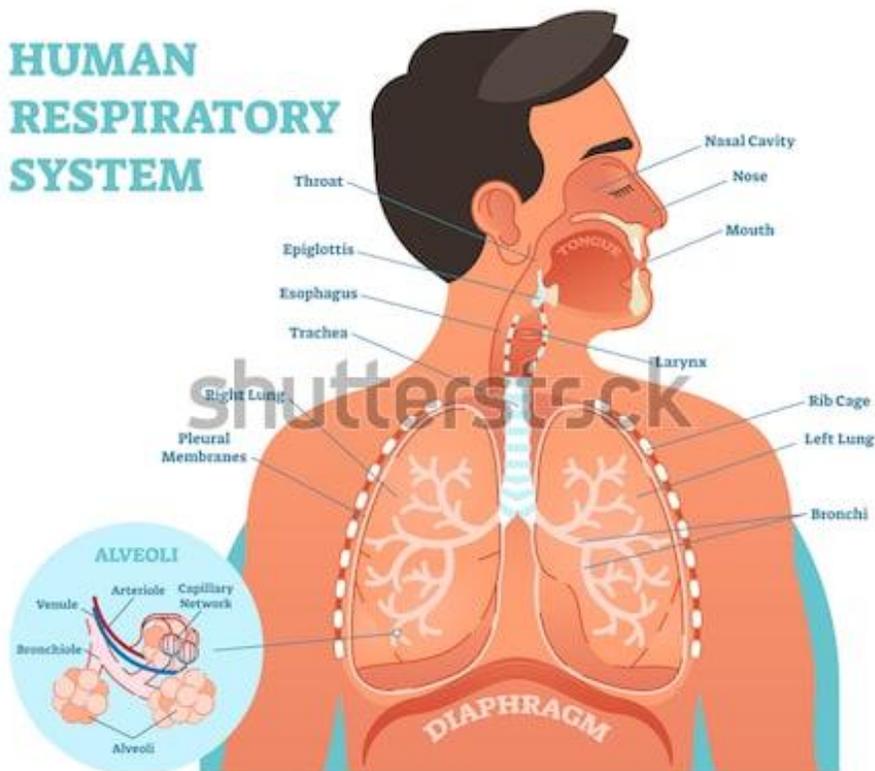


Lung Cancer

This lung cancer guide provides an overview of lung cancer: how it starts, its risk factors, symptoms, diagnosis, and treatment options. Knowing more about the disease can help you cope better, take informed decisions, and make the course of treatment as manageable as possible.

HUMAN RESPIRATORY SYSTEM

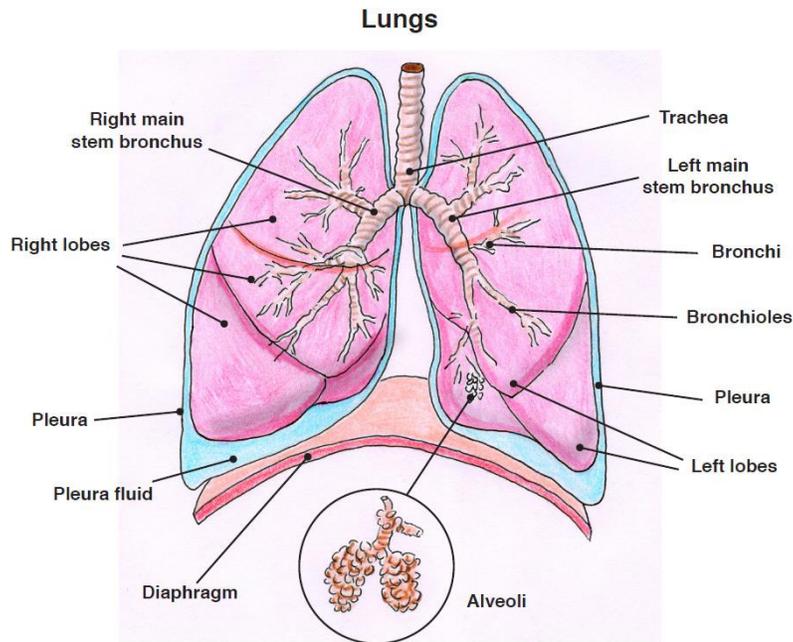


www.shutterstock.com • 1030704802

What are the lungs?

- The lungs are a pair of organs of the respiratory system located in the chest. They are spongy and have a cone shape. They deliver oxygen to your body and take out the carbon dioxide.
- The left lung has two lobes while the right one has three. Each lung is covered by a membrane called pleura. This membrane protects the lungs and helps them rub safely against the chest wall during breathing.
- When you breathe, air passes down from your nose or mouth to the trachea (windpipe), through the bronchi, then bronchioles to the air sacs (alveoli). The trachea divides into two bronchi (main passages into the lungs). Each bronchus extends into a lung lobe and branches out into smaller passages called bronchioles. Bronchioles open up at their end into

air sacs that fill up with air when you breathe. The oxygen is absorbed into the blood and then transported around the body. When you breathe out, air sacs contract to move out carbon dioxide, a waste gas, from the blood out of the body through the nose.

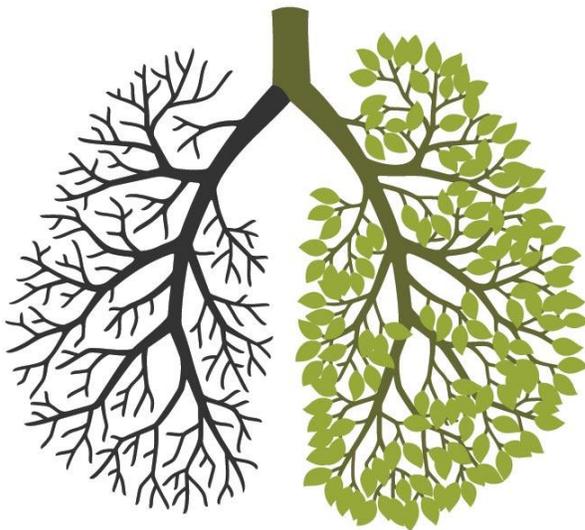


(Source:londoncancercentre.co.uk)

What is lung cancer?

