



## Lung Cancer Screening

### What is lung cancer screening?

Screening examinations are tests performed to find disease before symptoms begin. The goal of screening is to detect disease at its earliest and most treatable stage. In order to be widely accepted and recommended by medical practitioners, a screening program must meet a number of criteria, including reducing the number of deaths from the given disease.



Screening tests may include laboratory tests to check blood and other fluids, genetic tests that look for inherited genetic markers linked to disease, and imaging tests that produce pictures of the inside of the body. These tests are typically available to the general population; however, an individual's needs for a specific screening test are based on factors such as age, gender and family history.

In lung cancer screening, individuals who have a high risk of developing lung cancer but no signs or symptoms of the disease undergo low-dose computed tomography (LDCT) scanning of the chest.

LDCT is a unique CT scan technique that combines special x-ray equipment with sophisticated computers to produce multiple, cross-sectional images or pictures of the inside of the body. LDCT produces images of sufficient quality to detect many abnormalities while using up to 90 percent less ionizing radiation than a conventional chest CT scan.

In the past, two other tests have been used to check for lung cancer: chest x-ray and sputum cytology. A chest x-ray makes images of the heart, lungs, airways, blood vessels and the bones of the spine and chest. X-rays are the oldest and most frequently used form of medical imaging. Sputum cytology is a laboratory test in which a sample of sputum (mucus that is coughed up from the lungs) is viewed under a microscope to check for cancer cells. However, the use of chest x-ray and sputum cytology, individually or in combination, has not resulted in a decreased risk of dying from lung cancer.

### Who should consider lung cancer screening – and why?

## About Lung Cancer

Lung cancer is cancer that forms in tissues of the lung, usually in the cells lining air passages.

Lung cancer is the leading cause of cancer deaths in the United States and worldwide. Approximately 85 percent of lung cancer deaths occur in current or former cigarette smokers.

The most common type is non-small cell lung cancer. The type of cancer diagnosed is based on how the cells look under a microscope.

Lung cancer that is detected early — before spreading to other areas of the body — is more often successfully treated. Unfortunately, when lung cancer is diagnosed, occasionally the disease has already spread outside the lung.

## Risk Factors for Lung Cancer

Anything that increases an individual's chances of developing disease is called a risk factor. Risk factors for lung cancer include:

- tobacco smoking
- exposure to radon, asbestos or other cancer-causing agents
- a personal or family history of lung cancer
- certain chronic lung diseases

## Screening Trials

Before a screening program is widely accepted and recommended by medical practitioners, it must do more than detect disease at an early stage. The accepted measure of screening effectiveness is a reduction in the number of deaths from the given disease.

Clinical screening trials are research studies that help determine to what extent screening methods actually reduce mortality (death rate) and at what cost.

If you would like more information on screening trials using imaging tests to screen for the presence of disease, visit the American College of Radiology Imaging Network (ACRIN). Information on clinical trials studying both cancer screening and treatment methods is also available at the National Cancer Institute.

## National Lung Screening Trial

Current recommendations for lung cancer screening followed publication of a large, randomized clinical trial sponsored by the National Cancer Institute called the National Lung Screening Trial (NLST).

The NLST was performed to determine whether screening low-dose chest CT exams could reduce death rates from lung cancer among those at high risk for the disease. The trial studied more than 53,000 men and women aged 55 to 74 who were current or former heavy smokers at 33 sites across the United States. Each participant was randomly assigned to receive screenings with either low dose CT (LDCT) or standard chest x-ray once per year for three consecutive years. The trial demonstrated 15 to 20 percent fewer lung cancer deaths among the trial participants screened with LDCT.

## New Screening Recommendations

Based on the NLST results and other studies, the National Comprehensive Cancer Network, American Lung Association, American Association for Thoracic Surgery, American Society of Clinical Oncologists, American College of Chest Physicians, American Thoracic Society and the American Cancer Society all now recommend that individuals at high risk for developing lung cancer consider annual screening with LDCT.

The U.S. Preventive Services Task Force (USPSTF) issued a recommendation in favor of annual screening for lung cancer with LDCT in persons at high risk for lung cancer based on age and smoking history. For more information, please visit [www.uspreventiveservicestaskforce.org/uspstf/uspplung.htm](http://www.uspreventiveservicestaskforce.org/uspstf/uspplung.htm). Be sure to check back at [RadiologyInfo.org](http://RadiologyInfo.org) for updates.

The Centers for Medicare & Medicaid Services (CMS) has issued a final national coverage determination that provides for Medicare coverage of Screening for Lung Cancer with Low Dose Computed Tomography (LDCT).

Medicare will now cover lung cancer screening with LDCT once per year for Medicare beneficiaries who meet all of the following criteria:

- they are age 55-77, and are either current smokers or have quit smoking within the last 15 years;
- they have a tobacco smoking history of at least 30 "pack years" (an average of one pack a day for 30 years); and
- they do not have signs or symptoms of lung cancer;
- they receive a written order from a physician or qualified non-physician practitioner that meets certain requirements.

For more information, visit the [CMS.gov](http://CMS.gov) page.

To determine whether you are a candidate for lung cancer screening, you should see your doctor, who will review your medical history and advise you on the benefits, limitations and potential risks of the test. If you qualify, your doctor can enroll you in a lung cancer screening program.

If you have questions about lung cancer screening, it may be helpful to discuss with your doctor and refer to the National Comprehensive Cancer Network (NCCN) guidelines for lung cancer screening.

