LUNG CANCER

INTRODUCTION

Lung cancer is the second-most common cancer in men and women in the United States. Each year approximately 200,000 new cases of lung cancer are diagnosed and approximately 150,000 people who have lung cancer will die. Although the mortality rates for lung cancer have declined in recent years, this is still a very serious disease. Each year more people die from lung cancer than from breast cancer, colon cancer, and prostate cancer combined. Lung cancer affects men more than women. The incidence of lung cancer in white and African American women is essentially the same, but African American men are much more likely than white men to develop the disease, even after smoking patterns are taken into account. Lung cancer primarily affects people over the age of 40.

Although there are different types of lung cancer, the majority of cases (about 85%) are a type called non-small cell lung cancer: for the remainder of the module the term lung cancer will be used to refer to all cancers of the lungs. The number one cause of lung cancer is cigarette smoking, and the risk of developing lung cancer is directly associated with how much and long someone has smoked. Smoking rates in the United States are decreasing and in 2014 percentage of adults in the county who smoke reached an all-time low of 17.8%. This in part explains why mortality rates for lung cancer have been decreasing, but this good news is tempered by the fact that the prognosis for patients who
have lung cancer is very poor. Five years after diagnosis only 15% of all patients who have lung cancer will be alive.

**Learning Break:** The five-year survival rate is a term that is commonly used when discussing cancer. The five-year survival rate indicates the percentage of people who have a specific cancer who will be alive five years, measured from the time the cancer was diagnosed. Example: Five years after lung cancer has been diagnosed only 15 out of 100 patients will be alive. This assumes that the patient has been treated, and it does not mean that the cancer will never come back. The five-year survival rate is also an average and it cannot accurately predict the survival rate for everyone.

**OBJECTIVES**

After completing this module the learner will be able to:

1. Identify the most important cause of lung cancer.
2. Identify signs and symptoms of lung cancer.
3. Identify how the seriousness of lung cancer is evaluated.
4. Identify treatment options for lung cancer.
5. Identify side effects of the treatments for lung cancer.

**WHAT IS CANCER?**

Cancer is a neoplastic disease. The term *neoplasm* means new and abnormal growth of tissues and most cancers are characterized by the formation of abnormal collections of tissue called *tumors*. Tumors caused by cancers are *malignant* and they are potentially dangerous for two reasons.
1. Malignant tumors replace normal, functioning tissues and they also cause damage to the surrounding healthy tissues and organs.

2. Cancers can also spread from the primary site to other areas of the body: this process is called metastasis.

   Each type of cancer affects the body in a particular way and each type of cancer (but not all cancers) will metastasize to a specific area, or areas of the body.

**Learning Break:** Most people associate the word tumor with cancer, but some tumors are caused by non-cancerous conditions and these tumors are almost always harmless, or benign.

**HOW DOES CANCER HAPPEN?**

The development of cancer is usually a lengthy and complex process and it involves two factors: exposure to a carcinogen and genetic susceptibility.

**Carcinogens and Cancer**

A carcinogen is a substance that can initiate the process of cancer. Carcinogens occur naturally in the environment, we can be exposed to them at home or at work, or we can be exposed to carcinogens as a result of our personal health habits. Table 1 lists carcinogens that can cause lung cancer.

**Table 1: Carcinogens**

- Air pollution
- Arsenic
- Asbestos
- Beryllium
- Chromium
- Copper
HIV infection
Nickel
Radon
Tobacco smoke

Exposure to a carcinogen could be considered the first step in the process of developing cancer. But in most cases an exposure to a carcinogen alone and by itself will not necessarily cause cancer. The exposure must be to a certain amount of the carcinogen and for a sufficient period of time in order for cancer to occur.

Some carcinogens such as certain types of radiation are so powerful that even a brief exposure can cause cancer. People exposed to radiation from the atomic bombs dropped on Japan during World War II were exposed only briefly. But the level of exposure was so great and the radiation was such a powerful carcinogen that many of them developed cancer.

However, most carcinogens cause cancer only after continual exposure for months or years. For example, occupational exposure to asbestos is a well-known cause of a rare type of lung cancer called mesothelioma. But in order for asbestos to cause mesothelioma workers must be exposed for many, many years to high levels of asbestos in the air.

**Genetic Susceptibility and Cancer**

Exposure to a carcinogen is necessary for cancer to develop. But unless the carcinogen is very powerful and/or the level of exposure was very high or prolonged, *there must be some degree of genetic susceptibility for a cancer to develop*. Genetic susceptibility is defined as “the increased likelihood of
developing a particular disease due to the presence of gene mutations, or a family history of the disease.”