- Lung cancer starts when cells in the lungs become abnormal and begin to grow and multiply uncontrollably forming a tumor (mass).
- Lung cancer can form in any tissue of the lungs but in most cases it starts in the walls of the bronchi and bronchioles or alveoli.
- It often starts as a small mass of tissue called a nodule.
- When the tumor grows, cancer cells usually spread through the lymph vessels or blood to other areas. This condition is known as metastasis.
- Lung cancer often spreads first to lymph nodes in the lungs and then to lymph nodes in the center of the chest. If not treated, the tumor can also spread to other tissues in the lungs such as the pleura, bronchi, or the other lung lobe. Then to the bones, brain, liver, and adrenal glands.
- There are two main types of lung cancer:
 - Small cell lung cancer: It is the most aggressive form of lung cancer and occurs mostly in heavy smokers. It starts in the nerve cells or hormone producing cells of the lungs in the areas around the bronchi.

- Non-small cell lung cancer: It is the most common type. It starts in epithelial cells (cells that line the surface of the lungs) and includes three main types:
 - Adenocarcinoma starts in the cells lining the alveoli and secrete mucus. It often occurs in outer areas of the lungs.
 - Squamous cell carcinoma starts in the cells lining the lungs airways mostly in the center of the chest and bronchi.
 - Large cell carcinoma can start in any part of the lungs. It includes large type of cells and is the least common type.
- Lung cancer is one of the most preventable cancers and smoking is its biggest risk factor. Almost all cases develop as a result of tobacco smoking.
- In Lebanon, lung cancer cases are increasing due to tobacco smoking, whether active or passive. It is the third most common cancer in men and the fourth most common cancer in women.
- Chances of treatment and cure improve greatly when nodules are found while they are still smaller in size. Early detection and screening are essential since they detect any signs as early as possible and secure the best chances of recovery.



(source:cgvector.com)

(In a box)

What is a nodule?

- A nodule is a small round mass of tissue (less than 3 cm).

- It can be caused by infections, scar tissue, cancer, or other conditions.
- It shows as a small spot or abnormality on a computed tomography (CT) scan. It is common to discover nodules when performing a low dose computed tomography (LDCT) scan.
- Most nodules are benign (non-cancerous). Not all nodules become cancerous with time.
- Cancerous nodules grow as time passes and are usually larger than non-cancerous ones.
- The doctor will evaluate nodules for specific features that might help detect if they are cancerous or not. These features include edges, shape, size, etc.

What causes lung cancer?

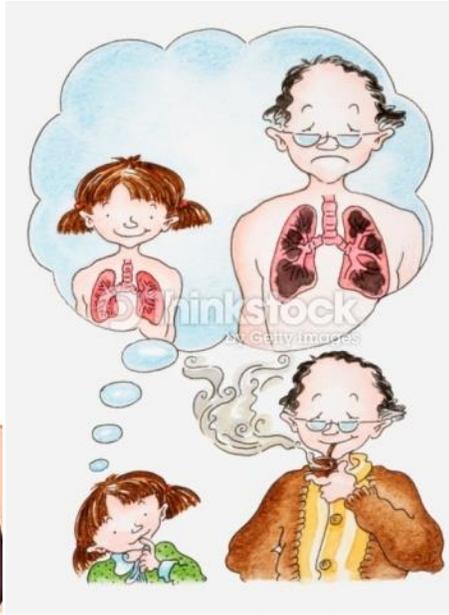
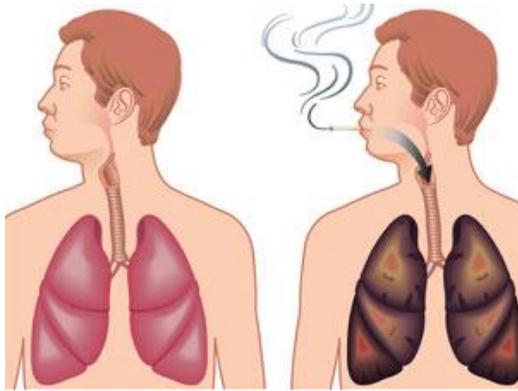
Smoking is the leading cause of lung cancer. All types of tobacco smoking (cigarettes, narjileh, cigar, or pipe) increase the lung cancer risk. In addition to that, they cause diseases and cancer in other areas of your body. There are no known safe levels of tobacco use. Smoking low tar or low nicotine cigarettes does not lower the risk of lung cancer. You are likely to inhale a similar amount of toxic chemicals as in a regular cigarette. E-cigarettes, known as electronic cigarettes, also have damaging effects on your health.

- Among thousands of harmful chemicals in tobacco about 70 are known to cause cancer.
- Your risk increases the younger you were when you first started smoking, the higher the amount of tobacco/cigarettes you smoke per day, and the greater the number of smoking years.
- Smokers are 20 times more at risk of developing lung cancer than non-smokers.

Please refer to the “Tobacco and Cancer” handout for more information.

Exposure to second-hand smoke also causes lung cancer. Passive smokers inhale as many toxic substances as smokers and are also at risk of developing lung cancer: the more exposed you are to second hand smoke the higher your risk. Living with a smoker increases the chance of developing lung cancer remarkably (by 30%). Former smokers are especially affected by second-hand smoke even if they have quit for several years.

