All About Small Cell Lung Cancer

What are the lungs?
The lungs are two spongy organs located in the chest. They are responsible for delivering oxygen to the bloodstream. When you take a breath in, air moves into the lungs causing them to expand. The air can then come very close to blood that is traveling in small vessels called capillaries. When you breathe out, you exhale substances that you don't need, like carbon dioxide. The lungs are specially designed to place blood in close contact with as much air as possible, so their tissues are very delicate. The right lung has three sections, which are called lobes; the left lung has two lobes. Air comes in through your mouth and nose and then travels down a tube, called the trachea, to the lungs. The trachea divides into smaller branches called bronchi, and the bronchi keep dividing and dividing like branches on a tree. As the branches get smaller, they are called bronchioles. At the end of the branches, there are little sacs of air called alveoli. The air comes into contact with blood in the alveoli. The lungs are exposed to whatever you breathe in, so any toxic chemicals or pollutants in the air you breathe can get into your body through your lungs.

What is lung cancer?
Lung cancer occurs when cells in the lung begin to grow out of control. These cells can then invade nearby tissues or spread throughout the body. Large collections of cancer cells are called tumors. Cells in any of the tissues in the lung can develop cancer; but most commonly, lung cancer comes from the lining of the bronchi. Lung cancer is not really thought of as a single disease, but rather a collection of several diseases that are characterized by the cell type that makes them up, how they behave, and how they are treated. Lung cancer is divided into two main categories:

- Small cell lung cancer (SCLC) - the rarer of the two types (about 15% of all lung cancers), small cell lung cancer is more aggressive than non-small cell lung cancer because it grows more quickly and is more likely to spread to other organs.
- Non-small cell lung cancer (NSCLC) - the more common of the two types (80-85% of all lung cancers), non-small cell lung cancer is generally slower growing than small cell lung cancer and is divided into different types based on how the cells look that make it up - adenocarcinoma, squamous cell carcinoma, and poorly differentiated or large cell carcinoma.

What causes lung cancer and am I at risk?
It is estimated that there are about 228,150 new cases of lung cancer diagnosed in the United States each year. The average age of diagnosis is 70. Lung cancer is slightly more common in men than women (116,440 men and 111,710 women diagnosed in 2019). Lung cancer is the most common cause of cancer deaths.

Smoking is the greatest risk factor for developing lung cancer. Other causes of lung cancer include exposure to radon, exposure to radiation, environmental exposure to particular chemicals, and previous lung diseases. Each of these risks is discussed in further detail.
Smoking

While there are a few potential causes of lung cancer, by far the most common is smoking tobacco. Every smoker (current or former) is at risk for lung cancer. Your risk of getting lung cancer from cigarette smoking increases the longer you smoke, the more you smoke, and the deeper you inhale. Smoking low tar cigarettes does not prevent you from getting lung cancer. Importantly, if you quit smoking, your risk of getting lung cancer declines. The longer you go without smoking, the greater your risk declines. It is never too late to quit because your risk declines no matter how long you have been smoking.

Patients diagnosed with lung cancer have been found to respond to treatment better and live longer if they quit smoking at the time of their diagnosis. If they continue to smoke they can have more difficulty getting through treatment, being at higher risk of side effects such as pneumonia and lung inflammation. This can result in needing to lower the chemotherapy doses a person receives, resulting in less effective therapy. In addition, giving up smoking decreases the chance of developing another lung cancer after treatment for the current cancer.

Smoking also has an effect on people around you. Second-hand smoke, or smoke inhaled when you are near someone smoking, is another risk factor for lung cancer.

Smoking pipes and cigars is a risk factor for lung cancer as well. Even though you are not inhaling, you are breathing the air that is filled with the smoke from these products. The more pipes or cigars you smoke, the more likely you are to get lung cancer. Although it is not as well established as cigarette smoking, smoking marijuana is also a risk factor for getting lung cancer. Both the magnitude and duration of marijuana use seems to be related to your overall risk.

