Lung Cancer: Diagnosis and Management

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Faculty

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Faculty Disclosure

Contributing faculty, Marilyn Fuller Delong, MA, BSN, RN, has disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

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The division planner and director have disclosed no relevant financial relationship with any product manufacturer or service provider mentioned.

Audience

This course is designed for all nurses, especially those involved in the care of patients with lung cancer.

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Course Objective

The purpose of this course is to address the various aspects of diagnosis, treatment, disease management and appropriate patient care for healthcare professionals caring for patients with lung cancer.

Learning Objectives

Upon completion of this course, you should be able to:

1. Discuss the risk factors and incidence of lung cancer.
2. Explain the pathophysiology of lung cancer.
3. Identify the signs and symptoms of lung cancer.
4. Discuss the various tests used to diagnose lung cancer.
5. Describe the lung cancer classification and staging system.
6. Discuss the treatment options available to the patient with lung cancer, including potential adverse effects.
7. Discuss the clinical course of a patient with lung cancer.
8. Describe conditions caused by advanced lung cancer and lung cancer treatments.
9. Identify the vascular access devices (VADs) commonly used in the treatment and management of lung cancer.
10. Define grief and loss and identify measures to facilitate the grieving process.
11. Differentiate between advance directives, physician directives, and do not resuscitate (DNR) orders.
12. Explain the hospice concept.
13. Discuss nursing case management and clinical pathways of the patient with lung cancer.
14. List patient teaching goals that are useful for patients with lung cancer.

EVIDENCE-BASED PRACTICE RECOMMENDATION

Sections marked with this symbol include evidence-based practice recommendations. The level of evidence and/or strength of recommendation, as provided by the evidence-based source, are also included so you may determine the validity or relevance of the information. These sections may be used in conjunction with the course material for better application to your daily practice.

INTRODUCTION

Lung cancer is the second most common cancer affecting both men and women in the United States, accounting for an estimated 12.5% of all new cancer diagnoses [1; 2]. Although it has been linked primarily with smoking and environmental factors, this disease can affect patients regardless of their occupation or lifestyle. Within the general diagnosis of lung cancer, there are several types, each with its own clinical course and prognosis. It is important that healthcare professionals understand these differences as they care for patients with the diagnosis of lung carcinoma.

Multiple treatment options are available to the patient with lung cancer. Traditional methods, such as surgery, chemotherapy, and radiation, continue to be the mainstays, but alternative methods are being increasingly developed and used. Many of the treatment options available to patients with lung cancer have extensive side effects, which should be discussed and minimized as much as possible.

By first understanding lung cancer and how it is diagnosed and treated, healthcare professionals will best know how to implement measures to save costs. The realities of healthcare costs in the last few decades have caused changes in the practice of medicine. Perhaps now more than ever before, the nurse has a vital role as patient advocate. When concerns exist about quality of care, the case manager can be a pivotal influence to keep all components of the process functioning.

EPIDEMIOLOGY

Early in the 20th century, lung cancer was rare. One report from 1912 found only 374 cases of lung cancer described in international medical literature; one man commented that it seemed of little value to write about such an "insignificant problem" [3]. However, in the 1930s, cigarette smoking became a socially acceptable trend for men in the United States. By the 1950s, lung cancer rates had risen significantly in the male population. In the 1960s, women began to embrace the trend and started smoking cigarettes in increased numbers. Ten years later, the rate of lung cancer among women had increased as well [2].

Among men in the United States, the number of new lung cancer cases and the number of deaths from lung cancer have decreased over the last several decades due to a decline in the number of men who smoke. Since the mid-2000s, the incidence of new lung cancer cases has decreased steadily by about 2% per year, but at a faster pace in men than in women [2]. Overall, lung cancer death rates in the United States have declined 54% since 1990 in men and by 30% since 2002 in women, with the pace accelerating in recent years. From 2014 to 2018, the rate decreased by more than 5% per year in men and 4% per year in women [2]. While the death rates for U.S. men continue to decrease and are lower than the death rates for men in several other countries, more men die from lung cancer than women [2]. In 2018, 76,233 men died from lung cancer, compared with 65,847 women [1].

Among women in the United States, reductions in smoking began in the late 1970s. As noted, the incidence of lung cancer among women decreased 2% per year from 2014 to 2018, and death rates have steadily decreased by 4% per year overall since the mid-2000s [2]. Lung cancer death rates for women in the United States are among the highest in the world; however, likely due to a decline in smoking rates, there has been a 30% reduction in lung cancer deaths among women in the United States since 2002 [2; 4]. Also, large state and regional variations in lung cancer trends among U.S. women persist [1; 2; 5].

The American Cancer Society estimates that 235,760 new cases of lung cancer (119,100 men and 116,660 women) will be diagnosed in the United States in 2021 [2]. Lung cancer deaths for the same year are estimated to be 131,880 (69,410 men and 62,470 women), accounting for approximately 22% of all cancer deaths [2].

ALTERABLE RISK FACTORS

Several risk factors for lung cancer have been associated with lifestyle choices, meaning that the risks can be either managed or avoided in many cases. The most common lifestyle risk factor in the development of lung cancer is smoking. A 1954 study was one of the first to substantiate the connection between smoking and lung cancer. This study demonstrated that a person who had smoked for 20 years, the equivalent of two packs per day for 10 years or one pack per day for 20 years, was, on average, 20 times more likely to have died from lung cancer than a nonsmoker [6]. Approximately 80% of lung cancer deaths in the United States each year are related to smoking [2; 7].

There are several other risks that contribute to the development of lung cancer besides smoking, including involuntary or secondhand smoking, industrial and environmental hazards, and geography. Smoke that is breathed in from the environment is not as concentrated as if it was inhaled directly, but it contains the same harmful materials. Secondhand smoke, also known as environmental tobacco smoke, is a complex mixture of gases and particles that includes smoke from the burning cigarette, cigar, or pipe tip (sidestream smoke) and exhaled mainstream smoke. Secondhand smoke contains at least 7,000 chemicals, 250 or more that are known to be toxic, including more than 70 that cause cancer. Secondhand smoke exposure causes lung cancer in nonsmoking adults. Nonsmokers who are exposed to secondhand smoke at home or work increase their lung cancer risk by 20% to 30% [8; 9; 10]. Secondhand smoke exposure also causes respiratory symptoms in children and slows their lung growth. There is no risk-free level of secondhand smoke exposure. Even brief exposure can be dangerous [8].

The role of particulate air pollution in the incidence of lung cancer was the source of serious debate and contention for many years. Between 1982 and 2006, the American Cancer Society conducted a study (the Cancer Prevention Study II [CPS-II]) to examine the impact of environmental and lifestyle factors on cancer etiology in men and women in the United States. Researchers determined that fine particulate and sulfur oxide-related pollution, from vehicle and industrial sources, was associated with an increased incidence of cancer, heart disease, and all-cause mortality. Long-term exposure to these pollutants was determined to be a significant environmental factor in lung cancer incidence and mortality [11]. Another study published in 2017, the Adventist Health and Smog Study-2 (AHSMOG-2), followed more than 80,000 participants for an average of 7.5 years and determined that there was a positive incremental association between ambient fine particulate air pollution and the incidence of lung cancer and associated mortality [12].

Those who work around certain industrial substances, such as asbestos, have been found to have an increased risk for developing lung cancer, as well as mesothelioma and nonmalignant lung and pleural disorders [13]. In the late 1970s, the U.S. Consumer Product Safety Commission imposed a limited ban on the use of asbestos. This was followed by a 1989 ban on all new uses of asbestos by the U.S. Environmental Protection Agency [14]. Studies have shown that cigarette smoking combined with asbestos exposure is particularly hazardous. Smokers who are exposed to asbestos have a risk of developing lung cancer that is greater than the individual risks from asbestos exposure and smoking added together [13; 14].

In addition to asbestos, many other materials have been linked to the development of lung cancer, including [9; 12; 15]:

- Radioactive ores (e.g., uranium)
- Inhaled chemicals or minerals (e.g., arsenic, beryllium, cadmium, vinyl chloride, nickel compounds, chromium compounds, coal products, mustard gas, chloromethyl ethers)
- Myristic acid
- Petroleum products
- Wood dust
- Radon
- Diesel exhaust

These substances are handled in many occupations, including by workers in chemical factories, automobile maintenance, uranium mining/processing, copper smelts, foundries, shipyards, mines, and glass, pottery, and linoleum factories [16]. Individuals in any of these occupations who also smoke cigarettes have an increased risk of developing lung cancer [9].

Geography has also been shown to be a significant risk factor for lung cancer. A report compiled by the American Cancer Society, the Centers for Disease Control and Prevention (CDC), the National Cancer Institute, and the North American Association of Central Cancer Registries found large geographic variations in smoking that are delaying a decrease in lung cancer death rates in women and slowing the decrease in men. For example, the average percentage decrease in the lung cancer death rate among men in California was more than twice that of many Midwest and Southern states during the period 2014 through 2018 [17]. In women, the lung cancer death rate remained stable in four states (Rhode Island, South Dakota, Nebraska, and Utah) and decreased in all remaining states for the same time period [17]. Another report from the American Cancer Society shows that, between 2011 and 2015, death rates attributable to lung cancer were highest for men (in order of highest to lowest) in Mississippi, Arkansas, West Virginia, Tennessee, and Alabama, and highest for women in Kentucky, West Virginia, Arkansas, Tennessee, and Maine [2]. State variations have been attributed to several factors, including the level of public awareness about the harmful effects of smoking, social norms (e.g., acceptability of smoking), state educational levels, racial/ethnic variations among states, tobacco control activities, industry promotional activities, and economic dependency on tobacco farming and production [2; 5].

NONALTERABLE RISK FACTORS

The risk factors mentioned so far have all been manageable or preventable (i.e., the decision to smoke or where to work is generally a personal choice). Race, gender, socioeconomic status, and family history are not factors that can be changed, but they nevertheless influence an individual's likelihood of developing lung cancer.

Significant racial and ethnic differences in the smoking-related incidence and progression of lung cancer have been reported [16]. Tobacco use varies within and among racial/ethnic minority groups and sex. In 2019, American Indian/Alaska Native adults had the highest prevalence of tobacco use (20.9%), followed by non-Hispanic individuals of multiples races (19.7%), Whites (15.5%), Blacks (14.9%), Hispanics (8.8%), and Asians (7.2%) [18]. The overall rate of cigarette smoking is higher among men (15.3%) than women (12.7%). Traditional uses of tobacco in ceremonial, religious, and medicinal roles in native cultures may affect behaviors and attitudes toward commercial tobacco use, leading to the high prevalence in this group [19].

Differences in the magnitude of disease risk are directly related to differences in patterns of smoking. No single factor determines patterns of tobacco use among racial/ethnic minority groups; these patterns are the result of complex interactions of multiple factors, such as socioeconomic status, cultural characteristics, acculturation, stress, biologic elements, targeted advertising, price of tobacco products, and varying capacities of communities to mount effective tobacco control initiatives [19].

There seems to be an identifiable trend of lung cancer in persons who have a family history of lung cancer, particularly in those cases where the patient was young. Studies have shown that there may be a specific gene that predisposes a person to lung cancer. Researchers studying the genetics of familial lung cancer have found strong evidence linking a major lung cancer susceptibility region of chromosome 6, specifically 6q23-25, to lung and other tobacco-related cancers [20; 21].

PREVENTION AND SCREENING

Most risk factors can be minimized by establishing goals to prevent the disease whenever possible. The majority of these efforts have been focused on educating the public to never begin smoking, decrease exposure to secondhand smoke, and/or stop smoking if already smoking. Educational efforts to prevent new smokers from beginning have been heavily aimed at teenagers and young adults. Many programs have been established in schools, on television, and in print media.

Smoking cessation is beneficial in the following ways [19; 22]:

- It lowers the risk for lung and other types of cancer; the risk declines with the number of years of smoking cessation.
- It reduces an individual's risk of dying prematurely.
- It reduces respiratory symptoms (e.g., coughing, wheezing, dyspnea).
- It slows the rate of decline in lung function and may improve lung tissue.

Patients who stop smoking continue to have a greater risk of developing lung cancer than those who never smoked at all, and the benefits are greater the earlier cessation occurs; however, cessation is beneficial at all ages.

