection of organs, vessels and nodes that are found throughout the body. The lymphatic system has two major functions: to collect excess fluid and return it to the blood and fight infection.

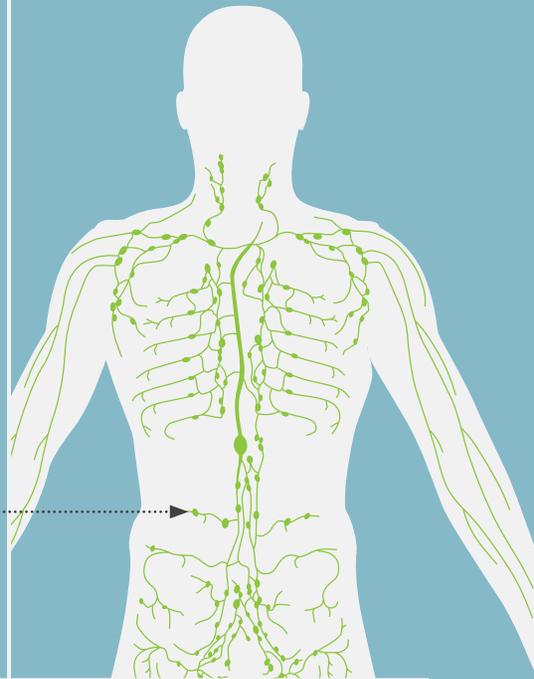
LYMPH VESSELS are similar to blood vessels and help to circulate lymph fluid throughout the body. Lymph fluid contains white blood cells, which help to fight infection.

LYMPH NODES are small, oval-shaped organs within the lymphatic system. The purpose of lymph nodes is to trap and collect invading organisms that can be destroyed by white blood cells. Lymph nodes are found throughout the body, but major clusters can be found behind the knee and elbow joints, and in the groin, armpits, chest and neck. A large group is found in the center of the chest (mediastinum) which drains lymph fluid from the lungs.

Cancer cells can break off from the main tumor and travel through the lymphatic system. Some of these cells can become trapped within a lymph node and start to grow. Determining whether there are cancer cells in lymph nodes can help a doctor estimate how far the cancer may have spread.

THE LYMPHATIC SYSTEM

LYMPH NODE



DIAGNOSING NSCLC: BIOPSIES

A biopsy is a procedure during which tissue or fluid is removed from the body for testing. The tissue can help doctors diagnose cancer and provide specific information about the suspicious area.

There are several types of biopsy procedures:

FINE NEEDLE ASPIRATION (FNA): Tissue is removed using a thin hollow needle

- Depending on the location of the tumor, FNA is done during a bronchoscopy procedure (in which a camera-equipped tube is used to view the windpipe and other airways) or through skin
- This procedure may be guided by a CT scan

CORE NEEDLE BIOPSY: Tissue is removed using a wider needle

- More tissue can be removed with this procedure than with fine needle aspiration

SURGICAL BIOPSY: Tissue is removed during a surgical procedure

- Smaller tissue samples may be removed surgically during a bronchoscopy procedure; larger samples may require traditional surgery

THORACENTESIS: Fluid is removed from the space around the lungs (also called the pleura) using a hollow needle inserted into the chest



STAGING

STAGE

I

The tumor is located only in one lobe of the lung.

STAGE

II

The tumor or tumors are only in one lobe of a lung and may be larger than those in stage I. The cancer may have spread to nearby tissues or lymph nodes but not beyond.

STAGE

III

The tumor or tumors are only in one lung and may have spread to the area around the lung and more lymph nodes.

STAGE

IV

The tumor or tumors may be any size and the cancer has spread to the other lung, the lining of the lung, lymph nodes or organs outside the lungs.

NSCLC is divided into four stages, based on the TNM System. Stage is generally determined by the size of the cancer and whether or not it has spread from the place it started (including to lymph nodes).

It is also important to know the stage of the cancer. Staging can help doctors create a treatment plan that is best for you.

T stands for **TUMOR**—where the tumor is and how big it is

N stands for **LYMPH NODES**—whether the cancer has spread to lymph nodes and where the affected lymph nodes are located

M stands for **METASTASIS**—whether the cancer has spread beyond the lung to the other lung, the pleura or other parts of the body

The terms “early stage” or “locally advanced” are sometimes used to refer to stage I, stage II and some stage III tumors. The term “advanced” may be used to describe some stage III tumors and all stage IV tumors. Ask your healthcare team for more details about tumor staging and how it may affect your choices for treatment.

