Lung Cancer: Diagnosis, Staging and Treatment

Cancer starts in our cells. Cells are the building blocks of our tissues. Tissues make up the organs of the body. Normal, healthy cells grow and divide to form new cells as the body needs them. When normal cells grow old or become damaged, they die, and new cells take their place. Sometimes, this process goes wrong. New cells form when the body does not need them, and old or damaged cells do not die like they should. The build-up of extra cells often forms a mass of tissue called a growth or tumor.

Lung cancer develops after many years of exposure to cancer-causing agents called carcinogens. The leading cause of lung cancer is smoking. Other strong risk factors are:

- Second-hand smoke
- Radon
- Asbestos
- Chemicals
- Radiation
- Genetics
- Diet

Lung Tumors that are Cancer (Malignant):

- May be a threat to life
- May grow back after being removed
- Can invade nearby tissues and organs
- Can spread to other parts of the body (metastasis)

This handout is for informational purposes only. Talk with your doctor or health care team if you have any questions about your care.

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Symptoms of Lung Cancer

- Hemoptysis (coughing up blood)
- Malaise (feeling of discomfort, illness or lack of well-being)
- Weight loss
- Dyspnea (hard to breath or short of breath)
- Hoarseness
- Cough
- Chest pain
- Symptoms that do not go away

Diagnosis

If you have a symptom that may be a sign of lung cancer, your doctor will need to find out if the problem is from cancer or something else. Your doctor may ask about your personal and family medical history. Your doctor also may order blood tests, and one or more of the following tests:

- **Physical exam** - Your doctor will check your general health, listen to your breathing, and check for fluid in the lungs. Your doctor may also check for swollen lymph nodes and a swollen liver.

- **Chest x-ray** - X-ray pictures taken of your chest to look for tumors or abnormal fluid.

- **CT scan** - Your doctor may order a CT scan to take pictures of tissue inside the chest. During this test, the CT scanner rotates around you as you lie on a table. The table passes through the center of the scanner. The pictures may show a tumor, abnormal fluid, or swollen lymph nodes.

Finding Lung Cancer Cells

The only way to know if lung cancer is present is for a pathologist to check samples of fluid, cells or tissue. A pathologist studies the sample under a microscope and performs other tests to check for cancer cells.
There are many ways to collect samples. Your doctor may order one or more of the following tests to collect samples:

- **Thoracentesis** - The doctor uses a long needle to remove fluid (pleural fluid) from the lung sac in the chest. The lab checks the fluid for cancer cells.

- **Bronchoscopy** - The doctor inserts a thin, lighted tube (a bronchoscope) through the nose or mouth into the lung. This test lets the doctor see the lungs and air passages. The doctor may take a sample of cells with a needle, brush, or other tool. The doctor may also wash the area with water to collect cells in the water.

- **Endobronchial Ultrasound (EBUS)** - The doctor inserts a scope and uses an ultrasound to help check for lung cancer and to check if the cancer has spread to nearby lymph nodes.

- **Fine-needle biopsy** - The doctor uses a thin needle to remove tissue or fluid from the lung or lymph node. Sometimes the doctor uses a CT scan or other x-ray to guide the needle to a lung tumor or lymph node.

- **Thoracoscopy** - The surgeon makes several small incisions in your chest and back. The surgeon uses a thin tube with a light to look at the lungs and nearby tissues. If an abnormal area is seen, a biopsy may be done to check for cancer cells.

- **Thoracotomy** - The surgeon opens the chest with a long incision. Lymph nodes and other tissue may be removed.

- **Mediastinoscopy** - The surgeon makes an incision at the top of the breastbone. A thin, lighted tube is used to see inside the chest. The surgeon may take tissue and lymph node samples.

**Staging**

To plan your treatment, your doctor needs to know the type of lung cancer and the amount (stage) of the disease present. Staging is done to find out whether the cancer has spread, and if so, to what parts of the body. Lung cancer spreads most often to the lymph nodes, brain, bones, liver, and adrenal glands.

When cancer spreads from the first place it was found to another part of the body, the new tumor has the same kind of cancer cells and the same name as the original cancer. For example, if lung cancer spreads to the liver, the cancer cells in the liver are actually lung cancer cells. The disease is metastatic lung cancer, not liver cancer. For that reason, it is treated as lung cancer, not liver cancer.
To stage your disease, your doctor may order blood tests, and you may have one or more of the following tests:

- **CT scan** - A CT scan is used to see if the cancer has spread to your lung, liver, adrenal glands, brain, or other organs. You will be given contrast material by mouth or by injection into your arm or hand. The contrast material helps these tissues show up more clearly.

- **MRI** - The MRI uses a powerful magnet linked to a computer. It shows detailed pictures of your brain, bones and other tissues on a computer screen.

- **PET scan** - A PET scan can be used to find cancer that has spread. You will get an injection of a small amount of radioactive sugar. A machine shows computerized pictures of the sugar being used by cells in the body. Cancer cells use sugar faster than normal cells, so areas with cancer will look brighter on the scan.