Radon

Radon is the second leading cause of lung cancer in the United States. Radon is a naturally occurring odorless, colorless, radioactive gas that results from the decay of rock and soil components. Radon moves up from the ground into homes, where it becomes trapped and accumulates, exposing the inhabitants to its cancer-causing potential. Different areas of the world have different amounts of radon produced. The type of foundation in your home is also important, since some foundations are better ventilated. Because of this, two homes next door to each other could have different levels of radon in the indoor air.

Radon can accumulate in new and old homes and those with or without a basement. The only way to know if your home contains radon is to have it tested, which can be done using a kit from a hardware store or having a radon professional perform the test. Many areas have laws requiring radon testing before a house is sold. If radon is detected in levels above 4 pCi/L (picocuries per liter), you can have a removal system installed, which vents the gas to the outside using a pipe and fan system.

Radiation Exposure

The use of radiation therapy to treat a prior cancer that includes lung tissue in the treatment field increases the risk for developing a new cancer in that area of the lung. Such secondary cancers often take a decade or longer to develop. This can be seen in people treated for Hodgkin’s lymphoma and breast cancer, among others. Some guidelines suggest that Hodgkin’s lymphoma survivors have screening for lung cancers after treatment. Modern radiation equipment and planning reduce the exposure of healthy tissue and may reduce this risk.

Other Risk Factors

Although smoking cigarettes is by far the most common and important risk factor for getting lung cancer, there are some environmental exposures that increase your risk for lung cancer as well. People who work with asbestos are more likely to get lung cancer; and if they smoke cigarettes too, their risk is even higher. Asbestos is found in industries like shipbuilding, insulation/fireproofing, and asbestos mining and production. Other workers who may have a higher risk of lung cancer are those exposed to arsenic, chromium, nickel, vinyl chloride, hard metal dusts, talc, uranium, and gasoline and diesel exhaust fumes.

Electronic nicotine delivery systems (e-cigarettes) and hookah use are becoming more popular amongst younger adults. At this time, there is no conclusive research stating that the use of e-cigarettes can cause lung cancer. However, the tiny particles in the aerosol of e-cigarettes can contain toxic chemicals that can penetrate into the lungs. Hookah use, and being exposed to hookah smoke, can cause serious health risks, including lung cancer. The tobacco used in a hookah is exposed to high heat from burning charcoal which is at least as toxic as cigarette smoke. The tobacco and toxic agents used in the hookah can be risk factors for lung cancer.
People who have already had lung cancer are at risk for getting it again. A history of interstitial lung disease, pulmonary fibrosis or tuberculosis (TB) also increases your risk of getting lung cancer. Changes in your genes, both from the environment and some inherited from your parents can also increase your risk of lung cancer.

**Lung Cancer in Never Smokers**

The number of cases of lung cancer in never smokers (people who have smoked less than 100 cigarettes in their lifetime) has been increasing in many countries, including the United States. Worldwide, never smokers make up 15-20% of new lung cancer cases in men, but 50% of new cases in women. Primarily, these are non-small cell lung cancers, as small cell lung cancer occurs almost exclusively in current or former smokers. This makes researchers think that lung cancer in never smokers may be a biologically different disease than in smokers.

The cause of these cancers is not clear, though the risk factors discussed above are all possibilities. Researchers are studying how these cancers may respond differently to targeted therapies aimed at specific molecular abnormalities and how smoking status could be used in treatment planning.

**How can I prevent lung cancer?**

The best way to prevent lung cancer is not to smoke or to quit if you already smoke. Avoid being around people who are smoking and do not use pipes, cigars, hookahs, and marijuana. Have your home tested for radon and install a removal system if needed. If you work in an industry where you are exposed to substances known to cause lung cancer, make sure to use all the proper protective equipment and attire made available by your employer.

The future of lung cancer prevention will rely on sophisticated analysis of patients' genes and molecular markers for lung cancer risk; this coupled with "smart drug" design and novel imaging techniques may one day help decrease the risk of developing lung cancer.