Among adult U.S. smokers, 68% report that they want to quit completely [19; 23]. Brief clinical interventions by healthcare providers can increase the chances of successful cessation, as can counseling and behavioral cessation therapies [24]. Treatments with more person-to-person contact and intensity (e.g., more time with counselors) have been shown to be more effective. Effective pharmacologic therapies include nicotine replacement products (e.g., gum, inhaler, patch) and non-nicotine medications, such as bupropion SR (Zyban) and varenicline tartrate (Chantix); however, the U.S. Food and Drug Administration (FDA) has required manufacturers to add a black box warning regarding a reported association between the use of these medications and neuropsychiatric adverse effects [19; 24; 25].

Several screening tools have been explored for the early detection and subsequent treatment of lung cancer, the most common being chest x-rays, sputum cytology, and computed tomography (CT) scans of the lungs. The tests involve risks, such as false-positive diagnoses, which may account for as much as 5% to 25% of total diagnoses [26]. False-positive results may lead to overtreatment, unnecessary invasive procedures, and exposure to radiation.

There is little evidence that chest x-ray or sputum cytology affect lung cancer mortality [26]. However, low-dose helical CT scans in high-risk patients do result in reductions in lung cancer-specific (20% reduction) and all-cause (nearly 7% reduction) mortality, mostly due to cancers being at an earlier stage at the time of diagnosis [26; 27]. Based on these findings, the U.S. Preventive Services Task Force (USPSTF) recommends that adults 50 to 80 years of age who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years be screened annually with low-dose CT scan [28]. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery.

PATHOPHYSIOLOGY OF LUNG CANCER

To understand the pathophysiology of lung cancer, it is necessary to examine normal tissue cells and how they function. Normal cells are differentiated. That is, they undergo structural changes that make them different from cells in other parts of the body; these differences allow the cells to operate optimally in a given environment.

Malignant cells divide at an uncontrolled rate; they may grow at a frenzied pace, accumulating many more cells than are needed and disrupting homeostasis. They also have the ability to undergo innumerable doublings without dying. These new cells are not the same as the original cells. Therefore, they cannot perform the same tasks, and function is altered. One example of malignant cell reproduction causing abnormal function is small cell lung cancer (SCLC) cells, which can produce adrenocorticotropic hormone (ACTH) in such large amounts that the patient may develop Cushing syndrome, characterized by upper body weight gain, hypertension, and loss of potassium [29]. Cells that are close in appearance and function to healthy cells are well-differentiated, while tumor cells that are dramatically unlike healthy lung cells are undifferentiated or anaplastic.

Carcinogenesis is the process by which a normal cell is changed into a malignant cell. Many steps are involved, beginning with damage to the genes that regulate cell growth or inactivation of tumor suppressor genes. The substance or factor that initiates these cellular changes is referred to as a carcinogen. In some cases, an oncogene may be the initiating agent. These bits of genetic code within the cell may allow the cell to be altered. When this is the case, a cocarcinogen enhances the work begun by the oncogene initiator [30; 31].

The second stage of carcinogenesis is promotion. In this phase, cells have an increased opportunity to become malignant. The effects of promotion are linked to the level and duration of exposure to the cocarcinogen (e.g., the number of years as a smoker and number of cigarettes smoked per day). This step of the process is reversible, so cancer prevention efforts are most effective when aimed at evading promoters. The length of time between exposure to the cocarcinogen and the development of the malignancy is referred to as the latency period [30; 31].

The next step is progression, during which the tumor cells proliferate and undergo changes in their microscopic structure. Progression occurs as the malignant cells divide faster and develop the ability to invade, metastasize, and resist normally limiting agents [30; 31].

TYPES OF LUNG CANCER

According to the World Health Organization (WHO), there are two main categories of lung cancer: small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC), each with their own pathology. NSCLC accounts for approximately 85% of all lung cancers and is further divided into two types: non-squamous carcinoma (this includes adenocarcinoma, large cell carcinoma, and other cell types) and squamous cell (epidermoid) carcinoma, each with distinct histologic and clinical characteristics [24; 32; 33; 34].

Cellular Pathophysiology of Small Cell Lung Cancers

SCLC accounts for approximately 10% to 15% of all lung cancers [32; 35]. It initiates in the basal cell lining of the bronchial mucosa, often in the central part of the chest. Because the cells resemble oat grains, SCLC was once called "oat cell carcinoma." SCLC is aggressive and grows rapidly, causing postobstructive pneumonia and atelectasis. It produces arginine vasopressin (AVP) and ACTH, which causes Lambert-Eaton syndrome, the syndrome of inappropriate antidiuretic hormone secretion (SIADH), and Cushing syndrome. SCLC metastasizes very early and to distant sites such as the brain, liver, and bone marrow. It is more responsive to chemotherapy and radiation than other types of lung cancer; however, because it has a tendency to be widely disseminated by the time of diagnosis, it is difficult to cure [36; 37].

Cellular Pathophysiology of Non-Small Cell Lung Cancers

Squamous cell carcinoma accounts for approximately 25% to 30% of all lung cancers. It can be well-differentiated, moderately differentiated, or poorly differentiated. The cells are stratified squamous epithelium that line the airways and have receptors for growing epidermal tissue. This carcinoma tends to begin in the medial portion of the lung, which makes it difficult to detect with a chest x-ray. Squamous cell carcinoma of the lung also produces a substance similar to parathyroid hormone and may cause sudden hypercalcemia [32; 33; 38; 39].

The non-squamous cell carcinoma of adenocarcinoma accounts for approximately 35% to 40% of all lung cancers and may manifest as a "scar carcinoma." It has a glandular appearance when viewed under a microscope and is comprised of acinar, papillary, solid, and bronchoalveolar types of cells. This cancer type begins, and usually remains, in a peripheral site of the lung, which makes it easy to visualize on chest x-ray, but difficult to reach through bronchoscopy. It metastasizes easily, often to the brain, liver, adrenal glands, or bones [32; 33; 39; 40].

Approximately 10% to 15% of all lung cancers are large cell anaplastic carcinoma, which is clinically similar to adenocarcinoma. Microscopically, the large cells lack distinctive features. It can start in any part of the lung, and it tends to grow and spread quickly, which makes it difficult to treat [32; 39].

SIGNS AND SYMPTOMS

Lung cancer rarely gives an early indication of its presence. It may be detected accidentally, when viewing a routine chest x-ray, or it may be suspected by symptoms presented by the patient (***Table 1***) [36].

SYMPTOMS OF LUNG CANCER
Cough, especially one that changes or becomes productive
Unilateral wheezing
Dyspnea
Pneumonia
Chest pain or pain in shoulder and arm
Hemoptysis
Vocal cord paralysis
Atelectasis
Neurologic changes
Lethargy
Unexplained weight loss
Source: [41] — *Table 1*

One of the most common symptoms experienced by patients with lung cancer is cough, which occurs when the airways become irritated (as from smoking) [2; 32; 36]. Those patients who have a cough related to their smoking may recognize a change in the type of cough but are not as likely to realize the significance of that change, particularly if the change occurs slowly over decades [36]. The cough may be more frequent, more irritating, of a different tone, or may feel as if it is arising from a different site than a normal cough. A cough that has always been dry may suddenly become productive as the obstructed bronchus develops an infection [2; 36; 41]. Persistent wheezing that occurs in one location in a smoker may also indicate lung cancer [36; 41].

For all lung cancer patients who have troublesome cough, the American College of Chest Physicians recommends that they be evaluated for treatable causes in addition to cancer-related etiologies.

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Strength of Recommendation: 1C (Strong recommendation based on low-quality evidence that the benefits outweigh the risks/burdens)

Pain that arises from lung abscess or tumor is often difficult to describe. It may not be severe, if present at all. With metastasis to the chest wall or lymph nodes, the patient may feel some tightness or a constant ache, which may be mistaken for a pulled muscle related to coughing. When a tumor invades the brachial plexus, there is usually pain in the arm and shoulder. Pain that originates in the chest wall may worsen with deep breathing or coughing [36; 41; 42].

Smokers may have emphysema and therefore be familiar with and accustomed to the feeling of dyspnea (shortness of breath) that accompanies that disease. The emphysematous patient may only feel a more frequent need for oxygen, or perhaps if already receiving oxygen continuously, his or her rate of O_2 flow may have to be increased. Because this change is more subtle, it may not be brought to the physician's attention as promptly. In contrast, when an otherwise healthy person becomes winded easily with exercise, he or she is more likely to investigate the cause and/or avoid exertion. If lung cancer is diagnosed, dyspnea may occur even at rest as the disease progresses [36].

Hemoptysis, bright red blood in the expectorant, is a symptom that generally prompts a rapid response from patients. Infection is the most common cause; however, lung cancer tumors account for approximately 20% of cases of hemoptysis [36]. Symptoms such as recurrent bouts of bronchitis or pneumonia that do not clear quickly may cause the patient to question whether there is an immune response problem but may never cause the patient to link the illness to cancer.

Metastasis has been shown to produce hoarseness, vocal cord paralysis, dysphagia, head and neck swelling, weakness, weight loss, loss of appetite, anorexia, and anemia [42]. Other symptoms that are indicative of metastatic spread of the disease include Horner syndrome, abdominal discomfort, nausea and vomiting, unexplained fever, jaundice, and cardiac symptoms. Elevated liver function tests may be signs of liver metastasis. Bone pain may signify bone metastasis, and severe, unrelenting headache may be caused by increased intracranial pressure from metastasis to the brain [42].

An estimated 10% to 20% of patients with lung cancer experience paraneoplastic syndromes. These symptoms may develop when substances (e.g., hormones, cytokines) released by cancer cells disrupt the normal function of surrounding cells and tissue [36; 42; 43]. SCLC is the most frequent cancer histology associated with paraneoplastic syndromes, including [42; 44; 45; 46]:

- SIADH
- Blood clots
- Cerebellar degeneration (e.g., loss of balance, unsteady limb motion)
- Hypercalcemia

These syndromes are common lung cancer complications. They have been most frequently associated with advanced stages of the disease but may also occur at early stages [45; 46].

DIAGNOSIS

When lung cancer is suspected, a complete history and physical examination is required. The history should inquire into any health problems, work history, smoking history, and family history. The physical examination should include listening to respiration, checking for fluid in the lungs, and feeling for swollen lymph nodes or swollen liver. It is important to pay attention to both organ-specific (e.g., bone, brain) and nonspecific (e.g., fatigue, anorexia, weight loss) signs and symptoms of potential metastatic disease [47]. If the exam results suggest lung cancer, additional tests should be done [32; 38].

RADIOLOGIC IMAGING

Chest x-rays help find masses or lesions on the lungs. When anteroposterior and lateral films are taken, a peripheral tumor at least 1 cm in diameter can be visualized. Additionally, there will be evidence of a widened mediastinum or hilar adenopathy visible with this view [36. These findings are suggestive but not diagnostic of lung cancer and require follow-up with CT or combined Positron emission tomography (PET)-CT scans to assist in diagnosis and staging [36].

CT scans film cross-sectional soft tissue images of the body to analyze tissue for density and reveal tumors or displaced organs. A CT scan of the chest with contrast is recommended for patients with known or suspected lung cancer who are eligible for treatment [47]. A chest x-ray and chest CT scan with contrast material is recommended for staging locoregional disease [48].

The patient may be asked to take nothing by mouth (NPO) prior to the procedure and may be asked to drink, or receive intravenously, a contrast solution to help outline structures in the body. The images can provide precise information about the size, shape, and position of tumors and can help find enlarged, potentially cancerous lymph nodes. The test can also be used to detect masses in the adrenal glands, brain, and other internal organs [32; 47]. While CT of the chest is the reference standard for detecting focal lung disease, missing lung lesions during CT is a well-recognized phenomenon [33; 47]. Although the computer-aided detection system has been shown to increase the overall accuracy of lesion detection when used as a second reader on chest CT studies, further research is needed to determine its value for experienced radiologists [49; 50; 51; 52; 53].

Spiral CT (also called helical CT) uses a faster, continuously rotating machine. The spiral CT allows for a more rapid collection of images than the standard CT. It also reduces blurred images, lowers the dose of radiation received, and produces thinner images that yield a more detailed picture for analysis [54].

With CT-guided needle biopsy, a CT scan is used to guide a biopsy needle into the suspected area. The scans are repeated until the physician is certain that the needle is within the mass. A biopsy sample is then removed and reviewed under a microscope [32].