Genetic susceptibilities are not completely understood. It is clear that some people are at risk for specific cancers because of their genetic makeup, yet family history and genetic mutations do not and cannot always predict who will develop cancer. For some cancers, the contribution of genetic susceptibility is considered to be proven and quite strong and for others the evidence for the contribution of genetic susceptibility in cancer development is theoretical.

**Carcinogens, Genetic Susceptibility, and Cancer**

Cancer, as mentioned previously, is characterized by abnormal growths called tumors and cancers happen because of exposure to a carcinogen in someone who is genetically susceptible. This process of cancer onset and development is outlined below.

- Normal growth and multiplication of the cells and tissues of the body are controlled processes.
- The potential for *abnormal* cell and tissue growth is always present, but this potential is also controlled and prevented.
- These processes of growth and multiplication can be disrupted by exposure to a carcinogen in a genetically susceptible person.
- Mutations of genes that control normal cell and tissue growth can be inherited, caused by exposure to a carcinogen, or by both.
- Mutations of the genes that control and prevent abnormal cell and tissue growth can be inherited, caused by exposure to a carcinogen, or by both.
• The genetic mutation and the carcinogen exposure together adversely affect how the body controls cell and tissue growth and prevents abnormal cell and tissue growth. This in turn allows for abnormal cells and tissues to develop; put more simply, a tumor begins.
Exposure to carcinogens → Genetic susceptibility → Abnormal cell and tissue growth
THE CAUSES OF LUNG CANCER

Tobacco Smoke

The number one cause of lung cancer is cigarette smoking. Tobacco smoke contains several very strong carcinogens and approximately 90% of all cases of lung cancer are directly attributed to cigarette smoking. There is a definite and strong relationship between how many cigarettes are smoked, the number of years of smoking, and the tar and nicotine content of the cigarettes. The more you smoke, the longer you smoke, and the stronger the cigarettes then the higher the chances are that someone will develop lung cancer. Not everyone who smokes will get lung cancer, but people who smoke have a risk of developing lung cancer that is 10 to 30 times higher than the risk of non-smokers. There is no safe number of cigarettes but smoking more than 20 cigarettes a day seems to be the amount that drastically increases the chances of lung cancer.

Unfortunately, cigarette smoke is also harmful to people who do not smoke but are exposed to second-hand cigarette smoke. The risk of developing lung cancer is increased by 20%-30% by exposure to second-hand cigarette smoke, and it has been estimated that each year there are approximately 3000 new cases of lung cancer that are caused by second-hand cigarette smoke.

Learning Break: Cigar and pipe smoking and chewing tobacco are not safe alternatives to cigarette smoking. All of these increase the risk of developing lung cancer and other cancers as well, and the harmful effects of tobacco products on
overall health have been clearly documented. At this time, the health risks of e-cigarettes are not well understood.

Stopping smoking does significantly decrease someone’s risk of lung cancer but the effect is not immediate and it is not absolute, and during the first year or two after stopping smoking the risk for lung cancer actually *increases*. Once a person has stopped smoking for five to ten years the risk for lung cancer then begins to decrease, but a former smoker is still is much more likely to get lung cancer than someone who never smoked.

**Other Causes and Risk Factors for Lung Cancer**

Although cigarette smoking and exposure to second-hand cigarette smoke are the most important *specific causes* of lung cancer, there are many cases of lung cancer that occur in people who never smoked or who are former smokers. These cases of lung cancer can be caused, or partially caused by:

- **Age**: Age is not by itself a risk factor for lung cancer except when it contributes to the number of years of smoking. But lung cancer primarily affects people over the age of 40 and the risk increases for each year past 40.

- **Asbestos**: Asbestos is a naturally occurring mineral that was once widely used for insulation, making automobile brakes, as a component of floor tiles, and for many other products. Long-term inhalation of high levels of asbestos can cause lung cancer. The combination of cigarette smoking and exposure to asbestos is especially dangerous.
• Chronic obstructive pulmonary disease: Chronic obstructive pulmonary disease (COPD) can increase the risk for lung cancer independent of someone’s smoking habits.

• Environmental and industrial exposures: People who are exposed to or work with arsenic, beryllium, chromium, copper, nickel, and other chemicals are at risk for lung cancer.