**What screening tests are available?**

Lung cancer screening is not suggested for those at average risk of lung cancer. The American Cancer Society has criteria that a person should meet to be screened annually with a low-dose CT scan. If you meet these conditions you should speak to your provider about having a low-dose CT scan of your chest:

- People between the ages of 55 to 74 who are in fairly good health, and
- Currently are a smoker or have quit within the past 15 years, and
- Have at least a 30-pack-year smoking history, and
- Receive smoking cessation counseling if they are current smokers, and
- Have been involved in informed/shared decision making about the benefits, limitations, and harms of screening with LDCT scans, and
- Have access to high-volume, high quality lung cancer screening and treatment center.

**What are the signs of lung cancer?**

Unfortunately, the early stages of lung cancer may not have any symptoms. As the tumor grows in size, it can produce a variety of symptoms including:

- Cough (especially one that doesn't go away or gets worse in character).
- Chest pain.
- Shortness of breath.
- Coughing up blood or bloody phlegm.
- New hoarseness, wheezing or changes in how your voice sounds.
- Recurrent problems with pneumonia or bronchitis.
- Weight loss.
- Loss of appetite.
Many of these symptoms are non-specific, and could represent a variety of different conditions. You should see your healthcare provider if you are experiencing any of these symptoms. Most patients (approximately 85%) who are diagnosed with lung cancer have symptoms that prompt a healthcare provider to order tests to look for a problem. A cough is the most common presenting symptom of lung cancer; however, many long-term smokers have a chronic cough, so it is especially important for someone with a chronic cough to see their healthcare provider if their cough changes in character or severity.

How is lung cancer diagnosed?

When someone has symptoms suggestive of a lung tumor, they will typically be referred for blood work and a chest x-ray and/or CT scan (a 3-D x-ray) of the chest. Your provider may order sputum cytology, which means examining your phlegm for cancer cells. To see if the lung cancer has spread outside of the chest (metastasis), you may have a CT scan of the abdomen and/or a PET-CT scan. To see if the lung cancer has spread specifically to the brain, you may have an MRI or CT scan of the brain.

While all of these tests are important pieces of the puzzle, a biopsy is the only way to know for sure if you have cancer. A biopsy takes a sample of the suspicious area, which is then examined under a microscope for the presence of cancer cells. In addition, the biopsy is necessary to determine the type of lung cancer and if there are cancer cells present in the lymph nodes.

A biopsy may be taken of the suspicious area in the lung and/or from lymph nodes near the lungs. Your doctor will determine which areas should be biopsied and which biopsy method is best in your case. Biopsies are often done by a lung surgeon or a pulmonologist (a doctor specializing in lung diseases), who is trained in bronchoscopy. Possible methods for obtaining a biopsy include:

- Bronchoscopy: uses a thin, lighted tube placed down your nose or mouth and into your lung to look at the tumor and take samples of it. This can also be used to take samples of the lymph nodes. There are several bronchoscopy techniques that can be used. Your healthcare provider will determine which methods are best in your case based on the location of the lesion and if lymph nodes are being sampled.
- Needle biopsy: a needle is placed through the skin and between the ribs, and then into the tumor to get cells.
- Thoracoscopy: A surgical procedure where the surgeon inserts a small camera into the chest wall to look at the suspicious area, evaluate the extent of the tumor and take biopsies.
- Video-assisted thoracoscopy or VATS: can be used for a biopsy or surgery in early stage lung cancer; this technique is similar to thoracoscopy but requires fewer/smaller incisions, which may result in quicker recovery.
- Mediastinoscopy: A surgical procedure that uses a scope (camera on a tube), placed through the chest wall, to look at the suspicious area and take samples of lymph nodes to evaluate for the presence of cancer cells.

In some cases, tumors cells can get into the fluid around your lungs (called pleural fluid), and your healthcare provider may want to drain off some fluid by putting a needle into the space where the fluid has collected and examine that fluid under a microscope. This is called a thoracentesis.

Once the tissue is removed, a healthcare provider called a pathologist examines the specimen under a microscope. The pathologist determines if it is cancer or not; and if it is cancerous, they will characterize it by what type of tissue it arose from, what subtype of lung cancer it is, how abnormal it looks (known as the grade), and whether or not it is invading surrounding tissues. The pathologist sends a pathology report to your healthcare provider, detailing his/her findings, which is an important piece in planning your treatment. You can request a copy of your report for your records.