Magnetic resonance imaging (MRI) is a noninvasive radiologic procedure used in some cases to aid in diagnosing lung carcinomas. It is more commonly used to stage lung cancers and identify possible metastases, particularly of the brain and spinal cord [32; 33]. However, it may also be employed to visualize areas of the lungs not well demonstrated on axial images. Head CT or MRI brain imaging has been recommended for use in patients with signs or symptoms of central nervous system disease as well as for patients with stage III disease who are being considered for aggressive local therapy [33; 47; 48].

PET scans may also be useful in the diagnosis of lung cancer. An 18F-deoxyglucose PET scan should be performed to investigate solitary pulmonary nodules or masses, particularly in cases where a biopsy is not possible or has failed, depending on nodule size, position, and CT characterization [33; 47; 48; 55; 56]. This study may also be useful in detecting metastatic spread of the disease but is not intended to replace conventional imaging techniques. The American College of Chest Physicians (ACCP) does not recommend PET scanning in the routine staging of SCLC, although the National Comprehensive Cancer Network (NCCN) guideline recommends combined PET-CT if limited-stage disease or metastasis is suspected [24; 55]. PET has been recognized as a valuable tool in developing a treatment plan in the management of lung cancer [55; 57]. While PET scanning is more accurate than CT scanning, tissue biopsy is still required to confirm PET scan findings [47].

Endobronchial ultrasound (EBUS) uses sound waves to produce images [58]. EBUS has been found to be a useful adjunct in the diagnosis of lung cancer, particularly when the lesions occur in the periphery of the respiratory tract [59]. Additionally, EBUS has been shown to have a high sensitivity and specificity for node staging compared to CT or PET scans and may be considered in staging lesions [60]. Endoscopic esophageal ultrasound is similar to EBUS, except it involves passing an endoscope down the throat into the esophagus. Ultrasound images taken inside the esophagus may help find cancerous lymph nodes inside the chest [61].

BRONCHOSCOPY	
Definition	The visualization of the pharynx, larynx, trachea, and bronchi through a rigid or flexible fiber optic bronchoscope.
Purpose	To collect specimens, visualize possible tumors, and obtain biopsies.
Procedure	Bronchoscopy may be performed at a patient's bedside if necessary but is usually done in the operating or procedure suites. Baseline vital signs are taken prior to beginning the procedure and are reassessed during and after the procedure. General anesthesia will be ordered for bronchoscopy performed with a rigid bronchoscope. Bronchoscopy performed with a flexible bronchoscope requires only local anesthetic, which is sprayed on the patient's throat and nares to reduce discomfort and override the gag reflex. Atropine may be ordered to decrease secretions. Patients are placed in a supine position with neck hyperextended. Patients should be constantly reassured and reminded to breathe through the nose and not cough, if possible. The bronchoscope is moved through the nares or mouth into the trachea and bronchial tree. Biopsy forceps may be used to remove tissue specimens, and a bronchial brush may be used to obtain cells from tissue surfaces.
Postprocedure	Withhold food and fluids until the local anesthetic has worn off, as the patient's ability to cough if aspirating will be inhibited.
Complications	Hypoxemia, hemorrhage, respiratory distress, hypertension, arrhythmia, tachycardia, and pneumothorax are all possible complications. Frequent observation of the patient is required until he or she is totally recovered from the procedure and the effects of the medications.

Source: Compiled by Author *Table 2*

Newer imaging techniques, such as four-dimensional computed tomography (4DCT), are being explored to help in diagnosis and improved treatment. 4DCT continuously scans the chest for about 30 seconds, as the patient breathes, and shows where the tumor is in relation to other structures. This can help practitioners to deliver radiation more precisely and can also show if a tumor is interfering with any other structures in the chest [62].

LABORATORY ANALYSIS

Blood work is done to assess the respiratory status and to look for metastasis to other organs. These tests may include arterial blood gases, complete blood count, serum calcium, alkaline phosphatase, and liver function studies [33].

Sputum specimens for cytology are completed in order to microscopically identify any malignant cells that may have been sloughed off and expectorated. This requires collecting three early morning specimens in an attempt to obtain deep sputum production, not just saliva from the mouth. Samples are placed in a fixative and processed before viewing. Sputum cytology is not routinely recommended and should be reserved to investigate patients with centrally placed nodules or masses and who are unable to tolerate or unwilling to undergo bronchoscopy or other invasive tests [33; 55].

VISUALIZATION AND BIOPSY

A bronchoscopy is performed routinely on patients suspected of having lung cancer. This procedure allows an opportunity to visualize the lung structure for possible narrowing, inflammation, bleeding, or tumors (***Table 2***). The ability to actually see some tumors permits a more representative tissue sample to be obtained. A sample of the tissue may be obtained through needle aspiration (transbronchial), brush or forceps biopsy, bronchoalveolar lavage, or bronchial washings [24; 33]. There is some controversy regarding the use of bronchoscopy and fine-needle aspiration. While some have challenged the practice as unsafe and useless, based on instances of complications and false-negative results, use of these procedures remains a recommended approach to diagnosis [55; 63; 64; 65]. The additional use of ultrasound imaging when using fine-needle aspiration is often utilized.

The patient is kept NPO prior to the procedure and given mild sedation. There are different types of bronchoscopes available; the fiber optic bronchoscope is generally less uncomfortable than the rigid type. The tube is inserted through the nares in most patients, or through the mouth in those whose nasal passages are obstructed. Once inserted, the bronchoscope allows visualization of the tracheobronchial tree down to the finer branches. It is customary in this procedure to obtain washings, brushings, and possibly even a biopsy.

While the bronchoscopy can easily find tumors that lie in or on the main airways, those that are more peripheral are not easily accessed. In these cases, a percutaneous fine-needle aspiration biopsy may be done with the assistance of the CT scan, ultrasound, or fluoroscopy to direct the needle [32; 55]. Ninety-five percent of the time this procedure is sufficient to diagnose the lesion, but there are some disadvantages as well. A pneumothorax or hemorrhage may occur. Also, if the tumor is cancerous, those malignant cells may be drawn along the path of the biopsy needle [66]. One study found that the resection rate of nonmalignant nodules was significantly lower for patients with preoperative CT-guided fine-needle aspiration biopsy than in those without [67]. Bronchoscopy should be performed on patients with central lesions who are able and willing to undergo the procedure. Chest CT should be performed before an intended fiber optic bronchoscopy [55].

Mediastinoscopy and mediastinotomy may be done in instances when mediastinal lymph nodes must be assessed for possible metastasis. These are invasive procedures, involving incisions made over the sternal notch to allow access into the mediastinum with a mediastinoscope. The primary difference between the two procedures is in the size and location of the incision [32]. Biopsies may be taken from the nodes or other suspicious structures. Mediastinoscopy is considered to be the long-standing "criterion standard" for evaluating mediastinal lymph nodes; however, it is a high-risk procedure, typically used prior to surgery to confirm or exclude the presence of tumor in enlarged nodes [24; 68; 69; 70]. Studies have shown that mediastinoscopy may be replaced by newer, more well-tolerated technologies, such as EBUS, which are safer and generally preferred by patients. Training to either maintain mediastinoscopy procedures skills or to elevate levels of accuracy for technologies such as EBUS is necessary to ensure a consistent level of accuracy between mediastinoscopy and other evaluation options [71].

Thoracenteses are done to obtain pleural fluid for analysis. They are most often performed when the patient has a pleural effusion [24]. In this procedure, fluid is removed, thereby improving the patient's comfort while also allowing that fluid to be sent to the laboratory for examination [32]. Local anesthetic is given to allow insertion of a trocar into the chest. In some cases, fluoroscopy is used to direct the needle insertion. ***Table 3*** provides more detail regarding thoracentesis.

In 2004, the FDA approved a CT system called the superDimension/Bronchus system (SDBS), a minimally invasive device used to diagnose lung cancer. It has undergone several series of hardware and software upgrades since its approval and is currently the most widely used navigational bronchoscopy system [72]. The SDBS uses overlaid CT images to navigate to lesions in the lungs in real time and has a greater capability to reach peripheral masses, lymph nodes, and areas outside the range of a traditional bronchoscopy [73; 74]. The procedure is proven to be safe, effective, and useful in establishing a diagnosis of lung cancer, especially when combined with other biopsy modalities [73; 74; 75]. Other navigational systems include the SPiN Thoracic Navigation System and Archimedes. The SPiN system features electromagnetic sensors that allowing tracking of the instrument position and target lesion. Archimedes is a virtual planning and navigational platform that displays an endoscopic map adjacent to the live endoscopic image [72].

THORACENTESIS	
Definition	The removal of fluid from the pleural space.
Purpose	To relieve pressure on the lungs by removing accumulated fluid; to withdraw fluid for laboratory analysis.
Procedure	Thoracentesis is usually performed at the patient's bedside. Baseline vital signs are taken before the procedure begins and are reassessed during and after the procedure. A narcotic or sedative may be administered prior to the procedure to relieve pain and/or relax the patient. Most often, patients are positioned sitting on the edge of the bed with legs supported and their head resting on their arms, atop a pillow, which has been positioned on an overbed table. This allows the physician access to the patient's back. The patient should have each step explained and should be reassured during this uncomfortable procedure. Patients should be reminded not to cough, sigh, or jerk away during the procedure, as this could cause an inadvertent puncture of other organs. If a patient needs to cough, he or she should be told to signal, so that the procedure can be stopped momentarily and the needle pulled back slightly. Local anesthetic is injected at the site of the insertion. A 17- or 18-gauge needle is inserted into the pleural space and fluid is withdrawn. If more than a few milliliters of fluid are removed, tubing may be attached for drainage.
Complications	Hypovolemic shock is possible if large amounts of pleural fluid are removed rapidly. Pneumothorax may occur and happens frequently enough that chest x-rays are routinely taken postprocedure as a precautionary measure.

Source: Compiled by Author *Table 3*

CLASSIFICATION AND STAGING

Four histologic types account for more than 95% of all primary lung neoplasms; they are SCLC and the NSCLCs of squamous cell carcinoma, adenocarcinoma, and large cell carcinoma [76].

Bronchogenic carcinoma cells have the ability to differentiate into squamous, glandular, or neuroendocrine structures. A patient may be diagnosed with one particular cancer, perhaps adenocarcinoma, but within that tumor more than one type of cell may be found (mixed cell type). As a result, when a biopsy is taken, although one particular sample may indicate a certain diagnosis, another sample may indicate something else. It is important that a larger sample be taken so that all possible mutations may be seen.

Even more enigmatic is the propensity for the cells to alter their cell type after being treated with chemotherapy or radiation. To avoid total confusion when keeping tumor registry records and other studies, the type of tumor first listed as the diagnosis is the one that will be kept throughout the patient's illness.

STAGING CRITERIA

Staging of any tumor is done to determine the extent of the disease and the prognosis, to select patients for surgical or other intervention modalities, and to decide on a plan of treatment. The extent of the disease is the most important prognostic indicator. To determine this, a staging system has been developed by the American Joint Committee on Cancer (AJCC). This widely used TNM tumor classification system examines and classifies three different aspects of the cancer's development and growth: tumor, regional lymph node involvement, and metastasis (***Table 4***). "T" indicates the features of the primary tumor; "N" indicates metastasis to regional lymph nodes; and "M" indicates the presence or absence of distant metastases. Based on the presence and extent of these three aspects, the cancer may be staged (***Table 5***). It is this set of criteria that tumor registrars use to classify cancers and compile statistics for study and research [37; 77; 78].