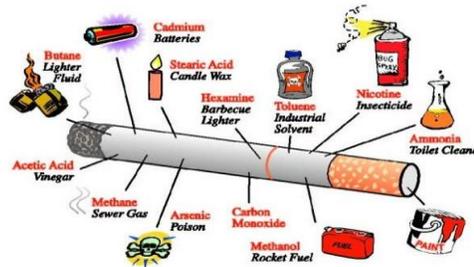
Smoking damages the cells lining your lungs and airways. Toxic and cancer causing chemicals present in tobacco reduce the lungs’ natural defense system. The effect is immediate on lung tissues that start to change. At first, your body can repair this damage but later on and with continuous smoking, the damage builds up harming your lungs cells and leading to lung cancer.



(source:adam.com) (source:gettyimages.com)

Several other factors can also increase your risk for developing lung cancer. They include:

- **Increasing age** lung cancer is more common after age 50



(source: ncppresbytery.org)

- **Family history of lung cancer** in close blood relatives such as parent or sibling (the risk is higher if the relative was affected at a young age or if more than one relative was affected)
- **Exposure to environmental hazards** such as radioactive radon gas (in the air, soil, and water), phosphate fertilizers, asbestos (material used in building insulation), arsenic, beryllium, cadmium, nickel, coal smoke, silica, air pollution, or diesel fumes (the risk is even higher if you are exposed to these agents and are also a smoker)
- **Exposure to radiation therapy to the chest** (especially if you are also a smoker)
- **History of previous lung cancer or smoking-related cancers** such as mouth, throat, or bladder cancer
- **History of chemotherapy treatment for Hodgkin lymphoma** (due to a certain medication)

- **Personal or family history of lung diseases or infections** such as chronic obstructive pulmonary disease (COPD), pulmonary fibrosis, tuberculosis, and pneumonia
- **History of auto-immune connective tissue disease** such as scleroderma
- **Infection with Human Immunodeficiency Virus (HIV)**
- **Genetic susceptibility** carrying genes that are less able to process toxic substances that harm the lungs (from smoking or other toxic substances)

(In a box) If you are considering quitting smoking and are looking for help, you can consult the Smoking Cessation Program at our Medical Center to help you quit. Please call 01 - 350000 ext. 8030.

What are the symptoms of lung cancer?

(In a box) Lung cancer usually does not show any signs or symptoms in its early stages. Symptoms usually start appearing when the disease is more advanced or has spread to other parts of the body. Having a screening test for lung cancer before symptoms appear is essential and can save your life. Lung cancer can sometimes be found unintentionally when an imaging test, such as an X-ray, is done for a different reason. **Please refer to the “Screening for Lung Cancer” handout for more information.**

The most common signs and symptoms you might experience include the following:

- Persistent or worsening cough
- Changes in a chronic cough or “smoker’s cough” (such as coughing up more mucus)
- Bloody or rust colored sputum when coughing
- Shortness of breath or difficulty breathing
- New onset of whistling or wheezing sound when breathing
- Pain or discomfort in the chest, shoulder, or back that worsens with breathing, coughing, or laughing
- Recurrent chest infections such as bronchitis or pneumonia
- Pain when swallowing
- Swelling in the face and/or neck
- Voice changes (hoarseness or high pitched sound)
- Unexplained weight loss and loss of appetite
- Weakness or fatigue
- Unexplained frequent episodes of fever
- Body pain
- Finger clubbing (the ends of fingers become larger or rounded)

Symptoms you might experience in more advanced stages of the disease include:

- Bone pain or fractures in the back or hips
- Neurologic changes (headache, weakness or numbness of your arm or leg, balance problems, or seizures)
- Jaundice (yellow skin and eyes)
- Lumps under the skin (such as in the neck or above the collarbones, between your breastbone and shoulders)

Consult your doctor if you experience any of the above symptoms.

Having these symptoms does not mean you have lung cancer; they are most often caused by other health problems.

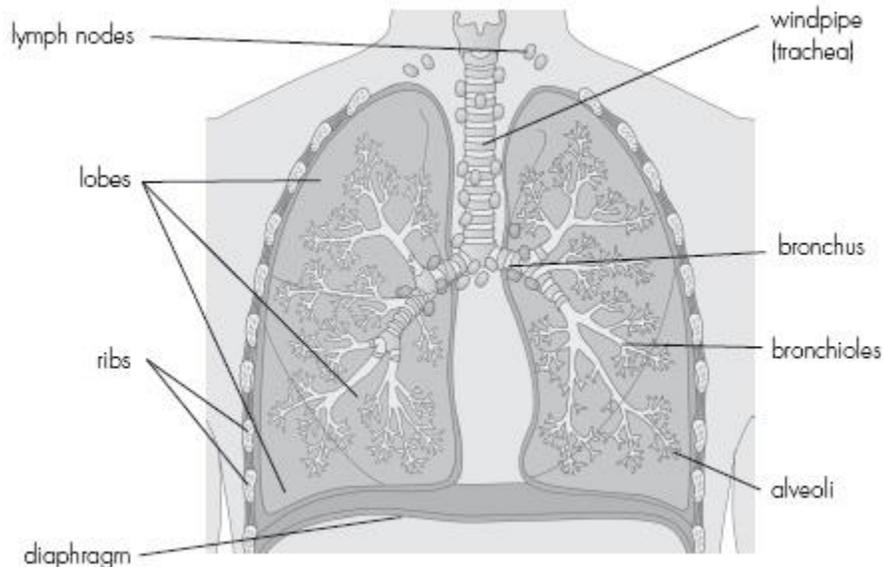
How is lung cancer diagnosed?

- **LDCT scan:** A special type of X-ray imaging test that creates detailed three dimensional pictures of the lungs from different angles. The LDCT scan uses a much lower dose of radiation than the one used in standard chest CT scans.
It is common for an LDCT scan to show nodules or other abnormalities. The first LDCT test often does not show if the nodule is cancer. Suspicious nodules are further investigated with more tests.
- **Physical exam:** Your doctor will review your medical history to check for possible risk factors such as smoking history, work environment, previous illnesses and treatments, as well as your family history. The doctor will fully examine your body for any signs of disease including lumps or anything that seems unusual.
- **Blood test:** Your doctor will order a blood test since it helps find out any abnormality in your body.