Individuals who are at least 50 years old and have at least a 20 pack-year history of smoking as well as one other risk factor (except contact with secondhand smoke) are also considered to be at high risk by the NCCN and may also benefit from lung cancer screening with LDCT.

### How to Compute "Pack-Years"

To translate your smoking history into "pack years," simply multiply the number of cigarette packs you have smoked per day by the number of years you have smoked. For example: 1½ packs a day smoked over a 30-year period = 45 pack years.

## How is lung cancer screening performed?

Experts note that a lung cancer screening program should:

- be run by medical professionals and facilities that have expertise in LDCT screening
- include multiple specialties involved in lung cancer care such as pulmonologists, radiologists, interventional radiologists, thoracic surgeons, medical oncologists, primary care doctors and pathologists
- not be a substitute for quitting smoking. Not smoking is the best way to prevent lung cancer.

CT scanning and LDCT work like other x-ray examinations. X-rays are a form of radiation that can be directed through the part of the body being examined. Different body parts absorb the x-rays to varying degrees. See the Safety page for more information about x-rays.

With CT scanning, numerous x-ray beams and a set of electronic x-ray detectors rotate around you, measuring the amount of radiation being absorbed throughout your body. At the same time, the examination table is moving through the scanner, so that the x-ray beam follows a helical (spiral) path. A special computer program processes this large volume of data to create two-dimensional cross-sectional images of your body, which are then displayed on a monitor. This technique is called helical or spiral CT.

No contrast material is needed when LDCT is used for lung cancer screening. To perform the exam, the technologist will position you on the CT exam table, usually lying flat on your back. Straps and pillows may be used to help you maintain the correct position and to help you remain still during the exam. You will usually be asked to raise your arms over your head. Next, the table will move quickly through the scanner to determine the correct starting position for the scans. Then, the table will move slowly through the machine as the actual CT scanning is performed while you hold your breath for the short five to 10 second scan.

## What are the benefits and risks of lung cancer screening?

### Benefits

- Because CT scans are able to detect even very small nodules in the lungs, LDCT of the chest is especially effective for diagnosing lung cancer at its earliest, most treatable stage.
- CT is fast, which is important for patients who have trouble holding their breath.
- CT scanning is painless and noninvasive. No contrast material is required for LDCT.
- No radiation remains in a patient's body after a CT examination.
- X-rays used in LDCT of the chest have no immediate side effects and do not affect any metal parts in your body such as pacemakers or artificial joints.
- Low-dose CT scans of the chest produce images of sufficient image quality to detect many abnormalities using up to 90 percent less ionizing radiation than a conventional chest CT scan.
- Lung cancer screening with LDCT has been proven to reduce the number of deaths from lung cancer in patients at high risk.
- When cancer is found with screening, it is often at an early stage and patients can more often undergo minimally invasive surgery and have less lung tissue removed.

### Risks

- False positive results occur when a test appears to be abnormal but no lung cancer is found.

Abnormal findings may require additional testing to determine whether or not cancer is present. These tests, such as additional CT exams or more invasive tests in which a piece of lung tissue is removed (called a lung biopsy), have risks and may cause a patient anxiety.

- Test results that appear to be normal even when lung cancer is present are called false-negative results. A person who receives a false-negative test result may delay seeking medical care.
- Not all of the cancers detected by LDCT will be found in the early stage of the disease. Screening that detects lung cancer may not improve your health or help you live longer if the disease has already spread beyond the lungs to other areas of the body.
- LDCT lung cancer screening and all other screening exams can lead to the detection and treatment of cancer which may never have harmed you. This can result in unnecessary treatment, complications, and cost.
- Health insurance companies and Medicare will only cover the cost of an LDCT scan to screen for lung cancer in patients who meet certain criteria.
- There is a theoretical small risk of cancer from exposure to low dose radiation. See the Safety page for more information about radiation dose.

## What happens if something is detected on my screening exam?

Lung cancer typically occurs in the form of a lung nodule, an area of abnormal tissue within the lung. The vast majority (greater than 95%) of these nodules do not represent cancer but instead represent areas of scarring in the lung from prior infection or small lymph nodes. If your LDCT scan detects a nodule larger than a certain size, your physician will likely recommend a follow-up LDCT scan several months later to check that the nodule does not change in size. In the event the nodule grows or is suspicious, your doctor may recommend further evaluation with a more advanced imaging study such as a contrast-enhanced CT or and/or removal of a small piece of the nodule (called a lung biopsy). A pathologist can analyze the cells from the biopsy under a microscope to determine whether the nodule is malignant (cancerous) or benign. See the Needle Biopsy of the Lung page for more information.

If the nodule is cancerous, additional blood and imaging tests may be recommended to determine the stage of the tumor. The imaging tests usually include additional computed tomography (CT) scanning of the body and may include a bone scan or a PET/CT scan. The treatment options and expected results of treatment depend on the stage of the tumor. For detailed information regarding treatments see the Lung Cancer Treatment page.

## What is the cost of a LDCT for lung cancer screening?

Each institution sets their price for the exam. You may be required to pay for the exam up front and then submit to your insurance company for possible reimbursement. The prices may vary up to several hundred dollars, so consider calling at least a few places for pricing prior to having your exam performed. Current legislation does not allow for co-pays to be charged to eligible patients seeking to obtain LDCT for lung cancer screening.

## Where can I find more information about lung cancer screening?

You can find more information on lung cancer screening at:

- Lung Cancer Alliance
- National Comprehensive Cancer Network
- American Lung Association
- The American Cancer Society
- The National Cancer Institute

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