ELEMENTS OF LUNG CANCER STAGING			
Code	**Description**		
Primary Tumor (T)			
TX	Primary tumor cannot be evaluated or malignant cells detected in sputum or bronchial washing, but not visualized through x-rays or bronchoscopy		
T0	No evidence of primary tumor		
Tis	Carcinoma in situ (only diagnosed after resection of tumor)		
T1: Tumor 3 cm or less in greatest dimension, surrounded by lung or visceral pleura; no invasion beyond lobar bronchus		T1a(mi)	Minimally invasive, irrespective of size
		T1a	Tumor 1 cm or less in greatest dimension
		T1b	Tumor more than 1 cm but 2 cm or less in greatest dimension
		T1c	Tumor more than 2 cm but 3 cm or less in greatest dimension
T2: Tumor more than 3 cm but 5 cm or less in greatest dimension, or tumor with any of the following features: involves main bronchus without carina, regardless of distance; invades visceral pleura (PL1 or PL2); associated with atelectasis or obstructive pneumonitis that extends to the hilar region but does not involve the entire lung		T2a	Tumor more than 3 cm but 4 cm or less in greatest dimension
		T2b	Tumor more than 4 cm but 5 cm or less in greatest dimension
T3	Tumor more than 5 cm but less than 7 cm or that directly invades any of the following: parietal pleural (PL3), chest wall (including superior sulcus tumors), diaphragm, phrenic nerve, mediastinal pleura, parietal pericardium; or tumor in the main bronchus less than 2 cm distal to the carina but without involvement of the carina; or associated atelectasis or obstructive pneumonitis of the entire lung or separate tumor nodule(s) in the same lobe		
T4	Tumor more than 7 cm in greatest dimension with extensive invasion of the mediastinum, diaphragm, heart, great vessels, trachea, esophagus, recurrent laryngeal nerve, carina, or vertebral body; or tumor with malignant pleural effusion; or satellite tumor nodule(s) within the ipsilateral primary lobe of the lung		
Regional Lymph Node Involvement (N)			
NX	Regional lymph nodes not assessable		
N0	No regional lymph node metastasis		
N1	Metastasis to ipsilateral peribronchial and/or ipsilateral hilar nodes and intrapulmonary nodes, including direct extension		
N2	Metastasis to ipsilateral mediastinal and/or subcarinal nodes		
N3	Metastasis to contralateral mediastinal, contralateral hilar, ipsilateral or contralateral scalene, or any supraclavicular nodes		
Distant Metastasis (M)			
MX	Distant metastasis not assessable		
M0	No distant metastasis		
M1: Distant metastasis		M1a	Separate tumor nodule(s) in a contralateral lobe, tumor with pleural nodules or malignant pleural (or pericardial) effusion
		M1b	Single extrathoracic metastasis, including single non-regional lymph node
		M1c	Multiple extrathoracic metastases in one or more organs

Source: [37] *Table 4*

STAGES OF LUNG CANCER			
Stage	**Primary Tumor**	**Node Involvement**	**Metastasis**
Occult	TX	N0	M0
Stage 0	Tis	N0	M0
Stage IA1	T1mi or T1a	N0	M0
Stage IA2	T1b	N0	M0
Stage IA3	T1c	N0	M0
Stage IB	T2a	N0	M0
Stage IIA	T2b	N0	M0
Stage IIB	T1a, T1b, T1c, T2a, or T2b	N1	M0
	T3	N0	M0
Stage IIIA	T1a, T1b, T1c, T2a, or T2b	N2	M0
	T3	N1	M0
	T4	N0	M0
	T4	N1	M0
Stage IIIB	T1a, T1b, T1c, T2a, or T2b	N3	M0
	T3 or T4	N2	M0
Stage IIIC	T3 or T4	N3	M0
Stage IVA	Any T	Any N	M1a or M1b
Stage IVB	Any T	Any N	M1c

Source: [37] *Table 5*

The Veterans Administration Lung Study Group has been the basis for treatment recommendations for SCLC for decades. This system classifies patients as having either limited-stage disease (i.e., tumor confined to one hemithorax and to the regional lymph nodes) or extensive-stage disease (i.e., tumor beyond this area in contralateral lung or extrathoracic sites). In 2009, the International Association for the Study of Lung Cancer (IASLC) launched a lung cancer staging project (using the sixth edition of the AJCC TNM staging system) designed to analyze clinical TNM staging for SCLC. The IASLC found a better correlation of patient survival when the TNM staging system was used and recommended that the AJCC TNM staging system be adopted more uniformly. These recommendations were incorporated into the seventh edition of the AJCC staging manual, and all cancer cases diagnosed between 2010 and 2017 use the seventh edition criteria. In 2017, updates based on new evidence in clinical cancer care were incorporated into the eighth edition of the AJCC TNM staging system, and all cases of cancer diagnosed after January 1, 2018 use the updated staging criteria [37; 38; 77].

CLASSIFICATION OF SMALL CELL LUNG CANCER

There are two subtypes of SCLC: small cell carcinoma and combined small cell carcinoma (i.e., SCLC combined with neoplastic squamous and/or glandular components). The classification of "SCLC combined" is used when at least 10% of the tumor bulk is composed of an associated non-small cell component. "SCLC" is reserved for tumors with pure SCLC histology [79].

As previously noted, SCLC accounts for approximately 10% to 15% of all bronchogenic carcinomas in the United States [34; 35; 79]. Without treatment, it is a highly aggressive malignancy with a median survival rate of only two to four months from the time of diagnosis. The overall survival at five years is 5% to 10% [79]. Approximately two-thirds of patients with SCLC have bilateral lung involvement at the time they are diagnosed [79]. Because distant metastasis is often present, SCLC is almost always considered metastatic. When found early, it is particularly sensitive to chemotherapy and radiation therapy; however, a cure is difficult to achieve. As discussed, SCLC is the cancer most commonly associated with paraneoplastic syndromes [79].

CLASSIFICATION OF NON-SMALL CELL LUNG CANCERS

There are several types of NSCLC, each with a different kind of cancer cell that grows and spreads in different ways [39]. Squamous cell carcinoma, also called epidermoid carcinoma, arises from the flat, scaly, stratified columnar epithelial cells that line the airways. It is almost always related to smoking and accounts for about 25% to 30% of all diagnosed cases [33; 38; 80]. Squamous cell carcinoma tends to be located centrally, causing atelectasis and pneumonia before it metastasizes. Squamous cell cancers grow slowly and are easier to surgically resect than some of the other types. Because of this, the prognosis is better for these patients [39]. One lesion most often caused by squamous cell carcinoma is Pancoast tumor. This cancer is located high in the lung apex, causing pain in the shoulder and radiating down the ulnar nerve distribution path [33].

Adenocarcinoma is the most common lung cancer. It represents approximately 40% of all cases and is increasing in frequency [33; 39; 80]. It is easy to diagnose, as it is most often located peripherally and can be readily visualized on chest x-rays. Adenocarcinoma metastasizes rapidly, and patients are often found to have distant lesions at the time of diagnosis [39]. Common sites for metastasis include the brain, bone, liver, kidneys, and the other lung [15]. A subtype of adenocarcinoma, adenocarcinoma in situ, is characterized by pneumonia-type infiltrates present on chest x-ray films. Patients with this subtype often have a better prognosis than those with other types of lung cancer [33].

Large cell carcinoma is the least common of the three major types of lung cancer, accounting for about 10% to 15% of cases [33; 39; 80]. It has characteristics similar to adenocarcinoma, but microscopically, the cells appear different. Metastasis occurs frequently, with the gastrointestinal tract being the most common site of metastatic symptoms. With improved histopathologic procedures and the use of electron microscopy, most NSCLCs that would previously have been classified as large cell carcinomas are instead identified as undifferentiated adenocarcinomas or SCLCs. Large cell undifferentiated carcinomas have the same prognosis as adenocarcinomas [33].

Other less common types of NSCLC include [38]:

- Pleomorphic
- Carcinoid
- Salivary gland carcinoma
- Unclassified carcinoma

Malignant mesothelioma is a type of lung cancer that tends to be grouped into the "other" category, mainly because there are fewer patients with the disease. Asbestos has been identified as the main carcinogen involved in the development of mesothelioma. Even when exposure is brief and occurs many years prior to the tumor development, a link may often be found. In most cases, the exposure was heavy and patients often have a history of asbestosis prior to the appearance of the mesothelioma [81]. Approximately 80% of patients diagnosed with mesothelioma also report a history of asbestos exposure [81; 82].

Prognosis in mesothelioma is difficult to assess because of the variability in the time before diagnosis and the rate of disease progression. The latency period between a patient's first exposure to asbestos and the manifestation of disease is generally between 20 to 40 years [82; 83; 84]. On a cellular level, mesothelioma is similar to several different cancer types, including adenocarcinoma and metastases [83]. Immunohistochemistry and electron microscopy are the most common tools used to identify malignant mesothelioma and to distinguish between it and lung adenocarcinoma [24; 81]. It may be difficult to differentiate mesothelioma from adenocarcinoma on small tissue specimens; therefore, obtaining a tissue sample, usually through thoracoscopy, is generally necessary for diagnosis [81]. Because it is usually advanced by the time it is diagnosed, prognosis in mesothelioma is poor. For patients with malignant pleural disease, the median survival time with trimodal treatment is 16 to 19 months; for those with extensive disease, the median survival time is four to eight months [81].

TREATMENT

After the tissue type has been confirmed and the stage has been determined, treatment options may be discussed with the patient and the patient's family. It is critical that all healthcare professionals thoroughly understand each type of treatment in order to answer questions posed by the patient and family as they work through the decision-making process.

Patients commonly ask about the quality of life that can be anticipated after the treatment decision has been made. The components of treatment, such as discomfort, pain, nausea, hospitalization, and loss of time with friends and family, should all be weighed against the possibility of a longer life. The course of treatment is ultimately the patient's decision, and it is helpful to answer questions and provide acceptance no matter what choice is made.

SURGERY

Surgery is a frequent and logical choice for removing a cancer. Many patients respond to the announcement of their diagnosis with comments indicating that they want the cancer removed from their body immediately. While this is not always an option, it is the best choice for many patients (e.g., those with stage I or stage II disease) [24; 85]. In general, the type of surgery performed depends upon the extent of the disease [24].

The American College of Chest Physicians recommends that patients with lung cancer be assessed for curative surgical resection by a multidisciplinary team, which includes a thoracic surgeon specializing in lung cancer, a medical oncologist, a radiation oncologist, and a pulmonologist.

(https://journal.chestnet.org/issue/S0012-3692(13)X6006-4. Last accessed August 16, 2021.)

Strength of Recommendation: 1C (Strong recommendation based on low-quality evidence that the benefits outweigh the risks/burdens)

The surgical procedures used to remove lung cancers include wedge resection, lobectomy, pneumonectomy, and sleeve resection. Wedge resection removes the tumor and a small amount of the normal surrounding tissue (called "segmental resection" or "segmentectomy" when more tissue is taken). Lobectomy removes the affected lobe of the lung, whereas pneumonectomy removes an entire lung. The sleeve resection removes only part of the bronchus [24; 38]. According to the American College of Surgeons Oncology Group, a complete mediastinal lymphadenectomy should obtain one or more lymph nodes from each mediastinal station [86]. For cancers on the right side, lymph nodes should be removed from stations 2R, 4R, 7, 8, and 9; in cases of left-sided cancers, stations 4L, 5, 6, 7, 8 and 9 should be sampled.

Surgery may be performed for the treatment of [24; 38]:

- Occult NSCLC (depending on where the cancer has spread)
- Stage 0 (carcinoma in situ) NSCLC
- Stage I or stage II NSCLC
- Stage IIIA NSCLC, with or without radiation therapy

Approximately 20% of NSCLC patients are at stage I or stage II at the time of diagnosis [87]. These patients have traditionally been treated with surgical resection alone; however, adjuvant treatment in these early-stage patients has shown promise [87]. A few stage IIA patients may be helped by surgical resection, but those at stage IIB or beyond are not considered surgical candidates. NSCLC is considered inoperable when there is distant metastasis, esophageal obstruction, or involvement into the chest wall or mediastinum. Sleeve lobectomy is generally preferred over pneumonectomy when anatomically appropriate. In patients with severely reduced pulmonary function who are otherwise not candidates for surgery, the use of lung-sparing surgeries (i.e., wedge resection) is controversial [24]. Surgical resection of a solitary metastasis (particularly a brain metastasis) may improve survival in select patients with stage IV disease. Resection of metastasis in other sites remains controversial [24].

Patients who are diagnosed with SCLC are generally considered to be metastatic at diagnosis and therefore are not usually advised to consider surgery. Fewer than 1 out of 20 patients with SCLC will have cancer in only one localized tumor nodule, with no spreading. Those who do have surgery combine it with another treatment, such as chemotherapy [79]. Preoperatively, patients should be advised of what to expect with the surgical experience. Patients tend to do better postoperatively if, prior to surgery, they are told or shown [88]:

- The extent and exact location of the wound
- The purpose and necessity of chest tubes
- Pain medication procedures
- How to splint the chest for proper coughing and deep breathing
- To refrain from smoking both before and after surgery
- That oxygen will be provided postoperatively
- Leg exercises to complete while recovering in bed

If there are critical pathways in place in the hospital where the patient will be admitted, these should be reviewed to allow the patient to anticipate the flow of postoperative events. For nurse case managers working inside the hospital, the primary postoperative focus will be on maintaining the patient's immediate bodily functions: airway, secretions management, intravenous (IV) fluids and medications, wound care, and chest tube maintenance. As the patient progresses, an increase in activity and dietary intake should be encouraged, with the anticipated outcome of discharging to home.