If your LDCT scan, physical exam, and blood test results indicate the need of further tests to determine if you have lung cancer, your doctor will order imaging tests and other tests or procedures to confirm the diagnosis.

- **Imaging tests:** Your doctor might order one or more of the following tests.
 - **Chest X-ray:** An imaging test that produces images of the structures inside the chest. It is usually the first imaging test done to look for any masses or nodules.
 - **Computed tomography (CT) scan:** An imaging test that produces detailed three dimensional images of areas inside the body taken from different angles. It is more detailed than the X-ray and helps find out small lesions and the extent of local disease (size, shape, and location of the tumor). It helps find out if lymph nodes are enlarged and if the disease has spread outside the lungs to other body parts such as other internal organs, adrenal glands, liver, or other areas. **Please refer to the “Computed Tomography Scan” handout for more information.**

- **Magnetic resonance imaging (MRI):** An imaging test that uses radio waves and a magnetic field to take detailed images of areas inside the body and check the extent of disease in your body. It helps find out if the tumor has reached areas such as the brain or spinal cord. **Please refer to the “Magnetic Resonance Imaging” handout for more information.**
- **Positron emission tomography and computed tomography (PET/CT):** An imaging test with a rotating scanner that produces very detailed images of areas inside the body. It uses a radioactive tracer absorbed by cancerous cells to locate small areas of the disease all over the body. This helps better identify if abnormal areas on X-ray and CT scan are cancer. PET/CT helps find out if disease has spread to nearby lymph nodes or other areas such as liver, bones, or adrenal glands. It also helps your doctor determine if surgery is possible. **Please refer to the “Positron Emission Tomography and Computed Tomography (PET/CT)” handout for more information.**
- **Bone scintigraphy:** An imaging test that uses a radioactive tracer and a special camera to check if cancer has spread to bones. **Please refer to the “Bone Scintigraphy” handout for more information.**

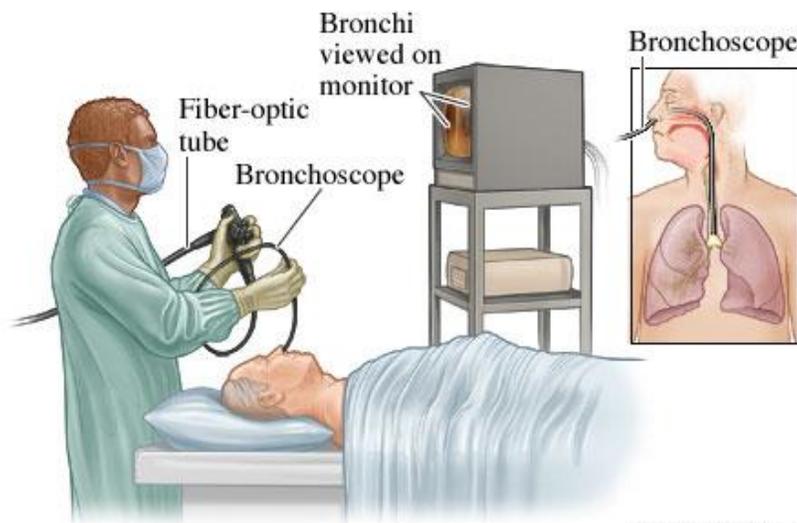


(source:screening.nhs.uk)

If your imaging tests suggest that you might have lung cancer, your doctor might order one or more of the following to study tissue or fluid from or around the lungs.

- **Sputum cytology:** If you are coughing up and are producing sputum, your doctor will order a sample of these secretions to study under the microscope and check for the presence of cancer cells.

- **Thoracentesis:** A procedure done to remove a sample of fluid from the pleural cavity (space between the lungs and the lining of the chest wall) to check for the presence of cancer cells. Your doctor inserts a needle into the pleural cavity between the ribs to collect the fluid. **Please refer to the “Pleural Tap” handout for more information.**
- **Lung biopsy:** A sample of lung tissue might be removed and studied under a microscope to check for cancer. The biopsy can be done through different ways depending on the mass. Procedures include:
 - **Bronchoscopy:** A procedure done to look directly into your lungs and take a sample of tissue or cells for biopsy. Your doctor inserts a bronchoscope through your nose or mouth down the trachea and lungs. A bronchoscope is a flexible tube with a light source and a video camera. It has special tools to collect samples of tissue. Bronchoscopy is only done when the tumor is accessible through the airways. **Please refer to the “Bronchoscopy” handout for more information.**



© Healthwise, Incorporated (source:webmd.com)

- **Image-guided biopsy:** A procedure done if the mass cannot be reached through bronchoscopy. It consists of two types, fine needle aspiration (FNA) and core needle biopsy. The doctor takes tissue samples from the suspicious area under the guidance of imaging, either ultrasound or CT scan. During FNA, the doctor will take small samples of tissue or fluid with a very thin needle. During core needle biopsy, he/she will take larger samples and might use a larger needle. Core needle biopsy is usually more common than FNA. **Please refer to the “Image-Guided Biopsy” handout for more information.**
- **Thoracoscopy:** A procedure done to look directly into your chest cavity and take a sample of tissue for biopsy. Your doctor inserts a thoracoscope through a small cut in the chest wall between the ribs. A thoracoscope is a thin flexible tube with a light source

and a video camera. This procedure is done under general anesthesia. It helps check for any abnormality in the pleural cavity, chest or lymph nodes.

