► LUNG CANCER ◄

The lungs – a pair of cone-shaped organs made up of spongy, pinkish-gray tissue – are part of the respiratory system. They take in oxygen, which body cells need to live and carry out their normal functions, and they rid the body of carbon dioxide, a waste product of the cells.

The right lung has three sections, called lobes, and is a little larger than the left lung, which has two lobes.

What is lung cancer?

Normally, lung cells divide to produce more cells only when the body needs them. Lung cancer occurs when cells divide and form more cells uncontrollably, creating a mass of tissue called a tumor.

Malignant tumors are cancers, which can invade and damage nearby lymph nodes, tissues and organs. Cancer cells can also break away from a malignant tumor and enter the bloodstream, spreading to other parts of the body where they can form new tumors. Build up of fluid around involved lung, or plural effusion, could be an indicator of lung cancer.

It is also possible to have a non-cancerous (benign) tumor in the lung which rarely poses a threat to life. Despite that such lesions still may need to be removed to make sure that no malignancy is present in that area.

What causes lung cancer?

Lung cancer is caused by cigarette smoking in 90 percent of cases. Tobacco smoke contains many carcinogens, substances that damage lung cells; over time, these damaged cells can become cancerous. The more people smoke, the higher their risk of developing lung cancer.

As soon as smokers quit, the risk of developing lung cancer begins decreasing slowly. The earlier smokers quit, the more their risk of developing lung cancer approaches that of a person who never smoked.

Exposure to other people's tobacco smoke, whether at home or in the workplace, increases the risk of developing lung cancer among nonsmokers. This is commonly referred to as second hand smoke.

Exposure in the workplace to certain carcinogens, such as asbestos, also increases the risk of developing lung cancer. The risk is especially high for workers who smoke. People should carefully follow work and safety rules to reduce their exposure to workplace carcinogens.

Also at increased risk for developing lung cancer are workers, especially those who smoke, exposed to high levels of the radioactive gas, radon, in some underground mines.

What are the types of lung cancer?

Nearly all lung cancers are carcinomas – cancers that begin in the lining or glandular tissues of an organ.

Lung cancers are generally divided into two major groups: nonsmall cell lung cancer and small cell lung cancer. The tumor cells of each

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type of lung cancer grow and spread differently and each type needs different treatment.

Nonsmall cell lung cancer is the more common of the two groups. The three main types of nonsmall cell lung cancer are named for the type of cells in the tumor:

- Squamous cell carcinoma, also called epidermoid carcinoma, is the most common type of lung cancer in the United States and many other countries. This disease often begins in the bronchi, or large air tubes leading to the lungs. It usually spreads less quickly than other types of lung cancer.
- Adenocarcinoma usually begins along the outer edges of the lungs and under the lining of the bronchi. This is the most common type of lung cancer in women and in people who have never smoked. The incidence of adenocarcinomas is on the rise.
- Large cell carcinomas, which usually begin along the outer edges of the lungs, are a group of cancers with large, abnormal-looking cells.

Small cell lung cancer grows rapidly and spreads quickly to other organs. This type of lung cancer accounts for 10 percent to 20 percent of all lung cancers.

What are the symptoms of lung cancer?

At first, lung cancer usually doesn't cause symptoms. Doctors sometimes discover it in people without symptoms after a chest X-ray for another medical reason. Usually, however, lung cancer is found after the growing tumor causes symptoms to appear.

A cough, which is the most common symptom of lung cancer, is likely to occur when a tumor irritates the lining of the airways or blocks the passage of air. The person may have a "smoker's cough" that worsens.

Another symptom is constant chest pain. Others may include shortness of breath, wheezing, repeated bouts of pneumonia or bronchitis, coughing up blood or hoarseness.

A tumor that presses on large blood vessels near the lung can cause swelling of the neck and face. If the tumor presses on certain nerves near the lung, it can cause pain and weakness in the shoulder, arm or hand. Problems with vision could be an indirect sign of nerve involvement as well.

In addition, there may be symptoms that don't seem to be related to the lungs. Like all cancers, lung cancer can cause fatigue, loss of appetite and loss of weight. If the disease spreads elsewhere, it may cause headache, pain or bone fractures.

Other symptoms result from substances the lung cancer cells make. For example, certain lung cancer cells produce a substance that sharply reduces the level of sodium (a component of salt) in the blood. This can cause many symptoms, including confusion and sometimes even coma.

None of these, however, is a sure sign of lung cancer. Only a physician can tell whether a patient's symptoms are caused by cancer or another problem.

How is lung cancer diagnosed?

To find the cause of any of these symptoms, the doctor asks about the patient's personal and family medical background, as well as smoking and work history.

The physician also performs a physical examination and usually orders chest X-rays and other tests.

In addition, the doctor may order a computerized tomography (CT) scan, which is a series of X-ray images put together by a computer. These detailed pictures can reveal a tumor in the lung, but they cannot show whether the tumor is benign or malignant.

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The only sure way to know whether cancer is present is to obtain cells from the lungs for examination under the microscope. Sometimes, cancer cells are in the sputum, a thick fluid that the patient coughs up from deep in the airways. Also, the doctor usually does a biopsy to remove a sample of cells from the lung.