Case managers working outside the hospital setting may or may not have direct contact with patients before surgery or communication with the hospital case manager during the patient's hospitalization. If contact is established, these case managers will help to coordinate the postdischarge plans and will follow the patient to home, hospice, or other facility as necessary.

CHEMOTHERAPY

Non-Small Cell Lung Cancer

The patient with NSCLC may receive chemotherapy in combination with radiation and/or surgery, as determined by the stage of the disease and the patient's overall health status [38]. Research has indicated that adjunctive chemotherapy, in addition to surgery, radical radiotherapy, or supportive care, is effective in improving overall survival rates and disease-related symptoms [38]. However, it is not recommended for use in patients with stage IA or stage IB NSCLC [38; 89]. The agents most commonly used for initial chemotherapy with NSCLC are [24; 90; 91]:

- Cisplatin
- Carboplatin
- Paclitaxel
- Docetaxel
- Gemcitabine
- Vinorelbine
- Irinotecan
- Etoposide
- Vinblastine
- Pemetrexed (as maintenance therapy with advanced or metastatic NSCLC)

Surgery, chemotherapy, and radiation therapy may all be used to treat stage III NSCLC; however, there is ongoing debate about which modalities to use and in what sequence. For example, combined modality therapy (chemoradiation) has been shown to be more effective than radiation alone for patients with unresectable stage IIIA or stage IIIB disease, and concurrent chemoradiation has been shown to be superior to radiation alone and sequential chemotherapy followed by radiation. The preferred concurrent chemoradiation regimens include carboplatin/pemetrexed, cisplatin/pemetrexed, paclitaxel/carboplatin, and cisplatin/etoposide [24]. Preoperative (i.e., neoadjuvant) chemotherapy has shown promise of increasing survival in patients with stage III disease. Cisplatin/pemetrexed, cisplatin/gemcitabine, and cisplatin/docetaxel are the preferred regimens [24]. Combined-modality therapy with neoadjuvant chemotherapy has been recommended for patients with good overall health status and stage IIIA NSCLC. Patients with poor health status are best managed with chest radiation therapy [38]. Patients who meet certain criteria may benefit from the addition of targeted therapy drugs (e.g., bevacizumab, cetuximab) to initial treatment [24].

Targeted Therapy for NSCLC

Targeted therapy drugs work differently than standard chemotherapy drugs by specifically targeting the gene changes in cells that cause cancer. They are most frequently used in conjunction with chemotherapy or when chemotherapy is no longer working. They produce different side effects than standard drugs (e.g., bleeding with bevacizumab) [38]. Chemotherapy generally consists of adjunctive treatment with two or more medications. Cisplatin or carboplatin in combination with radiotherapy have traditionally been the most common medications used to treat NSCLC [15; 33]. Adjuvant cisplatin-based chemotherapy has been recommended for patients with stage IIA, stage IIB, and stage IIIA disease [33; 38; 89]. Newer drugs that are active against stage IV NSCLC include the taxanes (e.g., paclitaxel, docetaxel), vinorelbine, the camptothecin analogs (e.g., irinotecan, topotecan), gemcitabine, and pemetrexed. In 2019, the FDA expanded approval of pemetrexed to include use for treatment of advanced NSCLC not caused by a gene mutation [91]. Many oncologists use pemetrexed-based regimens because taxane-based regimens are associated with more toxicity (e.g., neurotoxicity) [24].

In 2022, the FDA approved the first immune checkpoint inhibitor (nivolumab) for the treatment of NSCLC [168]. This agent is used in combination with platinum-doublet chemotherapy, regardless of PDL-1 status.

Combinations of these drugs have produced one-year survival rates greater than those produced by single agents alone [24]. Common chemotherapy regimens for stage IV NSCLC include cisplatin/pemetrexed, carboplatin/pemetrexed, and carboplatin/paclitaxel with or without bevacizumab. Additional regimens include gemcitabine/carboplatin and gemcitabine/cisplatin [24]. In instances where at least one prior chemotherapy regimen has failed, the FDA has approved the use of nivolumab (preferred), pembrolizumab (preferred), and atezolizumab (preferred) for the treatment of patients with locally advanced or metastatic NSCLC. The NCCN NSCLC Panel recommends durvalumab for patients with unresectable stage III NSCLC who have not progressed after two or more cycles of treatment [24].

Since 2013, advancements in the identification of gene deletions, rearrangements, and mutations has led to several new medications being approved for the treatment of NSCLC and updated guidelines for first-line treatment. Newer targeted therapy has been rapidly developed for several gene mutations involved in cancer, including [24; 43; 91; 92; 93]:

- Epidermal growth factor receptor (EGFR): Protein found on the surface of some cells to which EGF binds, causing the cell to divide
- Anaplastic lymphoma kinase (ALK): Protein involved in cell growth
- ROS1: Protein involved in sending signals in cells and cell growth; similar structure to ALK
- *BRAF*^{V600E}: Gene that produces protein involved in sending signals in cells and cell growth
- Programmed death-ligand 1 (PD-L1): Protein found on cancerous cells that suppresses immune activity
- Mesenchymal-epithelial transition (*MET*) gene: Proto-oncogene implicated in 25% to 70% of all NSCLC
- Neurotrophic tyrosine receptor kinase (*NTRK*) fusion-positive solid tumor

First-Line Treatment of NSCLC with EGFR Mutation

In 2013, the FDA approved the first automated molecular assay that is able to differentiate metastatic NSCLCs that are or are not susceptible to erlotinib [94]. The *EGFR* Mutation Test is approved to detect and identify mutations of the *EGFR* gene in DNA derived from NSCLC tumor tissue, allowing for personalized medical treatment for the 10% to 30% of patients with lung cancer known to have one of these mutations. Also in 2013, the *EGFR* inhibitor afatinib was approved for the treatment of patients with metastatic NSCLC that expresses *EGFR* gene mutations, followed by gefitinib in 2015 and osimertinib in 2018 [92; 95; 96; 97]. In 2018, the FDA also approved dacomitinib as an initial treatment for NSCLC with *EGFR* mutations [25; 91; 98]. In 2019, the FDA approved osimertinib as an adjuvant treatment for NSCLCs with *EGFR* mutations [99]. In 2021, the FDA approved Rybrevant (amivantamab-vmjw) as the first treatment for adult patients with NSCLC whose tumors specifically have EGFR exon 20 insertion mutations [166]. Among these drugs, gefitinib and erlotinib are generally regarded as the standard of care; however, studies of osimertinib have shown a higher response rate and response duration [97; 100]. The 2021 NCCN guidelines recommend afatanib, erlotinib, dacomitinib, gefitinib, or osimertinib as a first-line therapy in patients with NSCLC with *EGFR* mutation [24].

First-Line Treatment of NSCLC with ALK Rearrangement

Crizotinib, an ALK-inhibitor, was approved by the FDA for ALK-positive NSCLC in 2011 [101]. In 2014, another ALK-inhibitor, ceritinib, received accelerated FDA approval for patients who were intolerant or whose disease progressed while taking crizotinib. In 2017, ceritinib was granted regular FDA approval with the addition of approval as a first-line treatment [102]. In 2015, alectinib was granted accelerated FDA approval for treatment of patients with ALK-positive NSCLC, and the drug received regular FDA approval in 2017 [101]. Also in 2017, the FDA granted accelerated approval to brigatinib for treatment of patients with ALK-positive NSCLC who have either progressed on or are intolerant to crizotinib [25; 103]. Brigatinib was moved from "other recommended" to "preferred" first-line therapy in the 2021 NCCN guidelines [24]. The guidelines also added lorlatinib as a first-line, preferred treatment option with a category 1 recommendation [24]. The 2021 NCCN and American Society of Clinical Oncology (ASCO) guidelines recommend alectinib as the preferred drug of choice for ALK-positive NSCLC due to evidence of halting cancer growth longer while also causing fewer side effects than crizotinib in phase III clinical trials [104]. It should be noted that ALK-inhibitors are only considered FDA-approved after an FDA-approved test for ALK returns positive [104].

First-Line Treatment of NSCLC with ROS1 Rearrangement

As of 2021, entrectinib and crizotinib are FDA-approved for treatment of NSCLC with *ROS1* rearrangement-positive disease [24]. Entrectinib was granted accelerated approval by the FDA in 2019 for this indication [105]. Because of the similar structure of *ALK* and *ROS1* genes, the NCCN guidelines recommend ceritinib as an "other recommended" first-line treatment, although entrectinib and crizotinib are the preferred treatments [24].

First-Line Treatment of NSCLC with BRAF^{V600E} Mutation

In 2017, dabrafenib and trametinib were granted approval for NSCLC with *BRAF^{V600E}* mutation when administered in combination [106]. This is the first approved chemotherapy for this type of gene mutation disease process, and these agents are recommended in the 2021 NCCN treatment guidelines [24].

First-Line Treatment of NSCLC with PD-L1 Rearrangement

In 2016, pembrolizumab was FDA approved as a first-line treatment for NSCLC with expression of PD-L1 on at least 50% of the tumor cells [92; 107]. The 2021 NCCN treatment guidelines and 2017 ASCO guidelines recommend pembrolizumab alone as first-line treatment in patients with this gene mutation. Additionally, the FDA granted accelerated approval in 2017 for pembrolizumab in combination with pemetrexed and carboplatin or pemetrexed and cisplatin for patients with previously untreated, advanced nonsquamous NSCLC, regardless of whether PD-L1 is present [108].

The 2021 NCCN treatment guidelines also recommend atezolizumab as a preferred first-line treatment for NSCLC with expression of PD-L1 on at least 50% of the tumor cells [24]. Cemiplimab was FDA approved in 2018 for treatment of patients with locally advanced or metastatic NSCLC [109]. It is an immune checkpoint inhibitor administered subcutaneously at a dose of 350 mg once every three weeks. Common adverse reactions include hypertension, pruritus, and fatigue [25]. Cemiplimab is included in the 2021 NCCN guidelines as a preferred, category 1 treatment option for PD-L1 expression positive (≥50%) NSCLC [24].

First-Line Treatment of NSCLC with MET Gene Exon 14 Skipping

In 2020, the FDA approved the first medication (capmatinib) for the treatment of NSCLC with mutations leading to *MET* or *MET* exon 14 skipping [110]. Capmatinib is a kinase inhibitor administered at an oral dosage of 400 mg twice daily. Common side effects include peripheral edema, nausea, fatigue, vomiting, dyspnea, and decreased appetite [25; 110]. The tyrosine kinase inhibitor tepotinib also is included as a first-line treatment option for this gene mutation [24].

First-Line Treatment of NSCLC with NTRK Fusion-Positive Solid Tumor

In 2018, the FDA granted accelerated approval to larotrectinib for adult and pediatric patients with solid tumors that have a *NTRK* gene fusion [111]. Larotrectinib is a potent and highly selective TRK inhibitor with anti-tumor activity. The usual oral dose is 100 mg twice daily. Common adverse reactions include peripheral edema, neurotoxicity, anemia, and hypoalbuminemia [25].

In 2019, the FDA granted accelerated approval to the TRK inhibitor entrectinib for patients 12 years of age and older with a *NTRK* gene fusion [105]. Entrectinib is orally dosed at 600 mg once daily, until disease progression or unacceptable toxicity is reached [25]. The most serious adverse events include congestive heart failure, central nervous system effects, skeletal fractures, and QT interval prolongation [25; 105]. The 2021 NCCN guidelines recommend larotrectinib or entrectinib as either first-line or subsequent therapy options for patients with *NTRK* gene-fusion-positive NSCLC [24].

First-Line Treatment of NSCLC with KRAS Mutation

In 2021, the FDA approved sotorasib as the first treatment for adult patients with NSCLC whose tumors have KRAS G12C mutation and who have received at least one prior systemic therapy [167]. This is the first approved targeted therapy for tumors with any KRAS mutation, which accounts for approximately 25% of mutations in NSCLC. Sotorasib is dosed at 960 mg once daily until disease progression or unacceptable toxicity. common side effects include fatigue, musculoskeletal pain, and diarrhea.