- **Thoracotomy:** A procedure done if certain areas cannot be reached through thoracoscopy. The doctor makes a larger cut usually on the right or left side of the chest wall between the ribs. He/she opens the chest to examine the lungs directly and take a sample of tissue for testing. This procedure is done under general anesthesia.
- **Mediastinoscopy:** A procedure done to look directly into your mediastinum (area behind your breastbone and between the lungs) and take samples of tissue from lymph nodes in the chest. The doctor inserts a mediastinoscope through a small cut in the middle of the chest under the breastbone. A mediastinoscope is a thin flexible tube with a light source and a video camera. It has special tools to collect samples of tissue. This procedure is done under general anesthesia.
- **Bone marrow aspiration or biopsy:** A procedure done to examine the bone marrow for cancer cells. It is usually done at the pelvic bone over the hip. The doctor will insert a thin needle into the hip bone or breastbone to remove a small amount of fluid or tissue from the bone marrow. These biopsy cells are then studied under the microscope.

(Blue box)

Knowing that you have lung cancer can be overwhelming. You might need to know a lot of information. It is helpful to prepare for your doctor's appointments.

- Write down the symptoms you are having, their start date, frequency, and severity.
- Write down key personal information that might be relevant such as recent life changes, medical history of a disease, previous diagnosis of lung disease, and any relevant family history.
- List all the medications you are taking.
- Gather all your medical records. If you have any imaging or laboratory tests done at a different medical center, bring all the results with you to your appointment.
- Write down questions you would want to ask your doctor about:
 - When will the results be ready?
 - Will I need any additional testing?
 - How is my smoking history related to lung cancer? Will I benefit if I quit smoking now?
 - What is causing my symptoms? How can they be relieved?
 - Where is the disease located exactly? At which stage is my lung cancer?
 - When is my next follow-up visit?
 - What are my treatment options and their side effects?
 - When do I need to start treatment? How long will it last?

- Where will I receive treatment? Will I be able to go back home or do I have to stay at the Medical Center?
- Will treatment affect my daily life? When would I be able to practice normal activities?
- How often will I need checkups after treatment?
- What can I do to stop my cancer from recurring?
- Have a relative or close friend accompany you during appointments to help you remember the questions you want to ask and the discussion.

What are the stages of lung cancer?

Knowing the stage of lung cancer helps decide which treatment is better. The doctor will determine the stage based on the results of the diagnostic tests that you did.



(source:drugdiscovery.com)

To stage **non-small cell lung cancer**, the doctor most commonly uses a system called TNM classification:

- **T:** The size of the tumor and its location
- **N:** The number of nearby lymph nodes that have cancer
- **M:** Metastasis (the spread of cancer to other body parts)

It is also staged as the following:

- **Stage 0:** Abnormal cells (that may become cancer) are present in the lining of the airways.
- **Stage I:** Tumor is only in one lung and has not spread to nearby lymph nodes. It is found very early. There are two sub stages:
 - **Stage IA:** Tumor is smaller than 3 cm
 - **Stage IB:** Tumor is 3 to 4 cm
- **Stage II:** Cancer is found early. There are two sub stages:
 - **Stage IIA:** Tumor is 4 to 5 cm and has not spread to nearby lymph nodes.
 - **Stage IIB:**
 - Tumor is 5 cm or smaller and has spread to nearby lymph nodes
 - Or
 - Tumor is 5 to 7 cm and has not spread to nearby lymph nodes.

- **Stage III:** Cancer has spread to lymph nodes in the same side of the chest. There are three sub stages:
 - **Stage IIIA:**
 - Tumor has the below:
 - It is 5 cm or smaller
 - It has spread to bronchus or inner lining of the lung or part of the lung has collapsed or developed pneumonitis (inflammation of the lung tissue)
 - Or
 - Tumor has one or more of the below:
 - It is 5 to 7 cm
 - It has spread to the inner lining of chest wall, diaphragm nerves, or outer layer of the heart
 - It has spread to lymph nodes on the same side of the tumor or lymph nodes in the center of the chest
 - There are other tumors in the same lung lobe
 - Or
 - Tumor has one or more of the below:
 - It is larger than 7 cm
 - It is of any size and has spread to nearby structures such as trachea, breastbone esophagus, heart
 - There are other tumors in a different lung lobe
 - **Stage IIIB:**
 - Tumor has the below:
 - It is 5 cm or smaller
 - It has spread to lymph nodes further away from the chest above the collarbone, either bronchus, or inner lining of the lungs, or part of the lung has collapsed or developed pneumonitis (inflammation of the lung tissue)Or
 - Tumor has the below:
 - It is of any size
 - It has spread to lymph nodes in the same side of the chest and to either lungs, or nearby structures such as bronchus, trachea, breastbone, esophagus, or heart
 - **Stage IIIC:** Tumor is of any size and has spread to further distant lymph nodes in the chest above the collarbone and the near structures
- **Stage IV:**
 - **Stage IVA:** Tumor is of any size and has spread within the chest (such as to the other lung, pleura, or fluid around the lungs or heart) or to one area outside the chest such as a distant lymph node or organs such as heart, bones, brain, liver, or adrenal glands.

- **Stage IVB:** Cancer has spread outside the chest to more than one place in an organ or to more than one organ far from the lungs such as the brain, adrenal glands, kidney, liver, or bones.

Small cell lung cancer is also staged using a two-stage system:

- **Limited stage:** Cancer is limited to the lung where it first started and may have spread between the lungs or to the lymph nodes above the collarbone.
- **Extensive stage:** Cancer has spread throughout both lungs or the lymph nodes above the collarbone to lymph nodes on the other side of the chest, pleurae, or other organs in the body.

What is the treatment of lung cancer?

Treatment generally depends on the following:

- The stage, size, location, and type of cancer
- Your overall health status, medical history including other lung problems (such as emphysema or chronic bronchitis), and lung function
- Your performance status, ability to work and perform daily activities

To check your lung function, your doctor will order a pulmonary function test. It is a test that evaluates how your lungs work by measuring the amount of air you inhale and exhale as well as the lungs' ability to transfer oxygen into the blood.