How is lung cancer staged?

In order to guide treatment and offer some insight into prognosis, lung cancer is staged. Healthcare providers use the TNM system (also called tumor - node - metastasis system). This system describes the size and local spread of the tumor (T), if any
lymph nodes are involved (N), and if it has spread to other more distant areas of the body (M). The TNM is then converted to a stage, between 0 and IV (four), with higher numbers denoting more advanced disease.

Part of your workup is done to look for spread of the tumor (metastasis) and will probably include CT scans of the liver and adrenal glands (located above the kidneys), a CT scan or MRI (a scan that uses magnets instead of radiation) of your brain, and a PET scan. If you are having particular symptoms, your provider may want different or more specific exams to determine their cause. Stage IIIB and stage IV small cell lung cancers are generally considered inoperable, so it is very important to know if the cancer has spread to these more distant lymph nodes on the opposite side of the chest as the tumor or by the collarbone. Often times, your doctor will order tests called PFT's (pulmonary function tests) to assess your lung capacity prior to considering surgery, radiation therapy, and some types of chemotherapy. Overall, your providers will want to know as much about your cancer and your health as possible so that they can plan the best available treatments.

Clinical staging is done based on the size and location of the tumor on CT scans and PET scans, and if there is any evidence of spread to other organs that is picked up with radiology tests. The stage of the cancer affects how it is treated.

Small cell lung cancer is grouped into two stages for the purposes of treatment decisions:

- **Limited-stage**: stage I-II (T any, any N, M0) that can be safely treated with radiation therapy. Excludes T3-4 due to multiple lung nodules that are too extensive or have a size/area that is too large to be encompassed in a tolerable radiation plan.
- **Extensive-stage**: Stage IV (T any, N any, M1 a/b) or T3-4 due to multiple lung nodules that are too extensive or have a size/area that is too large to be encompassed in a tolerable radiation plan.

The complete TNM staging system is very complex, and the entire staging system is outlined at the end of this article. Though complicated, the staging system helps healthcare providers determine the extent of the cancer, and in turn, make treatment decisions for a patient's cancer. The stage of cancer, or extent of disease, is based on information gathered through the various tests done as the diagnosis and work-up of the cancer is being performed.

**What are the treatments for small cell lung cancer?**

**Surgery**

Most patients with this disease have lymph node involvement or distant metastases at the time of diagnosis. Surgery is a "local" treatment, meaning it only treats the area removed during the surgery. When cancer cells have already spread to areas outside of the lung, it is necessary to treat with a "systemic" therapy, in other words, one that can reach all areas of the body, such as chemotherapy.

The one exception to this is very early stage SCLC, where there is no cancer found in lymph nodes. In these rare cases, surgery to remove the lobe of the lung containing the tumor, combined with other therapies like chemotherapy, is the preferred treatment for patients who can tolerate the surgical procedure.

**Treatment for Limited Stage (LS-SCLC) Disease**

SCLC is very sensitive to the effects of chemotherapy. The majority of patients treated with chemotherapy will have a good response to initial treatment. Chemotherapy for limited stage disease is often combined with radiation therapy. This combination has been shown to improve survival over chemotherapy alone. Unfortunately, most patients will ultimately develop resistance to chemotherapy and experience disease progression.

The timing and number of cycles of chemotherapy you receive will be determined by your healthcare team. Chemotherapies that may be used include: cisplatin, etoposide and carboplatin. Chemotherapy can be given in combination with radiation therapy, which can be given once daily or twice (also called hyperfractionated) daily. If given once a day, radiation therapy is typically administered over 6 to 8 weeks, and if given twice daily, is administered over 3 weeks. Radiation therapy is preferably given during the same time period as chemotherapy is being given, and it is optimally started as early after diagnosis as is feasible. However, in some cases, it may be preferable to give the radiation therapy after the chemotherapy is completed.

**Treatment for Extensive Stage (ES-SCLC) Disease**
As with limited stage disease, extensive stage SCLC is very sensitive to the effects of chemotherapy and the majority of patients treated with chemotherapy will have a good response to initial treatment. Unfortunately, most patients will ultimately develop resistance to chemotherapy and experience disease progression.