### Types of Lung Cancer

There are two major types of lung cancer, **non-small cell (NSCLC)** and **small cell lung cancer (SCLC)**. These types of lung cancer are treated differently. The most common types are named for how the lung cancer cells look under a microscope.

- Only a low number of lung cancers are **small cell lung cancers**. This type of cancer tends to spread quickly.

- Most lung cancers are **non-small cell lung cancers**. This type of cancer spreads slower than a small cell lung cancer.

- A low number of **non-small cell** lung cancers are found in non-smokers, most often in women and younger people.

### Types of Non-Small Cell Lung Cancer

- **Adenocarcinoma** starts in cells that line the alveoli (air sacs) and make mucus. It is caused by tobacco smoking; however, it is also commonly found in nonsmokers, women and younger people.

- **Squamous cell carcinoma** starts in the thin, flat cells in the lungs, most often caused by tobacco smoking. It also is called epidermoid carcinoma.

- **Large cell carcinoma** starts in certain types of large cells in the lungs.

- **Bronchoalvelar cancer** develops in the outer region of the lung in glands that make mucus.
Stages of Non-Small Cell Lung Cancer

Non-small cell lung cancer is based on the size of the lung tumor and if the cancer has spread to the lymph nodes or other tissues.

Stage IA

- The lung tumor is an invasive cancer. It has grown through the innermost lining of the lung into deeper lung tissue.
- The tumor is **no more than 3 cm across**. It is surrounded by normal tissue and the tumor does not invade the bronchus (airway). Cancer cells are not found in nearby lymph nodes.

Stage IB

- The tumor is larger or has grown deeper, but cancer cells are not found in nearby lymph nodes. The lung tumor is one of the following:
  - The tumor is **more than 3 cm across**.
  - It has grown into the main bronchus.
  - It has grown through the lung into the pleura (tissue that covers the lungs).

Stage IIA

The lung tumor is one of the following:

- The tumor is **more than 5 cm across**, and may have grown into the main bronchus or through the lung into the pleura, but is **not** found in nearby lymph nodes.
- The tumor is **less than 3 cm across** and is found in nearby lymph nodes but is **not** found in nearby structures (pleura, chest wall, or diaphragm).
- The tumor is **more than 3 cm across** but **less than 5 cm** and may have grown into the main bronchus or through the lung into the pleura, and is found in nearby lymph nodes.
Stage IIB
The tumor is one of the following:

- The tumor is more than 7 cm but cancer cells are not found in nearby lymph nodes. The tumor has invaded the chest wall, diaphragm, pleura, main bronchus, or tissue that surrounds the heart.
- The tumor is more than 5 centimeters across and cancer cells are found in nearby lymph nodes. The tumor may have grown into the main bronchus or through the lung into the pleura.

Stage IIIA
- The tumor may be any size. Cancer cells are found in the lymph nodes near the lungs and bronchi, and in the lymph nodes between the lungs but on the same side of the chest as the lung tumor.
- The tumor may be any size. The tumor has invaded nearby organs, such as the heart, esophagus, trachea, vertebral body, or a separate tumor in the same side of the lung, but is not found in nearby lymph nodes involved.

Stage IIIB
- The tumor may be any size. The tumor may have invaded nearby organs, such as the heart, esophagus, trachea or vertebral body, or a separate tumor in the same side of the lung. Cancer cells are found in the lymph nodes on either side of the chest.

Stage IV
- The tumor may be any size. Cancer may be found in more than one lobe of the same lung or spread to the other lung. Cancer cells may be found in the pleural fluid or the fluid around the heart. Cancer may be found in other parts of the body, such as the brain, adrenal gland, liver, or bone.

Stages of Small Cell Lung Cancer
Small cell lung cancer is described using two stages:

- **Limited stage** - cancer is found in only one area of the lung.
- **Extensive stage** - cancer is found in more than one area of the lung or outside the lung in other tissues.

The treatment options are different for limited and extensive stage small cell lung cancer.
Non-Small Cell Lung Cancer

People with non-small cell lung cancer may have surgery, chemotherapy, radiation therapy, or a combination of these treatments. The treatment choices are different for each stage of cancer.

Treatment for non-small cell lung cancer may include the following:

**Stage I:** Surgery may be done to remove the cancer and lymph nodes.

**Stage II:** Surgery may be done to remove the cancer and lymph nodes. Other treatments such as chemotherapy and or radiation maybe used after surgery. Treatment given after surgery is called adjuvant therapy.

**Stage III:** Chemotherapy and or radiation may be used as first line treatment, this is called neoadjuvant or induction therapy. Surgery after chemotherapy or radiation may be an option.

**Stage IV:** The cancer is advanced and has spread to other parts of the body. Radiation therapy may be done to help relieve symptoms and reduce discomfort (palliative treatment). In some cases, surgery may be used to help relieve pain and symptoms.

Treatment options may include chemotherapy, targeted therapy, immunotherapy, or clinical trial. Your doctor will talk with you about the treatment options available to you based on your situation.

Adapted from What You Need To Know About Lung Cancer, National Cancer Institute (http://www.cancer.gov)