• Genetic lung cancer: Tobacco smoke is a powerful cause of lung cancer but not everyone who smokes gets lung cancer. Research has clearly shown that certain people are pre-disposed, or genetically susceptible, to developing lung cancer. It is not clear why this happens, but it may be that some people neutralize the tobacco carcinogens less effectively. Anyone who has a first-degree relative (parent or sibling) that has lung cancer has a higher risk for the disease.

• Human immunodeficiency virus: Infection with the human immunodeficiency virus (HIV) increases the risk of developing lung cancer, even in people who do not smoke.

• Radon: Radon is a naturally occurring gas that is found in “pockets” under the earth’s surface. Radon can enter occupied buildings through leaks in the foundation, and high levels of radon are a small but definite cause of lung cancer.

**SIGNS AND SYMPTOMS OF LUNG CANCER**

The signs and symptoms of lung cancer vary depending on the site of the primary tumor, how advanced the disease is, and whether or not the cancer
has metastasized. Many patients who have lung cancer will have some of the signs and symptoms that are listed in Table 3. The presence and intensity of these signs and symptoms will be different for each patient.

**Table 3: Signs and Symptoms of Lung Cancer**

- Anorexia
- Chest pain
- Chest
- Dyspnea
- Fatigue
- Hemothysis (Coughing up blood)
- Hoarseness
- Nausea
- Pain
- Shortness of breath
- Vomiting
- Weakness
- Weight loss
- Wheezing

Lung cancer often metastasizes and the primary sites lung cancer can spread to are the adrenal glands, the brain, the bones, the lymph nodes, the liver, and the skin. Because of the primary location of lung cancer most of the patient’s complaints will be respiratory. However, once the cancer has metastasized the patient may have many non-respiratory signs and symptoms. Metastases to the adrenal gland and the liver usually do not cause signs or symptoms. Metastases to the brain may cause neurological problems. Metastases to the bones cause pain, usually in the spine, ribs, and femur.

**HOW IS LUNG CANCER DISCOVERED AND DIAGNOSED?**

Unfortunately, the majority of people who have lung cancer do not have signs and symptoms until the disease is well advanced or the signs and symptoms are
mild or non-specific. Many cases of lung cancer are found when a chest x-ray is done as part of a routine check-up or for the evaluation of an on-going illness. A mass is seen on the x-ray, the patient is usually a smoker, so lung cancer is highly probable. The majority of people who have lung cancer have lymph node involvement and metastases at the time of the diagnosis.

If a mass is seen on the chest x-ray, the diagnosis of lung cancer must be confirmed by other studies because there are other cancers and benign illnesses that may appear on an x-ray to be lung cancer. There are several ways to determine if a mass in the lungs is cancer.

- Bronchoscopy: A bronchoscope in a thin, flexible, lighted tube that is inserted into the lungs through the throat. Using a bronchoscope the physician can directly examine the lungs and can also take tissue samples.
- Computed tomography scan, a.k.a., CT scan.
- Sputum samples: Cancer cells can be shed into the lungs and they may be detected in the sputum.
- Tissue biopsy: A CT scan can be used to guide a biopsy needle into the lungs to obtain a tissue sample.

Other tests will be done to determine if the cancer has metastasized. These might include blood samples, CT scans of the abdomen, chest, and head, a magnetic resonance imaging (MRI) scan of the spine, a bone scan, and pulmonary function tests to evaluate the patient’s respiratory status. Blood tests
alone cannot confirm a diagnosis of lung cancer but may useful for determining the seriousness of the case.

**Lung Cancer Staging**

Once the diagnosis of lung cancer is certain the next step is staging. Staging determines: 1) How big the primary tumor is; 2) If the cancer has affected the lymph nodes; 3) Whether or not the cancer has metastasized; 4) Where it has metastasized to, and; 5) The seriousness of the metastases. This approach to staging can be remembered by the letters _T, N, M_ - tumor, nodes, metastases.

Staging is very important. Staging provides valuable information about how serious the lung cancer is, how long the patient is expected to live, and what treatments are appropriate.

**Example:** The primary tumor is determined to be stage 2b, it is \( > 5 \text{ cm} \) but \( \leq 7 \text{ cm} \). The lymph node involvement is determined to be stage N3, lymph nodes throughout the chest have evidence of cancer. The metastatic involvement is stage M1, the cancer has spread to many distant sites. The stages of the primary tumor, the lymph nodes, and the metastases would be combined to provide an overall score of stage IV. This would represent a very serious, advanced case of lung cancer. The patient would be treated with chemotherapy and possibly a lung resection but treatment would not be expected to be successful.