Please refer to the “Pulmonary Function Test” handout for more information.

If you have non-small cell lung cancer, you might have a surgery, radiofrequency ablation, chemotherapy, radiation therapy, targeted therapy, immunotherapy, or a combination of these therapies.

If you have small cell lung cancer, you might receive chemotherapy, radiation therapy, and rarely you will have a surgery.

A. Surgery:

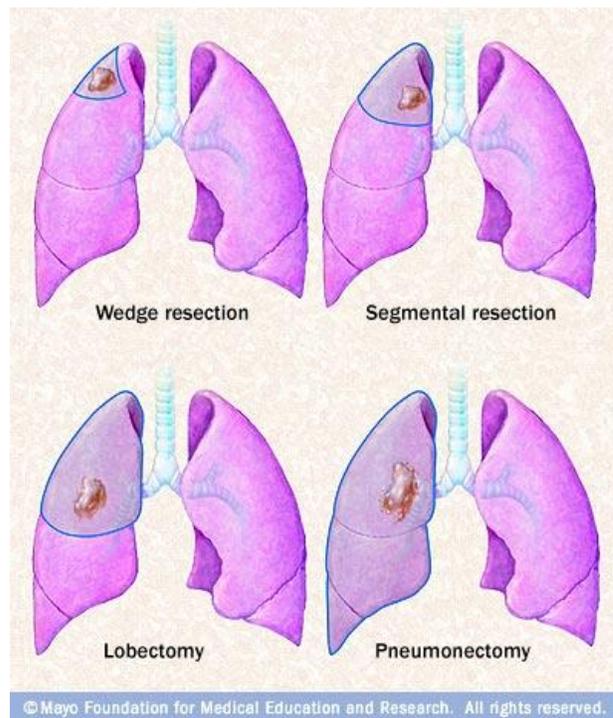
Surgery is the main preferred treatment to try to cure non-small lung cancer. It aims to remove the lung tumor completely and the lymph nodes nearby or outside the chest. The doctor might also remove a margin of healthy tissues around the tumor to ensure that no disease remains.

Surgery can be done through either thoracotomy or thoracoscopy.

- **Thoracotomy:** The doctor makes a large cut from the front of the chest to the back, between the ribs on the side of the chest to the shoulder blades. Sometimes, the doctor might remove a part of the rib. This is the common surgery done to remove a tumor.
- **Thoracoscopy:** The doctor makes three or more small cuts between the ribs on the side of the chest using a thoracoscope.

There are different surgical procedures to remove lung tumors. They differ according to how much lung tissue will be removed, location, and size of the tumor. They include:

- **Wedge or segmental resection:** In both surgeries the doctor removes only a part of the lobe containing the tumor when the whole lobe cannot be removed. In wedge resection, the doctor removes the smallest part of the lobe with a margin of healthy tissues around it. While the doctor removes a larger segment of the lobe during segmental resection.
- **Lobectomy:** The doctor removes the whole lobe where the tumor is present. It is the most effective surgery even when the tumor is very small.
- **Sleeve lobectomy:** The doctor removes part of the bronchus. Then he/she reconnects the remaining lobes to the bronchus.
- **Pneumonectomy:** The doctor removes the entire lung when the tumor is near the center of your chest.



Common side effects of surgery include pain, swelling, scarring, and shortness of breath. Bleeding and infection might happen after surgery.

After surgery, the tissue of the lung will re-grow and expand over time making it easier to breathe. The doctor might give you breathing exercises to help you regain good breathing.

B. Radiofrequency ablation:

Radiofrequency ablation is a procedure that uses high energy waves to heat the tumor. The doctor inserts a thin needle into the tumor under the guidance of a CT scan. Then he/she will apply an electric current to destroy cancer cells. RFA might be used when the tumor is located near the outer part of the lung and cannot be removed with the different types of surgeries.

C. Chemotherapy:

Chemotherapy medications are used to destroy cancer cells. They attack all cells that grow fast in the body; both normal and cancer cells.

- The stage and type of cancer will determine the way you will receive chemotherapy.
- You might receive chemotherapy as a single medication or a combination of two or more medications, which is more common.
- You might receive chemotherapy in pills that you swallow or intravenously injected into the veins (IV), which is the most common.
- You will receive chemotherapy in cycles. Each cycle is followed by a rest period to allow the body to recover. The length of cycles and the rest period depends on the medication used.
- You can receive chemotherapy alone or with other cancer treatments such as radiation therapy.
- You might receive chemotherapy before surgery (neoadjuvant therapy) to shrink the size of the tumor. This limits the amount of tissue your doctor needs to remove during the surgery. It will also help him/her remove the tumor easier.
- You might receive chemotherapy after surgery (adjuvant therapy) to destroy any remaining cancer.
- You might also receive chemotherapy to relieve pain and other symptoms of lung cancer.
- Chemotherapy side effects depend on the type, dose, and length of treatment. They include fatigue, loss of appetite, nausea, vomiting, diarrhea, mouth sores, hair loss, low blood cell counts, higher risk of infection, and numbness and tingling in your extremities.

Please refer to the “Chemotherapy” handout for more information.

C. Radiation therapy:

- Radiation therapy uses high energy rays to destroy cancer cells and stop their growth. It aims to limit the amount of healthy tissues exposed to radiation in order to reduce any possible side effects.
- You can receive it in two ways depending on the stage and type of lung cancer:

- **External radiation:** It is the most common type of therapy. A machine moves around your body from the outside and directs radiation beams into the tumor area. You usually receive several sessions for six weeks.
- **Internal radiation (brachytherapy):** The doctor places a radioactive substance through a bronchoscope, needle, or catheter inserted directly into or next to the lung tumor. It can be used to help reduce a tumor blocking an airway.
- In some cases, you need to receive radiation therapy in combination with chemotherapy.
- Radiation therapy might be done before surgery to help shrink size of the tumor. It might also be done after surgery to destroy any remaining cancer.
- You might receive radiation therapy as the primary treatment if surgery cannot be done. Some cases of very small lung cancer might receive radiation at the tumor from different angles.
- You might also receive radiation therapy to relieve pain and other symptoms of lung cancer.
- Possible side effects of radiation therapy include skin irritation, hair loss, swelling of the lungs, fatigue, and loss of appetite.