The timing and number of cycles you receive will be determined by your healthcare team. Some patients may benefit from receiving radiation therapy to the chest, which is given after completing chemotherapy. The chemotherapies used include: carboplatin, etoposide, cisplatin and irinotecan.

**Immunotherapy**

Immunotherapy medications work with the immune system to kill cancer cells. Nivolumab is used to treat advanced SCLC that is no longer responding to other treatments such as chemotherapy. Atezolizumab can be used as a first line of treatment along with chemotherapy.

**Prophylactic Cranial Irradiation (PCI)**

In both limited and extensive stage SCLC, some patients may be offered treatment with "PCI" or prophylactic cranial irradiation. SCLC tends to spread to the brain, despite treatment with chemotherapy. Studies have found that patients treated with radiation therapy to the whole brain after completing chemotherapy have lower rates of brain metastases and improved survival rates. Patients who have had the cancer spread to the brain can also benefit from radiation therapy to the brain, with improved survival and quality of life.

**Palliative Treatment**

Often, SCLC has spread to other parts of the body by the time it is diagnosed. There are many options for palliative treatments for these areas of metastasis such as chemotherapy, radiation, surgery, stent placement, laser therapies and removal of extra fluid from around the heart or lungs. Speak to your provider about your options for palliative treatment.

**Clinical Trials**

Clinical trials are extremely important in furthering our knowledge of this disease. It is through clinical trials that we know what we do today, and many exciting new therapies are currently being tested. Talk to your healthcare provider about participating in clinical trials in your area. You can also explore currently open clinical trials using the OncoLink Clinical Trials Matching Service.

**Follow-up Care and Survivorship**

Once you have been treated for lung cancer, you will need to be closely followed by your oncology team. During and shortly after treatment, you will be followed closely by your provider. How often you need to follow up will depend on the extent of your disease and your treatment plan. Often you will need a physical examination every 3-4 months for the first few years, every six months during years 3-5, and then annually. Your healthcare providers will order chest imaging and bloodwork as indicated. If any new pulmonary nodules appear, your healthcare provider should initiate a workup for a new primary cancer. Routine PET/CT is not recommended for follow-up care.

Quitting smoking is important in lung cancer survivorship. Remember, it is never too late to get the health benefits of smoking cessation. If your family members smoke, it is a great opportunity to support each other and quit together. There are many programs to provide support in quitting as well as medications to support your efforts as well. Talk with your provider about these resources.

Fear of recurrence, relationships challenges, financial impact of cancer treatment, employment issues and coping strategies are common emotional and practical issues experienced by lung cancer survivors. Your healthcare team can identify resources for support and management of these practical and emotional challenges faced during and after cancer.

Cancer survivorship is a relatively new focus of oncology care. With some 15 million cancer survivors in the US alone, there is a need to help patients transition from active treatment to survivorship. What happens next, how do you get back to normal, what should you know and do to live healthy going forward? A survivorship care plan can be a first step in educating yourself about navigating life after cancer and helping you communicate knowledgeably with your healthcare providers. Create a
survivorship care plan today on OncoLink.

**Resources for More Information**

**Lung Cancer Alliance**

Provides support and advocacy for people living with lung cancer or at risk for the disease.

[www.lungcanceralliance.org](http://www.lungcanceralliance.org)

**Lungevity**

Dedicated to changing outcomes for people with lung cancer through research, education, and support.

[lungevity.org](http://lungevity.org)

**American Lung Association**

Information on diagnosis, treatment and support.


**Free to Breathe**

Funds research and advocates for improved treatments. Provides patients with treatment information.

[www.freetobreathe.org](http://www.freetobreathe.org)

**Lungcancer.org**

Professional oncology social workers provide free emotional and practical support for people with lung cancer, caregivers, and their loved ones; affiliated with CancerCare.