**Learning Break:** A lymph node is a small structure (usually \( \frac{3}{4} \) of an inch or smaller that is part of the lymphatic system. The lymphatic system and the lymph
nodes are an important part of the body’s immune system. They are also a very common route by which cancers metastasize.

**Prognosis**

Lung cancer is a very serious disease and in most cases the prognosis is very bad. The majority of cases of lung cancer are discovered after the disease has become advanced and there are metastases. The overall five year survival rate for patients who have lung cancer is 15%, but this figure represents all patients who have the disease. However, there are seven stages of lung cancer, IA, IB, IIA, IIB, IIIA, IIIB, and IV. Once the cancer has progressed to stage IIIB or IV the five year survival rate is less than 5% and as low as 2%. If the cancer has progressed to a stage where surgery is not possible, most patients will only live for 8 to 14 months.

**Learning Break:** Lung cancer can be essentially incurable if the disease is in an advanced stage and smoking is the number one cause of lung cancer. It would seem sensible then that patients who smoke should be screened for lung cancer often and early, to find the disease before it has progressed. Unfortunately, research has not shown that screening makes a significant difference and it is not currently recommended. If the patient is a smoker and if she/he is 55 years of age or older some physicians will order a yearly CT screen of the chest. Screening chest x-rays for the general population are **not** recommended.
Treatment of lung cancer has three goals; cure the disease, slow the progression of the disease, and lessen the intensity of the signs and symptoms so that the patient feels better. The specific treatment approach that is used will depend on what stage of lung cancer the patient has. There several options and each of these will be discussed separately.

Table 4: Treatment Options for Lung Cancer by Stage

<table>
<thead>
<tr>
<th>Stage</th>
<th>Treatment Options</th>
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<tbody>
<tr>
<td>Stage I</td>
<td>Surgical resection; radiation therapy if resection is not possible</td>
</tr>
<tr>
<td>Stage II</td>
<td>Surgical resection; radiation therapy if resection is not possible</td>
</tr>
<tr>
<td>Stage IIIa</td>
<td>Chemoradiotherapy and surgical resection in certain patients</td>
</tr>
<tr>
<td>Stage IIIb</td>
<td>Chemoradiotherapy</td>
</tr>
<tr>
<td>Stage IV</td>
<td>Chemotherapy, surgical resection in selected cases</td>
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**Surgical Resection**

Surgical resection of the lung is one of the recommended treatments for stage I through stage IIIa lung cancer. In stages I through stages IIIa the cancer has remained localized to the lung: it has not metastasized and the lymph nodes are not affected. Surgical resection is seldom used for patients who have stage IIIb or stage IV lung cancer.

There are several different types of lung resections that can be done. If the tumor is relatively small and localized a small section of the lung can be removed. This is called a **wedge resection** and is the least extensive and complicated procedure. If the cancer is more extensive, the entire lobe that contains the cancer may be removed; this is called a **lobectomy**. And if the disease is a more advanced stage the entire lung may need to be removed in a procedure called a **pneumonectomy**.

**Chemoradiotherapy**
Chemoradiotherapy is a combination of chemotherapy and radiation therapy. This treatment is the recommended approach for patients who have stage IIIa or stage IIIb lung cancer, and it can dramatically improve survival rates. Combining the two is much more successful than using either chemotherapy or radiation therapy alone. Chemotherapy by itself is not used because as a single treatment it is not effective and by itself cannot cure lung cancer. Radiation therapy alone is typically only used for patients who have stage I or stage II disease but cannot tolerate surgery.

Chemotherapy for lung cancer uses IV infusions of a platinum-based drug combined with other chemotherapy drugs: either cisplatin or carboplatin are the platinum-based drugs that are typically used. These drugs along with the other chemotherapeutic agents kill cancer cells and they also stop them from growing. The doses and the duration of therapy are individualized for each patient, but a typical treatment plan is one to three days a week of IV chemotherapy for three weeks. This is called a cycle of therapy. After each cycle a rest period is prescribed so that the drugs can work and then another cycle is started. Most patients require four to six cycles and at the end of that time the progress, or lack of progress is determined.

Radiation therapy uses high-energy radiation that is directed at the tumor. Lung cancer is treated with external beam radiation delivered by a machine called a liner accelerator: this looks somewhat like a CT scan machine. The patient lies down on a treatment table and the liner accelerator delivers high-energy radiation to the tumor, destroying malignant tissue and shrinking the
tumor. Prior to the treatment the size, shape, and location of the tumor is determined and the current methods of delivering external beam radiation precisely aim the radiation directly at the tumor, thus sparing non-cancerous tissue. Radiation can be given after or before chemotherapy or concurrently. The treatment sessions are usually about 15 minutes long and are painless at the time they are delivered.