Small Cell Lung Cancer

SCLC, which is often considered a systemic disease due to its common metastasis, is customarily treated with chemotherapy. It is not unusual to administer radiation to shrink the tumor and chemotherapy to discourage the growth of metastatic cells. While chemotherapy often increases survival time, actual remission is rare. Research has indicated that increased doses or more intensive chemotherapy has no correlation to survival rates for patients with SCLC [79]. A combined modality treatment that includes chemotherapy and thoracic radiation therapy (TRT) is considered to be the standard treatment for patients with limited-stage disease SCLC (the optimal dose and timing of TRT is a subject of ongoing controversy). The combination of chemotherapy/TRT has been shown to produce an improvement in survival of 5% at three years when compared to chemotherapy alone [79]. The most common combined chemotherapy regimens for initial use with SCLC are [32]:

- Cisplatin and etoposide
- Carboplatin and etoposide
- Cisplatin and irinotecan
- Carboplatin and irinotecan

The 2021 NCCN guidelines for SCLC list combination cisplatin/etoposide as the preferred regimen for limited-stage disease [112].

Chemotherapeutic drugs are considered to be either cell cycle phase specific or cell cycle phase nonspecific. The cell cycle phase-specific drugs work on cells undergoing cell division and are therefore more efficient in cases of rapid cell division. This class includes antimetabolites and vinca plant alkaloids. Examples of cell cycle phase-nonspecific drugs are alkylating agents, antitumor agents, hormones, and nitrosoureas. This class of chemotherapy is generally indicated for cells with longer division times. Some drugs may be both specific and nonspecific. Corticosteroids are often used concomitantly with other chemotherapeutic medications due to their anti-inflammatory and appetite stimulatory effects [113]. Chemotherapeutic agents that are cell cycle phase specific are given on a schedule to maximize their effect on the particular cell being treated. Some are given daily for one to three weeks, then stopped for one week before repeating the schedule again. Others are given daily for longer periods of time.

Although a single drug may work, drug combinations have an improved result. The combinations of drugs are commonly known by their initials or as acronyms; however, these acronyms can be confusing and potentially dangerous, as they are sometimes used to define more than one regimen. It is for this reason that the Institute for Safe Medication Practices has recommended against the use of acronyms or abbreviations when prescribing and has placed chemotherapeutic agents on its List of High-Alert Medications [114; 115].

In addition to these combination regimens, several agents that specifically target lung tumors are being investigated [116]. Physicians and pharmacists should have a good understanding of the most common and current regimens in use and be able to answer any questions the patient may have.

Chemotherapy may be administered orally, intracavity, or intrathecal. However, most drugs are administered intravenously, and some (e.g., vincristine) must only be administered intravenously [117]. Chemotherapy is administered in a variety of settings, including the acute hospital, outpatient ambulatory care centers, physicians' offices, subacute care centers, or patients' homes with the assistance of home health nurses.

Chemotherapeutic agents are destructive to tissue cells, so care should be taken in handling the solution to avoid spills or extravasation, which would be harmful to the patient. When handling chemotherapeutic agents, healthcare professionals should wear protective eyewear, gowns, and gloves [118]. Gloves should be changed between preparation and administration and again every half hour throughout the process.

When etoposide is given, either a glass bottle and non-polyvinyl chloride (PVC) tubing or PVC equipment may be used [25]. Some facilities have opted to use non-PVC tubing as a means of minimizing diethylhexyl phthalate (DEHP) exposures. Paclitaxel and docetaxel have an incompatibility with PVC and require the use of either glass or non-PVC containers [25]. All supplies used in the administration of chemotherapy should be sealed in a leak-proof container that has been marked as "chemotherapy" and discarded using regulated hazardous waste disposal procedures [25].

Side Effects

Although extensive research has been undertaken in an effort to minimize the adverse effects of chemotherapy, nausea and vomiting remain among the stressful side effects of treatment. Antiemetics are generally given immediately prior to the chemotherapy infusion; they may also be ordered after treatment to help prevent delayed emesis. It is often helpful for patients to avoid foods with strong scents or spiciness, as they may encourage nausea [36]. It is important that patients be made aware of the seriousness of dehydration. If unable to keep food or fluids down, they should notify a physician to begin intravenous rehydration. Adequate hydration is of particular importance when patients are receiving cisplatin, which is nephrotoxic. Patients receiving cisplatin should be encouraged to increase fluid intake to at least 2,000 cc per day [25]. Cisplatin, vinorelbine, docetaxel, or paclitaxel may damage nerves, which can lead to peripheral neuropathy [32].

Alopecia, or hair loss, generally occurs two to three weeks after chemotherapy is initiated. Because hair follicle cells divide rapidly, they are affected by the cell cycle-specific forms of chemotherapy. Hair grows back (generally within two to three months) after the treatment is discontinued. However, while enduring treatment, patients may be sensitive regarding their appearance. The use of a hat, scarf, or wig may help raise spirits [119]. Chemotherapy agents that seem to have the greatest tendency towards alopecia include cyclophosphamide, doxorubicin, etoposide, and vincristine. Some hair thinning may also occur with mitomycin and vinblastine [25].

Other side effects from chemotherapy include anorexia, constipation, cystitis, diarrhea, fatigue, allergic reactions, and neurotoxicity [32; 36]. Cisplatin has been specifically associated with ototoxicity [25].

Clinical Trials

Some patients may be asked to participate in clinical trials of chemotherapeutic drugs. The NCCN recommends participation in a clinical trial for any patient with cancer [112]. Government agencies, such as the National Institutes of Health (NIH), National Cancer Institute, Department of Defense, and Department of Veterans Affairs, as well as physician organizations, medical institutions, foundations, and pharmaceutical companies, sponsor, conduct, and fund research into the treatment of cancer of all types and test possible chemotherapy medications [120]. These trials may be performed either within the NIH campus (intramural research studies) or at participating facilities around the country (extramural research studies).

Clinical trials in the United States undergo four phases. Phase I determines the maximum tolerated human dose and the method of administration. Phase II evaluates the antitumor properties of a drug and the safety and efficacy of the drug. Phase III establishes the value of the treatment by random and comparative study with a current standard therapy, and phase IV evaluates the long-term safety and efficacy of the treatment [121; 122]. It is vital to ensure that patients understand the rules of participation.

This is done by explaining the protocol that will be used for conducting the trial and by adhering to the trial's specific eligibility criteria. Additional areas under evaluation include [112]:

- Combining local treatment (surgery)
- Regional treatment (radiation therapy)
- Systemic treatments (e.g., chemotherapy, immunotherapy, targeted agents)
- Developing more effective systemic therapy

Aside from chemotherapy, several alternative modalities, such as stem cell and bone marrow transplantation, are in clinical trials to determine their effectiveness in the treatment of lung cancer.

RADIATION THERAPY

Radiation therapy is defined as the use of ionizing radiation to kill cancer cells. It is usually considered local therapy because it treats only the cells at which the radiation is directed; however, systemic radiation therapy, or introduction of radioactive material (i.e., radiopharmaceuticals) into the circulatory system, is also available. When healthy cells surrounding the cancerous lesion are exposed to radiation, they may also be destroyed; however, they are better able to repair DNA damage than are cancer cells. Radiation treatments may be administered IV or orally, whichever is determined most effective to treat the specific tumor type and magnitude [123; 124].

External beam therapy, or teletherapy, can be delivered by several different types of machines, depending on the type and extent of the tumor [123]. The linear accelerator is the most commonly used machine. With the linear accelerator, electrons bombard a target and produce high-energy photons. Because the electrons have both mass and charge, they lose energy more quickly than, for example, x-rays. This limits their ability to penetrate and minimizes damage to surrounding tissue. An extension of external beam therapy is conformal radiation therapy, which uses a three-dimensional CT scan of the affected area in order to better target the tumor. An extension of conformal therapy and a more advanced method is intensity-modulated radiation therapy (IMRT). The IMRT facilitates shaping of the intensity of the radiation beam, which allows for a more precise distribution of the desired dose around the target site [123; 124].

Prior to beginning any type of external radiation therapy, CT scans, MRIs, and/or other imaging results are studied to determine the exact area for the best effect of the radiation. The patient is tattooed or marked to ensure that the technician will correctly position the beam each time the treatment is given. Patients may also be fitted with a support to help them hold the correct position during the radiation therapy treatments [123; 124]. Patients should be told to allow one to two hours for the initial planning session prior to beginning treatment. Daily treatments usually take less than five minutes, but positioning may take a few minutes longer [124].

Both NSCLC and SCLC patients are likely to have courses of radiation therapy. NSCLC is treated most commonly with five treatments, also called "fractions," of external beam radiation per week for five to eight weeks. The amount of radiation and the duration of treatment with this therapy is dependent on the stage of the cancer and its responsiveness to treatment [124]. Research has supported the use of hyperfractionated accelerated radiotherapy, in which smaller radiation doses are administered several times a day five times a week, or continuous hyperfractionated accelerated radiotherapy, in which radiation is given several times a day every day, especially in later stages of lung cancer [125].

Intraoperative external beam radiation therapy may be an option for some patients, depending on the inaccessibility of their tumors or metastasis. During surgery, organs may be moved out of the line of radiation and treatment is given directly to the affected site [123; 124].

Internal radiation, known as brachytherapy, is the temporary or permanent implantation of radioactive isotopes. It provides an opportunity to deliver a large amount of radiation to a small site in a relatively short period of time. The usual procedure involves surgery to insert the wires, tubes, or needles into

the tumor. After the tubes are sutured into place, the patient is returned to the hospital room and the radioactive isotopes are loaded into the receptacles [123; 126].

Patients undergoing brachytherapy should be informed prior to the procedure that the staff caring for them will be maintaining precautions to prevent overexposure to the radioactive source. Nurses and other healthcare professionals should keep the time spent in close contact to a minimum and should encourage the patient to do as much self-care as possible. Shielding is placed in the room to protect workers from being exposed when doing tasks not directly involving the patient. When the radioactive substances have been removed from the patient, these precautions are no longer necessary.

Radiation therapy may cause a variety of side effects, including [123; 124]:

- Skin irritations (e.g., erythema, dryness, itching, flaking), which may progress to sloughing
- Fatigue and depression
- Anorexia, with weight loss and increased fatigue
- Stomatitis or painful, ulcerated areas in the mouth
- Bone marrow suppression (may be worse when bones are treated due to metastasis)
- Esophagitis, especially when the esophagus is within the area being irradiated
- Cough, often caused by material that had been trapped by the tumor being released into the alveoli
- Radiation pneumonitis, which generally occurs one to three months after the beginning of treatments
- Radiation fibrosis, which may occur 6 to 12 months after the treatments have been completed

Skin Care Issues

Skin reactions are normal and temporary side effects to radiation treatment. They are not the burns historically associated with radiation, but rather dryness, itchiness, and peeling. Some patients also experience increased tanning or pigmentation [123; 124].

As treatment continues, moist desquamation may occur in areas where skin surfaces meet. When this is the case, patients should be given a few days break from radiation therapy in order to allow for normal tissue healing. Desquamated areas are potential sites of infection and should be kept as clean as possible. The area can be gently irrigated with normal saline, and an ointment may be applied to soothe the exposed skin surfaces. The following are general skin care guidelines for patients receiving radiation therapy [124; 127]:

- Wash the skin with warm water and pat dry. For patients who do not have permanent ink dots, they should take care not to wash off skin markings.
- Use a mild soap that does not contain perfume or deodorant.
- Avoid the use of creams or lotions that contain perfumes or deodorants. These products may contain a heavy metal-ion residue that can irritate the skin.
- Hydrophilic creams and lotions may be used on the skin surface to prevent dryness. Petroleum jelly is not water-soluble and should be avoided.
- Avoid the use of cornstarch in the groin and buttock folds.
- Avoid tight-fitting garments that can rub or press against the skin. Loose-fitting cotton garments are the best.

PHOTODYNAMIC THERAPY

Photodynamic therapy (PDT) (also called photoradiation therapy, phototherapy, or photochemotherapy) combines a photosensitizing agent with a specific type of light. The FDA has approved porfimer sodium for use in PDT to treat symptoms of certain cancers, including endobronchial NSCLC. Porfimer is administered intravenously and retained in cancer cells at a greater concentration than healthy cells. A light source (e.g., laser, light-emitting diodes) is used to illuminate, via bronchoscopy, the photosensitized cells, which results in increased laser light uptake, photochemical reaction, and the subsequent death of cancer cells. Both primary and metastatic tumors present in the tracheal or bronchial passages respond to PDT. However, this treatment is not appropriate and not effective for all tumors (e.g., large tumors, those located in areas difficult to expose to light). The advantages of this therapy are that no resistance has been found and there are no significantly adverse side effects. Due to increased skin photosensitivity, patients who have undergone PDT should avoid sunlight for at least six weeks following treatment [128; 129].