They might also include:

- Radiation pneumonitis: An inflammation or irritation of the lungs caused by the radiation therapy to the chest area. Symptoms include cough, fever, and shortness of breath that might last few months after treatment. If your condition is mild, it resolves by its own but if your condition is more severe, you might need to receive corticosteroids.
- Permanent scarring of lung tissue: This occurs at the location of the tumor. If your condition is severe, you might experience a permanent cough and shortness of breath.

Please refer to the “Radiation Therapy” handout for more information.

D. Targeted therapy:

Targeted therapy is a new cancer treatment that specifically attacks cancer cells and blocks their growth. It targets specific cancer cell genes, proteins, or tissues that help cancer cells grow and survive. This treatment affects normal cells less than chemotherapy.

- Medications you might receive include:
 - Medications that block cancer cell growth such as Afatinib (Gilotrif®), Cetuximab (Erbix®), Erlotinib (Tarceva®), and Gefitinib (Iressa®). They are given for advanced metastatic cases or as maintenance therapy for tumors that have not grown after therapy.
 - Medications that stop the blood supply and growth of the tumor such as Bevasizumab (Avastin®)
 - Medications that target a gene leading cancer cells to grow such as Crizotinib (Xalkori®)
- Targeted therapy can be given in pills that you swallow or intravenously.

- It can be given alone or in combination with chemotherapy.
- Targeted therapy side effects depend on the medication and dose you receive. They might include diarrhea, loss of appetite, skin problems, mouth sores, nausea, fatigue, and vision problems.
- Tests on tumor samples can help find out the most effective targeted therapy for different cases of lung cancer.

E. Immunotherapy:

Immunotherapy is a treatment that helps improve the immune system's ability to fight cancer. It uses substances made either by the body or in the laboratory to enhance or restore the body's natural defenses against cancer.

- Medications you might receive include Atezolizumab (Tecentriq®), Nivolumab (Opdivo®), and Pembrolizumab (Keytruda®).
- Immunotherapy side effects depend on the medication and dose you receive.

Adjuvant therapy: Treatment given after the main therapy for cancer to destroy any remaining cancer. It reduces the chance of the disease to return. Adjuvant therapy can include chemotherapy, radiation therapy, and sometimes targeted therapy.

What are the complications of lung cancer?

Complications of lung cancer might include:

- **Shortness of breath:** Several reasons can cause shortness of breath including:
 - Presence of a tumor blocking the airways
 - Accumulation of fluids between the lungs and chest which prevents the lungs from expanding normally when breathing
 - Decreased oxygen levels in the blood. Lung cancer can reduce the levels of red blood cells that transport oxygen.
 - Development of an infection due to the tumor blocking the airways

(In a box) Tips to manage shortness of breath

You might feel that you have difficulty catching your breath, taking adequate breaths, or have tightness in your chest. You might also feel more breathless when you engage in physical activity. Below are few tips that can help you cope with shortness of breath:

- **Use breathing techniques:** Few techniques can help you breathe properly and control shortness of breath:
 1. **Pursed lip breathing:** Breathe in slowly through your nose, hold your breath for a few counts, then breathe out slowly while pursing your lips as if you are whistling. Breathing out should take more time than breathing in. For example, count till two while

breathing in, and count till four while breathing out. This technique would help you empty your lungs effectively.

2. **Abdominal (diaphragmatic) breathing:** To practice this technique, sit on a chair in a comfortable position. Relax your head, neck, and shoulders. Put one hand on your chest and another hand on your belly or below your rib cage. Breathe in slowly through your nose while feeling your stomach moving out with your hand. Press in the muscles of your abdomen and breathe out fully through your mouth (while pursing your lips). If you relax your abdominal muscles while breathing in, then press them in while breathing out; you will be able to breathe more air in, and exhale more air out.
 3. **Paced breathing:** Whether you are walking, running or climbing stairs, breathe in a pattern that can match the efforts you are doing. It is helpful to control your breathing before you start any activity.
- **Try a comfortable “recovery position”:** This position allows you to take deeper breaths. As you breathe out, try to relax your shoulders and upper chest muscles.
 1. Sit on a chair with your feet flat on the floor. Lean forward slightly. Use one of the following techniques:
 - Rest your elbows on your knees, and hold your chin in your hands.
 - Rest your arms on a table and turn your palms upwards.
 - Rest your arms on a table. Rest your head on a pillow or on your forearms.
 2. Stand comfortably, feet slightly apart, and use one of the following techniques:
 - Rest your thighs on a wall. Lean forward slightly. Rest your hands slightly on your thighs, and dangle your arms.
 - Rest your hands on a table. Lean forward, rest your head down, and relax your shoulders.
 - **Try to elevate your head and upper body** using pillows when you are sleeping.
 - **Try to relax:** You might feel scared and anxious when you have shortness of breath. This can make it even harder to breathe. When you start feeling short of breath, trying to hold in that fear can help. Try to help yourself relax by letting that moment pass through and closing your eyes. Choose an activity that can help you relax, like music or meditation.
 - **Save your energy:** Feeling short of breath might make you more easily tired. Try to save your energy for essential tasks. Plan your daily activities ahead of time, take regular breaks especially around activities that can make you feel short of breath.
 - **Cool down the room air:** Cooler air is easier to breathe. Open a window to lower the room temperature you are in or try sitting near an open window to get extra air.
 - **Use a small hand held fan:** This helps blow cool air towards your nose and mouth.
 - **Quit smoking and avoid second-hand smoking.**



(source:greatist.com)

Contact your doctor immediately if your symptoms get worse.

