

## Lung Cancer - Diagnosis [1]

This section has been reviewed and approved by the [Cancer.Net Editorial Board](#) [2], 06/2014

**ON THIS PAGE:** You will find a list of the common tests, procedures, and scans that doctors can use to find out what's wrong and identify the cause of the problem. To see other pages, use the menu on the side of your screen.

Doctors use many tests to diagnose cancer and find out if it has spread from the lung. Some tests may also determine which treatments may be the most effective. A biopsy is the only way to make a definitive diagnosis of lung cancer. Imaging tests may be used to find out whether the cancer has spread, but they can never be used alone to diagnose lung cancer. This list describes options for diagnosing this type of cancer, and not all tests listed will be used for every person. Your doctor may consider these factors when choosing a diagnostic test:

- Size, location, and type of cancer suspected
- Age and medical condition
- Signs and symptoms
- Previous test results

In addition to a physical examination, the following tests may be used to diagnose and [stage](#) [3] lung cancer:

**Biopsy** [4]. A biopsy is the removal of a small amount of tissue for examination under a microscope. In recent years, doctors have learned it is helpful to have a larger tumor sample in order to determine the subtype of NSCLC and to do additional molecular testing (see below). If not enough of the tumor is removed to do these tests, another biopsy may be needed. The sample removed during the biopsy is analyzed by a pathologist. A pathologist is a doctor who specializes in interpreting laboratory tests and evaluating cells, tissues, and organs to diagnose disease. If cancer cells are found, the pathologist will determine if it is small cell lung cancer or NSCLC, based on what it looks like when seen through a microscope.

**Molecular testing of the tumor.** Your doctor may recommend running laboratory tests on a tumor sample to identify specific genes, proteins, and other factors unique to the tumor. There are several genes that may be changed, called mutations, in a lung tumor that can help the cancer grow and spread. These mutations are found in the tumor, and not in normal cells in the body, so they are not inherited or passed down to your children. Mutations that are known to contribute to cancer growth often occur on one or more of several genes, including *EGFR*, *ALK*, *KRAS*

, *BRAF*, and *HER2*. Results from testing for these mutations help decide whether your treatment options include a type of treatment called targeted therapy, which can be directed at specific mutations (see [Treatment Options](#) [5]). Mutations for which targeted therapies exist are much more likely to occur in patients with the adenocarcinoma type of lung cancer and in patients who never smoked.

More procedures that doctors use to collect tissue for the diagnosis and [staging](#) [6] of lung cancer are listed below:

**Sputum cytology.** If lung cancer is suspected, the doctor may ask a person to cough up some phlegm so it can be looked at under a microscope. A pathologist can find cancer cells mixed in with the mucus. However, sputum cytology provides a smaller amount of tissue than is needed to completely diagnose lung cancer and perform molecular testing (see above).

**Bronchoscopy** [7]. In this procedure, the doctor passes a thin, flexible tube with a light on the end into the mouth or nose, down through the main windpipe, and into the breathing passages of the lungs. A surgeon or a pulmonologist may perform this procedure. A pulmonologist is a medical doctor who specializes in the diagnosis and treatment of lung disease. The tube lets the doctor see inside the lungs. Tiny tools inside the tube can take samples of fluid or tissue so the pathologist can examine them. Patients are given mild anesthesia during a bronchoscopy. Anesthesia is medication to block the awareness of pain.

**Needle aspiration/core biopsy.** After numbing the skin, a special type of radiologist, called an interventional radiologist, removes a sample of the lung tumor for testing. This can be done with a smaller needle or a larger needle depending on how large of a sample is needed. The doctor uses the needle to remove a sample of tissue for testing. Often, the radiologist uses a chest CT scan or special x-ray machine called a fluoroscope to guide the needle. In general, a core biopsy provides more tissue than a needle aspiration, which is needed for diagnosis and molecular testing (see above).

**Thoracentesis.** After numbing the skin on the chest, a needle is inserted through the chest wall and into the space between the lung and the wall of the chest where fluid can collect. The fluid is removed and checked for cancer cells by the pathologist.

**Thoracotomy.** This procedure is performed in an operating room, and the patient receives general anesthesia. A surgeon then makes an incision in the chest, examines the lung directly, and takes tissue samples for testing. A thoracotomy is the procedure surgeons most often use to completely remove a lung tumor.

**Thoracoscopy.** Through a small cut in the skin of the chest wall, a surgeon can insert a special instrument and a small video camera to assist in the examination of the inside of the chest. Patients need general anesthesia for this procedure, but recovery time may be shorter with a thoracoscopy because of the smaller incisions that are used. This procedure may be referred to as video-assisted thoracoscopic surgery or VATS.

**Mediastinoscopy.** A surgeon examines and takes a sample of the lymph nodes in the center of the chest underneath the breastbone by making a small incision at the top of the breastbone. This procedure also requires general anesthesia and is done in an operating room.