To perform a biopsy, physicians use one of the following procedures:

- **Bronchoscopy** – this permits the physician to look into the breathing passages through a bronchoscope, which is a thin, flexible, lighted tube inserted through the nose or mouth under local or general anesthesia. The doctor can brush or wash cells from the walls of bronchi or snip off small pieces of tissue for study under the microscope. Depending on the location of the tumor, transbroncheal biopsy of the tumor may be performed.
- **Percutaneous Needle biopsy** – removal of tissue hard to reach with the bronchoscope. With the patient under a local anesthetic and using CT or X-ray fluoroscopy guidance, the doctor inserts a needle through the chest wall into the tumor to withdraw a small sample of tissue.
- **Thoracentesis** – an examination of fluid from the pleura (the fluid-filled sac surrounding the lungs). With the patient under local anesthesia, the physician uses a needle to remove a fluid sample and to have it checked for cancer cells.
- **Mediastinoscopy** – Permits surgeons to sample lymph nodes that drain the lungs and may be the first defense barrier to a tumor spread. It allows for better staging of lung cancer thus influencing treatment. Done under general anesthesia, mediastinoscopy does not require overnight stay.
- **Video-Assisted Thoracic Surgery (VATS)** – a minimally invasive procedure involving the introduction into the chest of a video camera that transmits a picture to a video monitor. This allows surgeons to see structures within the chest so they can remove tissue samples to have them checked for cancer. This procedure requires general anesthesia. Removal of certain lesions with this technique is a possibility as well.
- **Thoracotomy** – the surgical opening of the chest that requires general anesthesia, used for some patients who require surgery for diagnosis or for treatment.

If the physician feels an enlarged liver or swollen lymph nodes (small bean-shaped structures that store special cells to trap cancer cells or bacteria traveling through the body), these areas may also be biopsied. The doctor may also biopsy other areas of the body where cancer is suspected.

What is staging and how is it performed?

If lung cancer is diagnosed, physicians need to learn the stage, or extent, to which the disease has progressed so they can give appropriate treatment.

Staging is a careful attempt to find out whether the cancer has spread and, if so, to what other parts of the body.

To learn whether a patient's lung cancer has spread to the lymph nodes in the chest, physicians remove a sample of tissue either with a needle or surgically.

Surgery to biopsy lymph nodes in the chest can often be done through a small incision near the breastbone. If a thoracoscopy or a thoracotomy is planned, physicians will remove lymph nodes at that time. Patients receive general anesthesia for these operations.

Doctors may order CT scans to detect the spread of lung cancer to the lymph nodes and other parts of the body, including the brain, liver and other abdominal organs.

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Radionuclide scans of the bones may also help determine whether the cancer has spread. For these procedures, a small amount of a radioactive substance is injected into a vein, after which a machine scans the body to reveal abnormal areas.

Radiolabeled monoclonal antibodies against lung cancer could also be used to detect the spread of the disease.

In another technique, called magnetic resonance imaging, a strong magnet linked to a computer produces images that indicate whether lung cancer has spread to the brain or spinal cord.

What are the main methods of treating lung cancer?

The earlier cancer is detected, the more successful treatment is likely to be.

Physicians develop a treatment plan comprising surgery, radiation therapy, chemotherapy, or a combination of the three, and tailor it to each patient's needs.

The type of plan depends on many factors, including the type of lung cancer, the size and location of the tumor and the stage of the disease. Other factors to consider are the patient's age, medical history and general health.

Patients may have just one form of treatment or a combination, depending on their needs; several specialists may work as a team to provide treatment.

- **Surgery**
  Surgery is performed for early-stage lung cancers when it's likely that all of the tumor can be removed. Three main types of surgery are used to treat lung cancer. The choice depends on the size, location and extent of the tumor; the general health of the patient, and other factors.
  - An operation to remove only a small part of the lung is called a segmental or wedge resection.
  - A lobectomy is the procedure in which the surgeon removes an entire lobe of the lung.
  - Pneumonectomy is the removal of an entire lung.
- **Radiation therapy**
  Radiation therapy, like surgery, is a local treatment that kills the cancer in the treated area and is usually given five days a week for several weeks at the hospital on an outpatient basis.
- **Chemotherapy**
  Chemotherapy is the systemic treatment with medications that kill cancer cells. This means that the medications flow through the bloodstream to nearly every part of the body. Most anticancer medications are injected into a blood vessel or a muscle; some are given by mouth. Chemotherapy is most often given in cycles – a treatment period alternating with a "rest" period.

  Usually, patients have chemotherapy as outpatients: at the hospital, at the physician's office or at home. Sometimes, depending on which medications the physician orders, patients may need to stay in the hospital a few days to be monitored for side effects.

  Because of the proven association of cigarette smoking with the development of lung cancer, the best form of treatment is prevention. If you don't smoke or stop smoking, your chances of getting lung cancer are greatly reduced.

Do I need a second opinion?