EVIDENCE-BASED PRACTICE RECOMMENDATION

For patients with superficial limited mucosal lung cancer in the central airway who are not candidates for surgical resection, the American College of Chest Physicians recommends endobronchial treatment with photodynamic therapy, brachytherapy, cryotherapy, or electrocautery.

(https://journal.chestnet.org/issue/S0012-3692(13)X6006-4. Last accessed August 16, 2021.)

Strength of Recommendation: 1C (Strong recommendation based on low-quality evidence that the benefits outweigh the risks/burdens)

ALTERNATIVE THERAPIES

Alternative therapy encompasses any method used to treat cancer that is out of the mainstream of medical protocol. Patients who have a poor prognosis or who have not responded to conventional treatments may look to these methods as a source of hope. Some alternative therapies offer psychologic comfort, others are being investigated as possible advances in the treatment of lung cancer, and many are seriously questionable. Patients may feel they have nothing to lose by trying these methods, but alternative treatments may prove to be harmful if they result in [130]:

- Delaying legitimate treatment in lieu of questionable treatment
- Interference with legitimate treatment, such as a megadose of folic acid interrupting the antifolate action of methotrexate
- Great financial loss that leaves the patient and/or the patient's family impoverished
- Actual physical harm or poisoning

False therapies that should be avoided include devices that supposedly rid the body of tumors, hyperoxygenation products, diets that espouse only one or two foods and thereby deprive the body of needed nutrients, and psychic surgery.

Dietary approaches to cancer treatment have not been proven to diminish or eliminate cancer in the body. However, good nutrition strengthens the immune system, which in turn may help patients withstand the rigors of legitimate therapy.

It is helpful to be able to discuss these methods while encouraging adherence with the established protocol. Any question regarding the safety of herbs, foods, or other ingested substances should be referred to the physician and/or pharmacist immediately.

FIVE-YEAR RELATIVE SURVIVAL RATES BY CANCER TYPE BY STAGE AT DIAGNOSIS	
Stage	**Survival Rate**
Small Cell Lung Cancer	
Localized	29.3%
Distant	2.6% to 3.2%%
Non-Small Cell Lung Cancers	
Squamous cell carcinoma	
Localized	46.8%
Regional	26.8%
Distant	5.8%
Adenocarcinoma	
Localized	70.8%
Regional	44.5%
Distant	8.4%
Large cell carcinoma	
Localized	53.6%
Regional	28.9%
Distant	5.4%
Source: [131]	*Table 6*

THE CLINICAL COURSE OF LUNG CANCER

The clinical course and outcomes for patients diagnosed with lung cancer may vary widely from one patient to another. Prognosis is dependent on the extent of the disease, the cell type, and the patient's physical condition at the time of diagnosis.

The overall five-year survival rate for all patients not differentiated by type is 21.7% [7]. Because 57% of all patients have metastasis at the time of diagnosis, their prognosis is greatly impacted [38]. Women generally have a better prognosis than men [15; 38].

As mentioned, cell type is a prognostic indicator. The data provided in ***Table 6*** illustrate the differences in survival according to stage at diagnosis.

Patient condition impacts prognosis in that an immunocompromised individual who is weakened by chronic illness may not have the immune reserves stored away to fight another battle. Also, comorbidities, especially comorbid lung conditions such as chronic obstructive pulmonary disease, are common in smokers and may complicate diagnosis, limit treatment options, and lengthen recovery times. Similarly, elderly patients may be less likely to withstand rigorous treatment programs.

Unfortunately, many persons with lung cancer have a difficult and obstacle-strewn path to negotiate. Metastases, results of advancing disease, and complications from treatment are all part of disease management.

METASTASIS

Metastasis presents a very real concern and complication for the patient with lung cancer. Distant metastasis is the most common reason for failure to cure. A vital portion of the role of the healthcare professional is to maintain close contact with the patient to be alert for early signs of metastasis.

Brain Metastasis

Approximately 48% of all brain tumors are metastatic from lung cancer; therefore, it is important to be alert for even vague symptoms of central nervous system involvement [132]. If a patient complains of headache, nausea, vomiting, confusion, memory loss, mood swings, or other neurologic problems, there should be immediate contact with the physician [133]. Treatment is generally palliative rather than curative [134]. Patients may be given steroids to decrease the intracranial pressure being exerted by the metastatic lesion(s). Resection of the brain metastasis followed by radiation therapy is indicated in some cases; however, most patients are not candidates for the procedure based on the number, location, or type of lesions [134].

Brain metastases are an increasingly important cause of morbidity and mortality in cancer patients, and coping with brain metastasis is a major task for a patient's family or significant other. Patients may display personality changes, bizarre behavior, anger, and/or confusion, making it difficult for loved ones to understand what is happening. Guidance and explanations can assist in the coping process during this heart-wrenching period.

Bone Metastasis

Metastasis occurring in the bones is common, particularly for patients with lung cancer. It is possible for patients to have pathologic fractures, hypercalcemia, and spinal cord compression. Symptoms may be mild initially, with pain that comes and goes and increases in intensity with time [135]. The most common sites for bone metastasis, in approximate order of frequency, are the vertebrae, pelvis, proximal femur, proximal humerus, ribs, and skull [135]. These locations account for more than 90% of all bone metastases [136]. Patients who have extensive bone metastasis over a large percentage of their skeleton have a poor prognosis [15; 135].

Treatment options include pain control measures, prophylactic fixation of bones that have lesions, or chemotherapy [135]. The biggest challenge for bone metastasis remains pain control. It is important that pain relief measures are undertaken and that pain is effectively managed.

Liver Metastasis

Liver metastasis is also common and a poor prognostic sign. The liver is the second most commonly involved organ (after the lymph nodes). In 77% of patients, both lobes are involved [137]. Symptoms of this metastasis include an enlarged liver, elevated liver function tests, abdominal pain or tenderness, an abnormal liver scan, anorexia, nausea, and vomiting. Hepatic metastasis is generally treated palliatively with radiation and chemotherapy [137]. In the case of localized masses, hepatic resection may be an option for some patients. A celiac plexus block may be necessary to alleviate pain.

Cardiac Metastasis

Due to its close physical proximity, lung cancer may metastasize to the heart. When it invades the muscle, a pericardial effusion can result and, when enough fluid accumulates, cardiac tamponade will develop. Symptoms are nonspecific and include cardiac enlargement, dyspnea, cyanosis, cough, chest pain, palpitations, and venous distention. In many cases, cardiac metastases are identified only on autopsy. Treatment includes chemotherapy and/or pericardiocentesis. When cardiac tamponade occurs, surgery for a cardiac window is the usual treatment [138].

CONDITIONS CAUSED BY ADVANCED LUNG CANCER AND CANCER TREATMENTS

In addition to the direct effects produced by metastasis, advancing disease and treatments can result in several other symptoms, including respiratory distress, fatigue, nausea and vomiting, anorexia, and pain. These effects should be managed in order to minimize their effects on the patient's quality of life.

RESPIRATORY DISTRESS

Progressive lung cancer ultimately involves respiratory distress of some degree. Obstruction of airways and/or restriction of lung expansion results in dyspnea. Also, postobstructive pneumonitis, atelectasis, or pleural effusions may occur.

Pleural fluid accumulates when the lymphatic drainage system is obstructed. This results in poor lung expansion and decreased gas exchange. Treatment consists of thoracentesis or a chest tube. Some patients may require the insertion of a sclerosing agent through the chest tube into the pleural space (i.e., pleurodesis). The pleura's reaction to the sclerosing agent causes scarring, which will help to keep the lung inflated [139].

Dyspnea may be alleviated by several nursing measures. Patients and healthcare staff should be encouraged to schedule activities that require exertion so that they do not follow one another and are spaced with rest periods. Relaxation techniques may help and can be demonstrated to most patients. Pursed lip breathing is advantageous to some patients. Still others find that opioid inhalers provide relief; early use of opioids for dyspneic cancer patients has been associated with a reduction in stress and improved quality of life. Whenever possible, assessing and treating the underlying cause of the condition is recommended [140].

When oxygen is required, several factors should be considered before choosing the best system for the patient. Most patients use a concentrator at home. This small device converts normal room air into a higher concentration of oxygen. The system is electrical and generates a sound that may be annoying to some patients. Its main advantage is that the oxygen is supplied continuously with no need to change tanks or have deliveries. It works well for patients who require a high flow rate.

Oxygen cylinders are used for backup for concentrators in the case of power failure. They are also useful for patients who need only occasional oxygen. They are large, heavy, and require replacement as the oxygen is consumed. However, they are quiet and require no electricity to run.

Liquid oxygen systems are also available in some areas. A larger tank is filled by a delivery truck; small portable units can be replenished by the patient as needed. This type of system requires some physical strength but is preferred by many patients.

It is important to note that most insurance providers do not reimburse for the amount of oxygen used, but rather pay a monthly fee. Insurance carriers also require documentation of the need for oxygen, most often in the form of arterial blood gas reports or oximetry records. It is necessary to report the blood gas that shows the oxygen pressure (pO_2) when the patient has desaturated the most; usually, this is after ambulation or other activity.

When a patient on oxygen reports increased shortness of breath, it is advisable to have the oxygen delivery system examined to make sure that everything is functioning properly before deciding that the patient is deteriorating. Holes may appear in tubings, gauges can operate incorrectly, or any number of mechanical problems can be the cause of decreased effectiveness.

Some patients feel dyspneic, but their blood gases are normal. The potentially correctable underlying causes of dyspnea include hypoxia, anemia, bronchospasm, respiratory muscle dysfunction, poor oxygenation, muscle fatigue, abnormal cortisol and catecholamine levels, circulating cytokines, tumor obstruction, superior venal cava obstruction, pleural effusions, pericardial effusions, cardiac failure, and pulmonary embolism. Lack of understanding about the pathophysiologic mechanisms underlying dyspnea may hamper a clinician's ability to effectively manage it [140].

Coughing may be caused by an infection or inflammation in the lung or by the tumor pressing against the bronchial tree. Severe cough may result in major suffering for the patient in the form of lost sleep, fractured ribs, worsened fatigue, and hemoptysis. The optimal therapy is treatment of the underlying disorder. Hydration and humidification of the air may provide symptom relief. However, if the cough persists, an order may be obtained for a cough suppressant [140].

In adult patients with lung cancer experiencing cough despite anticancer treatment, the American College of Chest Physicians suggests cough suppression exercises as alternative or additional to pharmacologic therapy where such services are available.

(https://journal.chestnet.org/article/S0012-3692(17)30022-3/fulltext. Last accessed August 16, 2021.)

Strength of Recommendation: 2C (A weak and conditional recommendation based on low-quality evidence that the benefits outweigh the risks/burdens)

FATIGUE

Debilitating fatigue may be a problem for the patient with lung cancer and has been associated with a diminished quality of life [141]. It is different from the fatigue experienced by healthy individuals and may be so severe that it is difficult to deal with treatment or to carry out simple activities of daily living [142]. The fatigue may be directly related to chemotherapy treatments, or it may be solely a result of the cancer. Fatigue related to cancer treatment is categorized as chronic fatigue that is not relieved by sleep and rest, and it has been reported in 39% to more than 90% of patients undergoing cancer treatment and in 19% to 82% of patients post-treatment [142]. Cancer-related fatigue is prevalent in 75% of patients with metastatic disease and affects cancer survivors for months to years after cessation of treatment [142].

The best method to combat severe fatigue is to increase both rest and exercise. Even mild exercise can improve endurance and decrease stress from normal activities. The exercise may be an activity that encourages the patient to socialize, such as golfing or walking with others. Companionship may improve mental outlook and relieve some depression, which may also be part of the cause of the fatigue [142].

Patients may benefit from scheduling their activities to maximize their strength. For example, if a patient is exhausted simply by showering, shaving, and getting dressed each morning, it may be helpful to suggest that the patient shave and shower upon rising, then read the newspaper over coffee and breakfast while still wearing a bathrobe. The rest will ease the strain of dressing, which can be done later. This type of division of activities can ease shortness of breath and decrease fatigue [142].