HISTOLOGY AND SUBTYPE

NSCLC is not the same in every person. “Histology” refers to the structure of the cancer when viewed under a microscope. There are many subtypes of NSCLC but the most commonly diagnosed are:

NON-SQUAMOUS CELL CARCINOMAS:

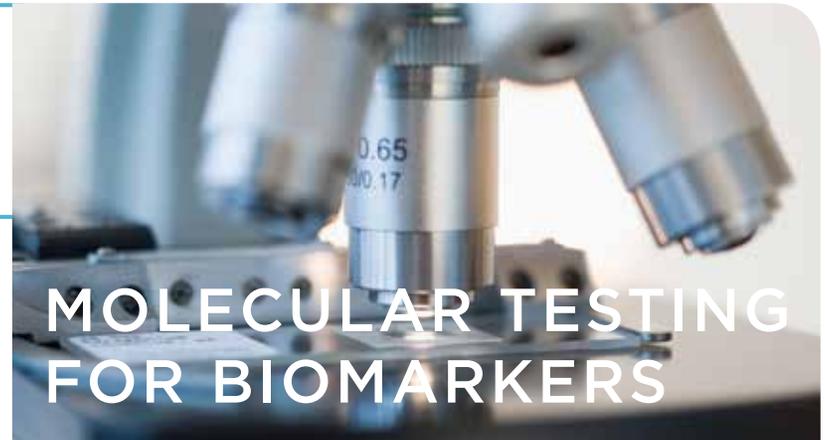
ADENOCARCINOMA

- Including adenocarcinoma in situ (AIS) and minimally invasive adenocarcinoma (MIA), formerly bronchioalveolar carcinoma (BAC)

LARGE CELL CARCINOMA

SQUAMOUS CELL CARCINOMA

Knowing the subtype of NSCLC helps the healthcare team to identify the best treatment options.



MOLECULAR TESTING FOR BIOMARKERS

Tumor tissue removed during a biopsy can be tested for biomarkers. Biomarkers are features of the cancer that give the treatment team specific information about the cancer. These features may be specific proteins on the surface of the cell or genetic information inside the cell.

Some biomarkers can help predict how the cancer will act while others indicate whether a specific treatment may be effective.

STAGING, HISTOLOGY AND BIOMARKERS

The stage and histology of NSCLC provide your treatment team with important information needed to choose the treatment that's best for you.

Molecular testing may also give your treatment team additional information about your cancer and help them to identify your best treatment options. Ask if your cancer should be tested.

TREATMENT OPTIONS

TREATMENT OPTIONS FOR NSCLC INCLUDE ONE OR MORE OF THE FOLLOWING:

- Surgery
- Chemotherapy
- Radiation
- Clinical trials

TREATMENT OPTIONS FOR NSCLC WILL DEPEND UPON THE FOLLOWING:

- Subtype and stage of NSCLC
- How well your lungs are working
- Other health concerns like the presence of diabetes, heart disease or high blood pressure
- Your ability to perform activities of daily living without assistance like eating, bathing and dressing
- If certain biomarkers are present

SURGERY

Types of lung cancer surgery include:

- **SUB-LOBAR RESECTIONS:** Removal of the tumor and surrounding lung tissue without removing the whole lobe of the lung. Types include wedge resection and segmentectomy.
- **LOBECTOMY:** Removal of an entire lobe of the lung.
- **PNEUMONECTOMY:** Removal of an entire lung.
- **COMPLEX RESECTIONS:** Removal of part or all of a lung and surrounding structures such as ribs, part of the chest wall or windpipe (bronchus) when the cancer has spread to those areas.

All surgeries should include testing of the lymph nodes associated with that part of the lung.

Types of surgical procedures:

- **THORACOTOMY:** An incision is made between the ribs to allow removal of the cancer.
- **MINIMALLY INVASIVE SURGERY:** A series of small incisions allows insertion of a video camera along with small instruments for removing cancerous tissue. Types include:
 - Video assisted thoracic surgery (VATS)
 - Robotic assisted thoracic surgery (RATS)

CHEMOTHERAPY

Chemotherapy is a treatment that kills cancer's rapidly growing and dividing cells. In NSCLC, chemotherapy may be given as a single drug or as multiple drugs at the same time, depending on the overall health of the patient as well as stage and subtype of NSCLC.

Chemotherapy drugs most often used to treat NSCLC are:

- Paraplatin (Carboplatin)
- Alimta (Pemetrexed)
- Platinol (Cisplatin)
- Gemzar (Gemcitabine)
- Taxol (Paclitaxel)
- Navelbine (Vinorelbine)
- Taxotere (Docetaxel)

TARGETED THERAPY

While the goal of chemotherapy is to kill rapidly growing and dividing cancer cells, chemotherapy can also affect normal cells (eg, cells in the skin, lining of the digestive tract, hair follicles) which can cause unwanted side effects. To reduce damage to normal cells, newer drugs called targeted therapies attack cancer cells by interfering with processes that are more specific to the cancer cells. These processes include:

NEW BLOOD VESSEL FORMATION

Cancer cells rely on the development of new blood vessels to supply them with oxygen and nutrients. This process is called angiogenesis. Drugs that block angiogenesis starve cells of their blood supply, which helps to slow or stop tumor growth.