**Learning Break:** The treatment approaches described in this module are the basic and standard ones that are used. New treatments and new combinations of therapy are being designed all the time and not all cancer treatment centers offer every type of therapy. In addition, each patient has different needs so the treatment plans your patients undergo may look different than what has been outlined here.

**Other Therapies for Lung Cancer Laser**

Surgery, chemotherapy, radiation therapy, and chemoradiation therapy are the primary treatments for lung cancer but there are other options. These are used less frequently and will not be discussed in detail.

- **Cryosurgery:** Cryosurgery is the application of intense cold. It has long been used to remove warts and certain types of skin cancer and it can be used to treat lung cancer.
- **Electrocautery:** Electrocautery uses a heated needle or probe to destroy tumors.
• Laser: A laser is an intensely focused beam of light that produces heat and it can be used to destroy lung tumors. Laser therapy can also be used in combination with injected drugs that accumulate in the cancer cells, making them easier to visualize during laser therapy.

• Targeted therapy: Targeted therapy used drugs that are designed to find and attack cancer cells that have a specific genetic weakness.

**Side Effects of Therapy**

The side effects of surgical resection are essentially the same as for any other surgical procedure: post-operative pain, risk for infection, the possibility of blood clots, and post-operative pneumonia. These patients may also need pulmonary rehabilitation to help them adjust to the changes in lung volume.

The side effects of chemotherapy, radiation therapy, and chemoradiation therapy are numerous and they are listed in Table 5. These side effects can be mild and temporary or very disabling and each patient will have a different experience with the treatments. Some of thses side effects can be managed with supportive care. For example, most patients have nausea and vomiting and an anti-emetic such as Zofran® will be prescribed. Some patients will have side effects that are dangerous or intolerable and therapy may need to be stopped for a while. When chemotherapy and radiation therapy are used together they are more effective than either one used alone, but the number and intensity of the side effects is correspondingly worse.
For the sake of convenience the side effects of chemotherapy and radiation therapy have been combined in Table 5 and they are described as side effects of chemoradiation therapy.

**Table 5: Side Effects of Chemoradiation Therapy**

- Anemia
- Anorexia
- Cough
- Diarrhea
- Fatigue
- Hearing problems
- Infections
- Mouth ulcers
- Nausea
- Peripheral neuropathy
- Skin irritation
- Throat irritation
- Weight loss
- Vomiting

Some of these side effects are common to many types of medications, but some are specific to radiation therapy and chemotherapy.

**Example:** Because the radiation energy is delivered to the chest the esophagus, which has sensitive mucous membranes that can be easily irritated, may be damaged by a thermal burn. Skin irritation and burns on the surface of the chest are also common.

**Example:** Chemotherapy drugs are designed to target and destroy cells that are rapidly growing and multiplying because that is what cancer cells do. However, other cells and tissues in the body also are very active in this respect and
Chemotherapy drugs damage healthy cells and tissues such as the bone marrow and the immune system, as well. Because of this effect patients receiving chemotherapy become anemic and they cannot fight off infections, making them prone to fatigue and illnesses.

Unfortunately the side effects listed in Table 5 are primarily the immediate ones the patient can experience. Chemotherapy, radiation therapy, and chemoradiotherapy also have long-term side effects such as kidney damage, heart damage, and various types of lung problem such as radiation pneumonitis, an inflammation of the lungs.

**EFFECTIVENESS OF LUNG CANCER TREATMENTS**

Surgical resection is effective only for a very small number of patients who have lung cancer and only if the disease is very localized and diagnosed quickly. Surgery and chemotherapy and/or radiation therapy can be combined and this approach increases survival rates and cure rates. Without treatment most patients with lung cancer will die very quickly, usually within weeks from the time of diagnosis. If the disease is in an early stage approximately 20%-25% of patients can be cured. Those who are not cured may have a remission but the cancer will re-occur in one to two years. These re-occurrences are more resistant to treatment than the original tumor and metastases.

If the patient is considered to have been cured or a remission has occurred, careful long-term follow-up care is still needed. The patient should have periodic evaluations by the physician, scheduled CT scans of the chest, yearly influenza
and pneumonia vaccinations, herpes zoster (shingles) vaccination if needed. and life style and nutrition counseling. If the patient has not stopped smoking she/he should be started on a smoking cessation program.