(In another box)

You can consult the Pulmonary Rehabilitation Program at our Medical Center. Please call the following number 01 - 759616 during weekdays.

- **Bloody cough:** Lung cancer can cause bleeding in the airways
- **Pain:** Cancer present in the lining of the lung can cause pain. It can also cause pain in advanced stages when it spreads to other areas of the body such as bones.
- **Pleural effusion:** Cancer can cause an accumulation of fluids in the space around the affected lung

What is the treatment of symptoms and side effects?

Different approaches can be used to manage and relieve your symptoms and side effects. They include:

- **Radiation therapy:** Treatment to shrink a chest tumor blocking the lung passages or causing bleeding
- **Bronchoscopy:** Procedure to open blocked lung passages and improve breathing
- **Laser surgery:** Surgery that opens up a blocked airway by burning the tumor or placing a stent
- **Thoracentesis:** Procedure to remove fluid from the chest and improve breathing
- **Pain medications:** Medications that reduce or relieve pain caused by cancer. They can also help alleviate shortness of breath.
- **Corticosteroids:** Medications that help decrease the inflammation caused by lung cancer and radiation therapy. They also help relieve shortness of breath.
- **Other medications:** Such as medications to open closed airways, treat cough, and decrease bronchial secretions
- **Bisphosphonates:** Medications that block the spread of cancer to bones, help strengthen bones, and reduce bone pain

Supplemental oxygen: Oxygen therapy might help you meet the oxygen needs of your body. This is in case your lungs might be less able to absorb oxygen from the air, and you might have low levels of oxygen in your blood.

When should I follow up with my doctor?

After you finish treatment, you should follow up with your doctor frequently to check your medical status and watch for any late side effects of treatment or cancer that might recur. Make sure you report any relevant symptoms to your doctor whenever you experience them. Follow up tests you might need to do include:

- A physical exam and a medical history review (to do every six to 12 months for two years, and then once yearly)
- Chest CT (to do every six to 12 months for two years, and then once yearly)
- Screening tests for cancer

If you have had lung cancer, you have a higher risk of developing a second cancer (lung cancer or another type of cancer). **Cancer survivors who continue to smoke are especially at higher risk.** It is important to pay attention to any signs or symptoms that may suggest the disease has come back.



Does stopping smoking after being diagnosed with lung cancer help?

Quitting smoking whether cigarettes, narjileh, or pipe **even at the diagnosis of lung cancer is essential and can improve treatment and chances of recovery.**

It can also decrease the risk of complications, cancer returning, or second cancer growing.

Any amount of smoking will decrease the effectiveness of treatment and might increase the likelihood of recurrence.

- Quitting smoking:
 - Improves your survival rate
 - Improves your body's ability to heal and respond to treatment

- Decreases the likelihood of experiencing side effects from treatment
- **Continuing smoking:**
 - **Decreases your survival rate**
 - **Decreases the chance of treatment success**
 - **Increases the risk of complications from surgery and slower your recovery**
 - Increases the likelihood to have more side effects from chemotherapy and radiation therapy
 - Increases the chance of cancer returning
 - Increases the risk of developing another serious illness

Avoiding second-hand smoking is also essential. Avoid any exposure to tobacco smoke (cigarettes and narjileh). If you live with someone who smokes, ask them to quit. They should smoke outside the house as a minimum precaution. You should also avoid places where there is tobacco smoke (including narjileh).

Tips during treatment

The health care team as well as the palliative and supportive care team are here to help you during and after treatment. These tips can help you manage the course of the disease, treatment, and follow up.

- **Don't smoke and avoid second-hand smoking**
- **Learn about the disease:** It is very important to know enough information about lung cancer, its treatment options, and the possible side effects to set your expectations and manage the course of disease. It will also help in taking essential decisions more easily.
- **Talk to your doctor and nurses:** Voice any of your concerns and talk about what you are experiencing. Do not wait until you feel you are overwhelmed.
- **Share your concerns with others:** Try to keep a good support network around you to share your concerns. Sharing concerns or questions related to the disease and treatment with your significant others might be of great help in coping with lung cancer. Patients who are going through the same experience can be of great support as well.
- **Keep a schedule of your appointments and tests:** Ask your doctor about the expected schedule of appointments and tests you need to go through. Keep a good record of your treatment course and plan, along with test results and your list of medications.
- **Eat healthy:** Take care of yourself by keeping a balanced diet that includes cereals, whole grains, vegetables, and fruits. Limit your intake of red and processed meat. Eating an appropriate amount of food and getting enough calories during and after treatment will help you maintain energy and feel better. It can also help you in maintaining a healthy weight during and after treatment. Maintaining good nutrition is important since treatment side effects can cause loss of appetite, fatigue and nausea. **Please refer to the "Nutrition Tips for Cancer Patients" handout for more information.**

- **Drink in moderation:** If you drink alcohol, limit your daily intake to one drink (for females) and two drinks (for males).
- **Exercise:** Exercise can help you feel better, have more energy, rebuild strength, and improve your appetite. It can help relieve cancer-related fatigue. Any type of exercise, no matter how long it is can be good. If you have been inactive, you can start slowly and build up your activity level. It is recommended to walk for 15 to 30 minutes every day even if you are using oxygen. This will improve your heart and lung function. Talk to your doctor before starting any type of exercise.
- **Stay active:** Having lung cancer does not mean you cannot continue doing the things you normally like to do. If you feel well enough, stay active as much as you can. Try to get enough rest and sleep. Balance between rest and activities. Practicing your regular activities will help you stay connected to your normal life, maintain a sense of normalcy, and have a break from treatment.