STIMULATION FROM GROWTH SIGNALS

Cancer cells may rely on signals that tell them to grow or divide uncontrollably. Molecular testing can identify these signals and there are drugs that then block the signals to slow or stop tumor growth.

TARGETED THERAPIES INCLUDE:

- Gilotrif (Afatinib)
- Avastin (Bevacizumab)
- Tarceva (Erlotinib)*
- Xalkori (Crizotinib)*

*Pill form

MAINTENANCE THERAPY

Some chemotherapies and targeted therapies are used after the first treatment cycle has ended and may be used as long as they continue to work.

THE TWO TYPES OF MAINTENANCE THERAPIES ARE:

- “Continuation” – when a drug that has been used before is continued
- “Switch” – when a new drug is used under certain circumstances

Tarceva, Alimta and Avastin are used for maintenance.

SIDE EFFECTS OF DRUG THERAPY

The goal of chemotherapy or targeted therapy is to kill cancer cells, which are fast growing. Chemotherapy can't tell cancer cells from other fast growing cells like those that make up the hair and the lining of the digestive system so chemotherapy can damage them, too, and cause side effects. While side effects from targeted therapies tend to be milder than chemotherapy, they can still interfere with normal cell function and result in challenging side effects.

COMMON SIDE EFFECTS OF BOTH TYPES OF TREATMENT INCLUDE:

- Tiredness (fatigue)
- Diarrhea
- Constipation
- Loss of appetite (anorexia)
- Nausea and vomiting
- Shortness of breath (dyspnea)

OTHER COMMON SIDE EFFECTS OF CHEMOTHERAPY INCLUDE:

- Hair loss
- Numbness or tingling in the hands or feet (neuropathy)
- Low red/white blood cell counts

OTHER COMMON SIDE EFFECTS OF TARGETED THERAPIES INCLUDE:

- Rash
 - Eye irritation or vision problems
 - Swelling of hands and feet
 - Nosebleeds
 - High blood pressure
-

RADIATION THERAPY

Radiation therapy is a treatment that uses high energy x-rays to kill or shrink cancer cells, to manage pain or to prevent the cancer from spreading. It can be used to get rid of tumors entirely or to reduce the size of tumors before surgery.

There are several types of radiation therapy:

EXTERNAL BEAM RADIATION: Use of carefully aimed doses of radiation at specific sections of the lungs or surrounding areas.

INTENSITY MODULATED RADIATION THERAPY (IMRT): A type of conformal radiation, which means the beams of radiation are shaped to match the shape of the tumor. By helping protect normal tissue surrounding the tumor, this technique helps reduce side effects associated with radiation therapy.

STEREOTACTIC BODY RADIATION THERAPY (SBRT): A newer type of treatment that can target small lung cancers that cannot be removed by surgery. SBRT can be given either in a one-day session with a single dose of radiation, or on a “fractionated” schedule in which smaller doses are given over time.

BRACHYTHERAPY (internal or implant radiation therapy): Radioactive material is sealed in needles, seeds, wires or catheters and placed directly into or near a tumor. This technique helps reduce side effects associated with radiation therapy.

SIDE EFFECTS OF RADIATION THERAPY

Common side effects of radiation therapy include:

- Tiredness (fatigue)
- Skin irritation
 - Redness
 - Itching
 - Dryness
 - Infection
- Loss of appetite (anorexia)
- Inflammation of the esophagus (esophagitis)
- Inflammation of the lung(s) (pneumonitis)

Be sure to talk with your healthcare team about ways to manage any side effects you may experience.

COMBINATION THERAPY

Sometimes using more than one type of treatment may produce better results. For example, chemotherapy may be combined with Avastin (a targeted therapy) or with radiation; radiation and chemotherapy may be used before and/or after surgery. Your treatment team will let you know if a single treatment or combination therapy is best for your situation.

CLINICAL TRIALS

Clinical trials are available for people diagnosed with NSCLC and should be considered as an option every time a treatment decision is made. Clinical trials allow patients to receive promising new treatments or combinations of treatment that are still being evaluated by doctors and researchers.

LUNG CANCER CLINICAL TRIAL MATCHING SERVICE

We work with EmergingMed to offer a free clinical trial matching service. By providing information about your diagnosis, such as the stage and kind of lung cancer you have, your treatment history and other information, a Clinical Trial Navigator will identify specific clinical trials for which you may be eligible. These recommendations can help you begin a discussion with your doctor to determine if enrolling in a clinical trial is right for you.