[www.lungcancer.org](http://www.lungcancer.org)

---

**Appendix: Complete Small Cell Lung Cancer Staging**

**American Joint Committee on Cancer 8th Edition, 2017**

<table>
<thead>
<tr>
<th>Primary Tumor (T)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX</td>
<td>Primary tumor cannot be assessed, or tumor proven by the presence of malignant cells in sputum or bronchial washing but not visualized by imaging or bronchoscopy</td>
</tr>
<tr>
<td>T0</td>
<td>No evidence of primary tumor</td>
</tr>
</tbody>
</table>
| T1s               | Carcinoma in situ  
Squamous cell carcinoma in situ (SCIS)  
Adenocarcinoma in situ (AIS): adenocarcinoma with pure lepidic pattern, ≤3cm in greatest dimension |
| T1                | Tumor: 3 cm ingreatest dimension, surrounded by lung or visceral pleura, without bronchoscopic evidence of invasion more proximal than the lobar bronchus (i.e., not in the main bronchus) |
| T1mi              | Minimally invasive carcinoma: adenocarcinoma (≤3 cm in greatest dimension) with a predominantly lepidic pattern and ≤5 mm invasion in greatest dimension |
### Regional Lymph Nodes (N)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NX: Regional lymph nodes cannot be assessed</td>
</tr>
<tr>
<td>N0: No regional lymph node metastasis</td>
</tr>
<tr>
<td>N1: Metastasis to ipsilateral peribronchial and/or ipsilateral hilar lymph nodes, and intrapulmonary nodes including involvement by direct extension</td>
</tr>
<tr>
<td>N2: Metastasis in ipsilateral mediastinal and/or subcarinal lymph node(s)</td>
</tr>
<tr>
<td>N3: Metastasis in contralateral mediastinal, contralateral hilar, ipsilateral or contralateral scalene, or supraclavicular lymph node(s)</td>
</tr>
</tbody>
</table>

### Distant Metastasis (M)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MX: Distant metastasis cannot be assessed</td>
</tr>
<tr>
<td>M0: No distant metastasis</td>
</tr>
<tr>
<td>M1: Distant metastasis</td>
</tr>
<tr>
<td>M1a: Separate tumor nodule(s) in a contralateral lobe; tumor with pleural nodules or malignant pleural or pericardial effusion</td>
</tr>
<tr>
<td>M1b: Single extrathoracic metastasis in a single organ and involvement of a single distant node</td>
</tr>
<tr>
<td>M1c: Multiple extrathoracic metastases in one or several organs</td>
</tr>
</tbody>
</table>

### Stage

<table>
<thead>
<tr>
<th>T</th>
<th>N</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occult Carcinoma</td>
<td>TX</td>
<td>N0</td>
</tr>
<tr>
<td>Stage 0</td>
<td>Tis</td>
<td>N0</td>
</tr>
<tr>
<td>Stage</td>
<td>T1</td>
<td>N1</td>
</tr>
<tr>
<td>-------</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Stage IAI</td>
<td>T1mi</td>
<td>N0</td>
</tr>
<tr>
<td>Stage IA2</td>
<td>T1a</td>
<td>N0</td>
</tr>
<tr>
<td>Stage IA3</td>
<td>T1b</td>
<td>N0</td>
</tr>
<tr>
<td>Stage IB</td>
<td>T1c</td>
<td>N0</td>
</tr>
<tr>
<td>Stage IIA</td>
<td>T2a</td>
<td>N0</td>
</tr>
<tr>
<td>Stage IIB</td>
<td>T2b</td>
<td>N0</td>
</tr>
<tr>
<td>Stage IIIA</td>
<td>T3a</td>
<td>N1</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td>T3b</td>
<td>N1</td>
</tr>
<tr>
<td>Stage IVA</td>
<td>T4a</td>
<td>N2</td>
</tr>
<tr>
<td>Stage IVB</td>
<td>T4b</td>
<td>N2</td>
</tr>
</tbody>
</table>

OncoLink is designed for educational purposes only and is not engaged in rendering medical advice or professional services. The information provided through OncoLink should not be used for diagnosing or treating a health problem or a disease. It is not a substitute for professional care. If you have or suspect you may have a health problem or have questions or concerns about the medication that you have been prescribed, you should consult your health care provider.