**Bone marrow aspiration and biopsy [8].** This is a test used occasionally for small cell lung cancer. These two procedures are similar and often done at the same time to examine the bone marrow. Bone marrow has both a solid and a liquid part. A bone marrow aspiration removes a sample of fluid with a needle. A bone marrow biopsy is the removal of a small amount of solid tissue using a needle. The sample(s) are then analyzed by a pathologist. A common site for a bone marrow aspiration and biopsy is the pelvic bone, which is located in the lower back by the hip. The skin in that area is usually numbed with medication beforehand, and other types of anesthesia may be used.

### **Imaging tests**

In addition to biopsies and surgical procedures, imaging scans are very important in the care of people with lung cancer. However, no test is perfect, and no scan can diagnose lung cancer. Only a biopsy can do that. Chest x-ray and scan results must be combined with a person's medical history, a physical examination, blood tests, and information from the biopsy to form a complete story about where the cancer began and whether or where it has spread.

**CT scan [9].** This test produces images that allow doctors to see the size and location of a lung tumor and/or lung cancer metastases. A CT scan creates a three-dimensional picture of the inside of the body with an x-ray machine. A computer then combines these images into a detailed, cross-sectional view that shows any abnormalities or tumors. A CT scan can also be used to measure the tumor's size. Sometimes, a special dye called a contrast medium is given before the scan to provide better detail on the image. This dye can be injected into a patient's vein or given as a pill to swallow.

**Positron emission tomography (PET) scan [10].** A PET scan is a way to create pictures of organs and tissues inside the body. A small amount of a radioactive sugar substance is injected into the patient's body. This sugar substance is taken up by cells that use the most energy. Because cancer tends to use energy actively, it absorbs more of the radioactive substance. A scanner then detects this substance to produce images of the inside of the body.

**Magnetic resonance imaging (MRI) scan [11].** This test also produces images that allow doctors to see the location of a lung tumor and/or lung cancer metastases and measure the tumor's size. An MRI uses magnetic fields, not x-rays, to produce detailed images of the body. A special dye called a contrast medium is given before the scan to create a clearer picture. This dye can be injected into a patient's vein or given as a pill to swallow. MRI scanning does not work well to take pictures of parts of the body that are moving, like your lungs, which move with each breath you take. For that reason, the MRI scan is rarely used to look at the lungs. However, it may be helpful to find lung cancer that has spread to the brain.

Scans are also available that use radioactive molecules, called tracers, injected into the blood to show where cancer is possibly located, such as:

**Bone scan** [12]. A bone scan uses a radioactive tracer to look at the inside of the bones. The tracer is injected into a patient's vein. It collects in areas of the bone and is detected by a special camera. Healthy bone appears gray to the camera, and areas of injury, such as those caused by cancer, appear dark. PET scans (see above) have been replacing bone scans to find lung cancer that has spread to the bones.

After diagnostic tests are done, your doctor will review all of the results with you. If the diagnosis is cancer, these results also help the doctor describe the cancer; this is called staging.

### **Finding out where the cancer started**

Lung cancer starts in the lungs. Many other types of cancer start elsewhere in the body and spread to the lungs when they metastasize. For example, breast cancer that has spread to the lungs is still called breast cancer. Therefore, it is important for doctors to know if the cancer started in the lungs or elsewhere.

To find where the cancer started, your doctor will take into account your symptoms and medical history, physical examination, how the tumor looks on x-rays and scans, and your risk factors for cancer. A pathologist can perform tests on the biopsy sample to help find out where the cancer began, and the doctor may recommend other tests to rule out specific types of cancer. If, after these considerations, the doctor is still not sure where the cancer started, the doctor may give a diagnosis of metastatic cancer of unknown primary. Most treatments for metastatic cancer of unknown primary [13] that are first found in the chest are the same as those for metastatic lung cancer.

### **Stopping smoking**

Even after lung cancer is diagnosed, it is still beneficial to quit cigarette smoking. People who stop smoking have an easier time with all treatments, feel better, live longer, and have a lower risk of developing a second lung cancer or other health problems. Stopping smoking is never easy and even harder when facing the diagnosis of lung cancer. People who smoke should seek help from family, friends, programs for quitting smoking, and health care professionals. None of the products available to quit smoking interfere with cancer treatment. Learn more about stopping tobacco use after a cancer diagnosis [14].

*The next section helps explain the different stages for this type of cancer. Use the menu on the side of your screen to select Stages, or you can select another section, to continue reading this guide.*

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#### **Links:**

- [1] <http://www.cancer.net/cancer-types/lung-cancer/diagnosis>
- [2] <http://www.cancer.net/about-us>
- [3] <http://www.cancer.net/cancer-types/lung-cancer/stages>
- [4] <http://www.cancer.net/node/24406>
- [5] <http://www.cancer.net/node/19155>
- [6] <http://www.cancer.net/node/19154>
- [7] <http://www.cancer.net/node/24511>

[8] <http://www.cancer.net/node/24409>

[9] <http://www.cancer.net/node/24486>

[10] <http://www.cancer.net/node/24648>

[11] <http://www.cancer.net/node/24578>

[12] <http://www.cancer.net/navigating-cancer-care/diagnosing-cancer/tests-and-procedures/bone-scan>

[13] <http://www.cancer.net/node/19687>

[14] <http://www.cancer.net/node/28476>