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YOUR TREATMENT TEAM MAY INCLUDE:

A multidisciplinary team approach is when members of the healthcare team discuss your situation and work together to make treatment recommendations. It is thought that this team approach improves coordination of care and communication amongst the team.

THORACIC SURGEON: A doctor who performs surgeries in the chest region. Some thoracic surgeons specialize in lung cancer.

MEDICAL ONCOLOGISTS: A doctor who specializes in diagnosing and treating cancer.

PATHOLOGIST: A doctor who specializes in diagnosing and classifying cancer by studying tissue, fluid or blood samples.

RADIATION ONCOLOGIST: A doctor who specializes in treating cancer using various forms of radiation by focusing it on the tumor site in the body.

PULMONOLOGIST: A doctor who specializes in treating diseases and conditions involving the lungs.

PULMONARY REHABILITATION SPECIALIST: A specialist who works to reduce symptoms and side effects from diseases of the lung—including lung cancer—and their treatments.

ONCOLOGY NURSE: A nurse who specializes in helping people with cancer and who may further specialize in the surgical or medical management of a patient's care.

ONCOLOGY SOCIAL WORKER OR COUNSELOR: A social worker or counselor who specializes in helping patients and loved ones cope with the emotional impact of cancer and who may help identify other needed resources.

PATIENT NAVIGATOR: A nurse, social worker or trained lay person who assists patients and loved ones on their journey through the health care system.

GLOSSARY

ANGIOGENESIS: The process of creating new blood vessels. Once tumors reach a certain size, they produce chemicals that trigger the growth of new blood vessels to supply nutrients and oxygen.

BIOPSY: Removal of a small piece of tissue for examination and analysis.

CANCER: A group of diseases in which cells grow and divide uncontrollably, forming tumors. In some cases, the tumors can invade nearby tissues. Tumor cells may also travel through the bloodstream and lymphatic system to spread to more distant parts of the body.

CARCINOMA: Cancer that arises from epithelial cells, which are cells that cover or line internal and external body surfaces.

CHEMOTHERAPY: Treatment with a chemical or a combination of chemicals, to slow or kill rapidly dividing cells.

CLINICAL TRIAL: A research study conducted to determine whether investigational drugs or treatments are safe and effective in humans.

COMPUTED TOMOGRAPHY (CT): An imaging technique that uses a computer to create a series of precise X-ray images of internal organs. CT scans show much more detail than standard X-rays. Also known as “CAT” scanning.

HISTOLOGY: The microscopic structure of tumor cells that helps a doctor determine the subtype of a tumor.

LOBECTOMY: Surgery that removes the lobe (a portion) of the lung that contains a tumor. The right lung is divided into three lobes; the left lung has two lobes.

LYMPH NODES: Small, oval structures located throughout the body that together form part of the immune system.

MAGNETIC RESONANCE IMAGING (MRI): The use of magnetic fields to create images of internal organs.

METASTASIS: The spread of tumor cells to sites in the body beyond the location in which the tumor began.

PNEUMONECTOMY: Surgical removal of an entire lung.

POSITION EMISSION TOMOGRAPHY (PET) SCAN: An imaging technique that detects rapidly dividing cells. This may help find cancers that are difficult to detect by other means (eg, X-ray, CT scan, MRI).

RADIATION THERAPY: The use of focused beams of radiation to kill cancer cells and reduce tumor size.

RESECTION: The surgical removal of part of a tissue or organ.

SIDE EFFECTS: Any undesired effects of a drug or treatment on a patient.

SPUTUM: A phlegm-like substance brought up from the lungs that contains mucus, cells, microorganisms, blood and/or pus.

STAGING: Description of a tumor based on its size, location and extent of spread to other organs.

TNM SYSTEM: Staging of tumors according to three factors—size and location of tumor (“T”), spread to lymph nodes (“N”), and spread to other organs (also known as metastasis, “M”). In lung cancer, a tumor is considered metastatic if it spreads to the other lung or the pleura (the thin sac covering the lung).

TUMOR: Abnormal tissue that results from uncontrolled cell division. Tumors perform no useful bodily function and may be either benign (not cancerous) or malignant (cancerous).

WHERE CAN I GO FOR MORE INFORMATION?

For more information about lung cancer and current treatments, to discuss support options or for referral to other resources, please contact us:

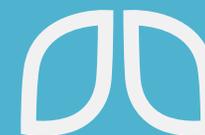
HELPLINE | 1-800-298-2436

**CLINICAL TRIAL
MATCHING SERVICE** | 1-800-698-0931

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LUNG CANCER ALLIANCE

SAVING LIVES AND ADVANCING RESEARCH BY
EMPOWERING THOSE LIVING WITH AND AT RISK
FOR LUNG CANCER



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