Learning Break: The term remission means that a cancerous tumor has substantially decreased in size or is gone but there are still cancer cells in the body and the cancer will probably re-occur. A remission is a positive sign but a remission is not the same as a cure.

SMOKING CESSATION

Smoking cessation is a vital part of prevention and treatment of lung cancer. Nicotine is the active ingredient is tobacco and it is a very addictive substance. Many people find that stopping smoking is very difficult, and it may take several attempts before a smoking cessation is successful. The most successful smoking cessation programs combine education, individual counseling, and the medications Chantix® and Zyban®

PALLIATIVE CARE

If a patient has lung cancer that has not responded to treatment or if the lung cancer is very advanced and treatment will not be helpful palliative care will be started. Palliative care is a term for therapies that relieve the pain and symptoms of a disease but are not intended to cure the disease. The patient is made comfortable but there is no expectation that he/she will survive. Since the cure rate for lung cancer is so small, most patients will eventually need palliative care. Commonly used palliative care therapies are listed in Table 6.
Table 6: Palliative Care Therapies for Lung Cancer

- Analgesics for pain relief
- Anti-anxiety medications such as diazepam (Valium)
- Anti-depressants
- Anti-tussives for cough relief
- Bronchodilators
- IV hydration
- Nutritional support
- Oxygen therapy
- Psychotherapy
- Social services
- Soporifics such as zolpidem (Ambien) for sleep

SUMMARY

Lung cancer is the second-most common cancer in the United States and it is one of the most dangerous. The five-year survival rate for lung cancer is approximately 15% and if the disease is discovered late and considered to be untreatable, most patients will die within months. Each year more people die of lung cancer than from breast cancer, colon cancer, and colon cancer combined. Lung cancer affects men and women equally, and it affects African American men more than white men. Most people who develop lung cancer are 40 years of age or older. Lung cancer is very uncommon is people less than 40.

Lung cancer is caused by exposure to a cancer-causing agent - a carcinogen - and by genetic susceptibility to the disease. The two together disrupt the normal processes of cell and tissue growth and the result is an abnormal mass of tissue called a tumor. Lung cancer destroys normal lung tissue and it can also metastasize to the lymph nodes, the adrenal glands, the bones, the brain, the liver, and the skin. Carcinogens that can cause lung cancer include (but are not limited to) air pollution, asbestos, HIV, tobacco smoke, radon, and environmental
and occupational exposure to various metals and chemicals. People over the age of 40 and people who have COPD are more likely to develop lung cancer.

The most common cause of lung cancer is smoking and the more cigarettes that are smoked and the longer someone smokes the greater the risk for developing lung cancer. Exposure to second-hand smoke can also cause lung cancer as can the use of other tobacco products such as chewing tobacco, cigars, and pipes. The risk of developing lung cancer is greatly increased by smoking but not everyone who smokes will get the disease and non-smokers are not immune. Smoking cessation is very important for preventing lung cancer, but former smokers still have a higher risk than non-smokers for developing lung cancer.

Common signs and symptoms of lung cancer include chest pain, cough, dyspnea, hemoptysis, nausea, shortness of breath, and weight loss. Many patients who have lung cancer have non-specific signs and symptoms or initially no signs and symptoms at all. Unfortunately this means that by the time the cancer is diagnosed the primary tumor has grown and the disease has spread to the lymph nodes and/or other organs, and the majority of cases of lung cancer are discovered when the disease is in an advanced stage. A simple chest x-ray may reveal a tumor, but the diagnosis of lung cancer must be confirmed by other studies such as bronchoscopy, CT scan, sputum samples, or a tissue biopsy. Once the diagnosis is certain, the size of the tumor, the involvement of the lymph nodes, and the degree of metastases is used to determine what stage the cancer
is in, stage I through IV. These stages are used to determine how serious the disease is and to decide which therapies should be used.

The primary treatments used for lung cancer are surgery, chemotherapy, radiation therapy, or a combination of chemotherapy and radiotherapy. The stage of the cancer will determine which of these should be used and in what combination. Other treatments that can be used are cryosurgery, electrocautery, laser therapy, and targeted therapy. The treatment success rate for lung cancer is not high. A small percentage of people can be cured. But many people do not respond to the treatments and even if a remission is achieved, relapses are very common. If treatment has failed, palliative care therapies that alleviate signs and symptoms and help the patient feel comfortable will be prescribed.