Treatment decisions for lung cancer are complex. Before starting treatment, patients might want another doctor to review the diagnosis and the treatment plan. Here are ways to find another doctor to give a second opinion:

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- Patients can call Thomas Jefferson University Hospital's free physician referral service at 1-800-JEFF-NOW.
- The patient's doctor may be able to suggest a specialist. Specialists who treat lung cancer include thoracic (chest) surgeons, radiation oncologists and medical oncologists.
- Patients can obtain the names of physicians from their local medical society, a nearby hospital or a medical school.

How is nonsmall cell lung cancer treated?

Patients with nonsmall cell lung cancer may be treated in several ways. The choice of treatment depends mainly on the stage of the disease.

Surgery is the usual treatment for patients whose cancer is in only one lung or in one lung and the closest lymph nodes. New studies are designed to assess whether additional forms of systemic therapy before or after surgery can prevent further recurrences of the cancer.

Patients who can't have surgery because of other medical problems often receive radiation therapy. Radiation therapy is also the usual treatment for patients whose cancer has spread within the chest to more distant lymph nodes or other tissues.

It has recently been shown that chemotherapy enhances the effects of radiation therapy and is now used with radiation in most instances. Some patients have both surgery and radiation therapy.

Chemotherapy is used to treat patients whose cancer has spread from the lung to other parts of the body. Radiation therapy is used to control specific symptoms caused by the spread of cancer to specific parts of the body. Although it's very difficult to control lung cancer that has spread, treatment can often shrink the tumors. This can help relieve pain and other symptoms.

How is small cell lung cancer treated?

Small cell lung cancer may spread quickly. To be sure that treatment affects all cancer cells in the body, chemotherapy is used for virtually all patients, even when the disease appears to be limited to the lung and nearby lymph nodes. Usually, chemotherapy for small cell lung cancer includes a combination of two or more anticancer drugs.

When the disease appears clinically limited to the lung, treatment also includes radiation therapy. Radiation therapy is also used to treat the brain, even without evidence of cancer, to prevent tumors from forming there; this treatment is reserved for patients whose lung tumor has responded well to treatment.

Surgery combined with chemotherapy can also be part of the treatment plan for small cell lung cancer, but only for a small number of patients.

Because of the proven association of cigarette smoking with the development of lung cancer, the best form of treatment is prevention. If people do not smoke or stop smoking, their chances of getting lung cancer are greatly reduced.

What hope does research hold for patients with lung cancer?

Scientists are continuing to identify factors that increase the risk for lung cancer. Recent research has shown that genetic factors play an important role in this disease. For example, certain genetic traits make some people very sensitive to cancer-causing agents. Smokers with these traits may be more likely than other smokers to develop lung cancer.

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Researchers are also studying ways to help people lower their risk of lung cancer by using natural and laboratory-made substances to prevent or delay cancer. Vitamin A and similar substances may offer some protection against lung cancer; additional compounds are also under study. Because some vitamins can be dangerous if taken in large doses, it's best to get a doctor's advice before taking vitamins or other nutrients. Furthermore, investigators are involved in a large study to determine whether a special form of Vitamin A can decrease the risk of developing a second cancer.

The earlier cancer is detected, the more successful treatment is likely to be. Since lung cancer is difficult to diagnose early, scientists are studying ways to check, or screen, for lung cancer in people without symptoms.

Because lung cancer is also difficult to control, researchers seek more effective treatments, plus ways to reduce the side effects of treatment and improve the quality of patients' lives.

Trials of new treatments are under way for patients with all stages of lung cancer. Some trials involve treatments to shrink or destroy the primary tumor. Others test ways to prevent lung cancer from recurring in the chest or spreading to other parts of the body after the primary tumor has been treated. Still others involve treatments to slow or stop the spread of lung cancer.

Also under study are the timing of treatments and new ways to combine various types of treatment, as well as new anticancer drugs and drug combinations, new forms of radiation therapy and drugs that make cancer cells more sensitive to radiation.

Another method being studied is photodynamic therapy. In this treatment, cancer cells are destroyed with a combination of laser light and light-sensitive drugs. Other types of laser therapy are being investigated to open the airways in patients whose tumors block the bronchi. Some researchers are also working with biological therapy to help the body's immune system fight cancer more effectively or to protect the body from some of the side effects of treatment.

What are clinical trials?

When laboratory research shows that a new treatment method has promise, patients with cancer have the opportunity to receive the treatment in clinical trials or protocols.

By participating in a clinical trial you may have the first chance to benefit from improved treatment methods and the opportunity to make an important contribution to medical science.

To find out more about current clinical trials that you may be able to participate in, ask your doctor or call 215-955-1661 or 1-800-JEFF-NOW.

*For an appointment with a Jefferson physician, more information or health information and education programs, please call **1-800-JEFF-NOW** (1-800-533-3669) or visit our Web site at **www.JeffersonHospital.org***

Jefferson also offers a number of cancer support and education programs as well as a Buddy Program in which survivors of cancer provide support and encouragement to patients who are newly diagnosed and an active cancer advocacy group. You'll find information on the Jefferson Web site about these programs or by calling 1-800-JEFF-NOW.

Speech- or hearing-impaired callers can access JEFF NOW® by calling 1-800-654-5984.