NAUSEA, VOMITING, AND WEIGHT LOSS

This triad of complications is often linked to treatment with either radiation or chemotherapy but may occur solely from the cancer. The most common causes are chemotherapy drugs and radiation therapy directed at the gastrointestinal (GI) tract, liver, or brain. Nausea and vomiting that result from cancer therapy occur in up to 80% of patients and have been classified as [143]:

- Acute: Occurring within 24 hours of start of chemotherapy
- Delayed: Occurring more than 24 hours after start of chemotherapy
- Anticipatory: Expecting it to occur if it has previously occurred
- Breakthrough: Occurring within five days of prophylactic use of antiemetics, requiring rescue
- Refractory: Does not respond to treatment
- Chronic: Not well understood, but it appears to affect many patients with advanced cancer

Previous severe episodes, female sex, age (50 years and younger), fluid and/or electrolyte imbalance, tumor location (e.g., GI tract, liver, brain), constipation, certain drugs (e.g., opioids), infection, blood poisoning, kidney disease, and anxiety all indicate the likely occurrence of nausea and vomiting [143].

Anorexia-cachexia syndrome occurs in patients with advanced cancer. As a response to the stress of the disease and/or treatment, the body's immune system triggers the development of increased metabolism, decreased intake, and wasting. Anxiety and depression may also worsen the problem in some patients. Treatment depends upon the type of nausea and vomiting (e.g., acute, delayed, anticipatory, chronic) and is more likely to be effective when the symptoms are recognized and treated early [144].

Patients may have gluconeogenesis to meet the demands for nutrients by the cancer cells. There may also be vitamin deficiencies and fluid and electrolyte imbalances caused by decreased intake. A nutritional assessment from a dietitian is recommended for most patients. The measurements and calculations made by a dietitian may be used to develop a plan of care to improve the patient's nutritional status. Being well-nourished has been linked to a better prognosis [144].

CARE OF THE PATIENT WITH TUBE FEEDINGS
Nasogastric Tube
1. Change tape daily.
2. Cleanse and lubricate nostrils daily.
3. Check the amount of residual remaining in the stomach before each intermittent feeding.
4. Elevate head of bed to semi-Fowler's position during feeding and for one hour after the feedings.
5. Flush the tube with 20–30 cc of water or carbonated beverage (room temperature) before and after each feeding.
6. Observe for nausea, cramping, diarrhea, or aspiration.
7. Maintain accurate intake and output records.
8. Weigh regularly.
9. Continue to maintain good oral hygiene.
Gastrostomy Tubes
1. Observe tube and surrounding skin for possible tube migration daily.
2. Cleanse area around tube and the tube itself, starting at base and moving outwards.
3. Secure tube with hypoallergenic tape.
4. Follow points 3 through 9 above.
Source: Compiled by Author — *Table 7*

Simple counseling may be very helpful. Dietitians can often suggest ways to increase the caloric content of simple foods without requiring the patient to eat a great deal more food. Adding dry milk powder to milk, ice cream, or puddings, for example, can substantially increase calorie intake.

For patients experiencing nausea, soda crackers and ginger ale may help settle their stomachs. For some patients, simply eliminating spicy foods or foods with strong odors may make a tremendous difference. Encouraging the family to eat with the patient and making it a social event can be helpful. Most antiemetics have not shown benefit for the treatment of acute nausea and vomiting once it has developed, but their use during chemotherapy may have a dramatic effect in decreasing subsequent episodes of nausea and vomiting [143].

Antiemetics commonly given alone or in combination include prochlorperazine, droperidol/haloperidol, aprepitant, netupitant, rolapitant, and lorazepam. Other agents include metoclopramide (an antiemetic and motility agent); ondansetron, granisetron, dolasetron, and palonosetron (antiemetics and serotonin receptor antagonists); dexamethasone and methylprednisolone (synthetic steroids); dronabinol and nabilone (synthetic forms of tetrahydrocannabinol [THC]); midazolam, lorazepam, and alprazolam (benzodiazepines used to treat anxiety); and olanzapine (an antipsychotic) [143].

For those who do not have relief, enteral nutrition may be required. Whether using a nasogastric tube for feeding or total parenteral nutrition via an intravenous line, the patient may be given the nutrients required to decrease wasting and maintain a strong immune system [144]. A brief overview of the care of patients receiving nutrition by nasogastric or gastrostomy tube is provided in ***Table 7***.

PAIN

One of the primary concerns voiced by patients who are given a diagnosis of cancer is that they will be in severe pain. Some patients are so certain their diagnosis equates to suffering that they are willing to forego treatment that would prolong their life. It is vital that patients and their families be assured that pain will be relieved effectively.

It has been estimated that pain occurs in 20% to 50% of patients with cancer; 70% to 90% of these patients can experience pain relief when properly treated. Nonetheless, studies also indicate that approximately 30% to 60% of cancer patients fail to receive adequate pain relief, with more than one-third experiencing moderate-to-severe pain [145; 146]. Pain usually occurs due to the location and stage of the tumor. For example, a tumor that is compressing a nerve or other organ will cause a great deal of pain. A late stage tumor produces more pain than one in the early stages. There are several different types of cancer pain. ***Table 8*** is provided to assist in the identification of a patient's type of pain.

TYPES OF LUNG CANCER PAIN	
Pain Type	**Definition**
Somatic	Caused by stimulation of afferent nerves in skin, connective tissue, muscles, joints, or bones. Characterized by localized, throbbing, sharp, or aching pain. Responds well to analgesics.
Visceral	Caused by pressure or distention. Pain is deep, more diffuse.
Neuropathic	Caused by peripheral or central sensory nerve trauma. Characterized by burning, shooting, or tingling sensations and poor response to analgesics.
Paraneoplastic syndrome	Several different types of pain, caused by bony metastasis, peripheral nerve compression, brachial plexus pressure (Pancoast tumor), or epidural spinal cord compression
Postoperative	Normally anticipated pain following a surgical procedure
Mucositis	Inflammation of the oral mucosa as a result of cancer therapies
Postradiation	The result of radiation fibrosis
Source: [146]	*Table 8*

How a patient responds to pain is highly individualized and should be managed accordingly by considering the patient's diagnosis, stage of disease, responses to pain and treatments, and personal likes and dislikes [146]. Anxiety will affect the patient's ability to cope with pain, and measures taken to reduce anxiety are often helpful in also reducing pain. Culture and background may play a role, as some cultures view the expression of pain as a weakness, while others more openly express it. The patient's level of pain should be measured at regular intervals, such as after the start of treatment and at each new report of pain. Patient self-reporting of pain should also be considered [146].

The WHO has developed a three-step approach for the management of cancer-related pain based upon the severity of the patient's pain. Patients who experience mild-to-moderate pain (a rating of 1–3 on a scale of 1 to 10) should receive a Step 1 pain medication, such as aspirin, acetaminophen, or a nonsteroidal anti-inflammatory drug (NSAID). Patients who experience moderate pain (4–6 on scale of 1 to 10) while already taking a Step 1 medication should receive a Step 2 medication, such as tramadol or acetaminophen products containing hydrocodone, oxycodone, and codeine. Step 3 indicates severe pain (7–10 on a scale of 1 to 10) and treatment includes strong pain medication, such as opioids (e.g., morphine, hydromorphone, oxycodone, methadone, fentanyl, oxymorphone, levorphanol). This will apply to most patients with cancer-related pain. Patients should be monitored for any side effects of opioids, such as nausea, sleepiness, constipation, vomiting, and breathing problems [146].

Analgesics may be administered in many ways. Oral administration is preferred because it is noninvasive and convenient. If the patient is unable to swallow, the medications may also be given in the form of rectal suppositories or infusions, transdermal patches, subcutaneous injections, intravenous drips, patient-controlled analgesia (PCA), or intramuscular injections [146]. Due to the pain and unreliable absorption associated with intramuscular administration, it is not usually used. If one route does not prove effective, another may be tried.

It is recommended that patients take pain medication regularly, as prescribed, to maintain a constant level of the drug in the body and to prevent pain from becoming so severe that it cannot be controlled [146]. Prevention of pain is more effective than trying to eradicate it once it has a grip on the patient.

Nonpharmacologic techniques for relief of pain include cutaneous stimulation, applications of heat and cold, transcutaneous electrical nerve stimulation (TENS), relaxation techniques, distraction, humor, music, prayer, biofeedback, and hypnosis. Other, more invasive techniques, in the form of nerve blocks, alcohol injections, or acupuncture, may also be employed to control pain [146].

Even when the prognosis is not good, pain should not be overwhelming. It should be controlled or alleviated for nearly every patient, allowing them to spend quality time with loved ones.

SUPERIOR VENA CAVA SYNDROME

As lung cancer progresses, there may be obstruction of the venous drainage, which in turn produces dilation of the veins of the upper chest and neck. Symptoms of superior vena cava syndrome (SVCS) are edema of the face, neck, and chest, dyspnea, headache, visual disturbances, and a depressed level of consciousness [147].

Prompt evaluation is necessary to determine if the cause of SVCS can be corrected. Chest x-rays will usually show a mediastinal mass. A CT scan is useful to obtain more exact information on the tumor's location and anatomy. MRI, contrast or nuclear venography, and ultrasound may be useful, depending on expertise of the healthcare provider. A sputum specimen should be obtained when bronchogenic carcinoma is suspected. A bronchoscopy with biopsy may allow diagnostic tissue to be removed in an attempt to establish a treatment plan [147].

Treatment of SVCS depends upon the etiology of the obstruction, the severity of the symptoms, the prognosis of the patient, and patient preferences. Radiation therapy is often used to treat SVCS because it is easily given and has minimal side effects. However, it should be withheld until the etiology of the obstruction is clear. Relief of symptoms following administration of radiation therapy is reported to be 62% to 80% in patients with SCLC and 46% in patients with NSCLC [147]. The treatment course involves a low dose of radiation, given daily for five to seven weeks [64]. Chemotherapy is effective for some patients (e.g., those with lymphoma or SCLC). Thrombolytic agents may also be used. A few patients (generally those with a benign obstruction) may require surgical resection of the tumor and bypass grafting of the vessels involved. Some patients will require no treatment [147]. The prognosis is not good for patients whose lung cancer causes SVCS; the 24-month survival rate is 9% in patients without SVCS and 3% in those with the syndrome [147].

SPONTANEOUS PNEUMOTHORAX

A pneumothorax occurs when the pleura is ruptured and the lung and chest wall separate as air enters. Lung volume is reduced as the air in the pleural space compresses the lung. A primary spontaneous pneumothorax is one with no obvious underlying lung disease; a secondary spontaneous pneumothorax is one with underlying lung disease. Iatrogenic pneumothorax is traumatic but typically smaller and more easily managed. Up to 10% of patients may be asymptomatic; some may have symptoms that are mild. Symptoms of acute, sudden onset of sharp chest pain and dyspnea occur in approximately 64% to 85% of patients. An estimated 80% to 90% of primary spontaneous pneumothoraces occur in smokers [148].

When a pneumothorax is greater than 20% of the lung, insertion of a chest tube is the usual treatment [148]. The chest tube is left in place until the lung has fully re-expanded and there is no evidence of an air leak. When a patient has a chest tube connected to a water-seal chamber, fluctuations that occur in the fluid level with each respiration should be checked. The tube should be clamped off if it becomes disconnected, as the pressure differences would be disturbed in such a case [149].

Respiratory distress resulting from pneumothorax may cause increased fatigue in the patient. If all of a patient's strength is required to breathe, there will be little energy left for activity. When respiratory distress becomes significant, decisions should be made as to whether the patient desires to have intubation with ventilator support.

HEMOPTYSIS

It is not uncommon for the patient with lung cancer to experience some degree of hemoptysis, ranging from mildly blood-tinged sputum to major hemorrhage. The cause of the bleeding can be capillary trauma, tumor sloughing, or even a pulmonary infection. Bronchitis, bronchiectasis, tuberculosis, and necrotizing pneumonia or lung abscess account for 70% to 90% of cases [36].

One objective of treatment is to protect the uninvolved lung, which may be achieved with positioning maneuvers and selective intubation and obstruction of the bronchus going to the bleeding lung. Massive hemoptysis (i.e., production of ≥600 mL of blood) is an indication for rigid bronchoscopy, which allows for better suctioning and therapeutic interventions, such as laser therapy. Embolization of a pulmonary segment is the preferred method to stop massive hemoptysis. Success rates with this method have been reported at 90% [36; 150]. Bronchial adenoma or carcinoma may indicate the need for early resection. Treatment with antibiotics is important, as bronchiectatic bleeding is usually the result of infection [36]. Most patients suffering even mild hemoptysis worry that they will have a major hemorrhage, so it is important that an emergency plan is developed. This plan will help both the patient and the patient's loved ones feel more comfortable and less anxious.

VASCULAR ACCESS DEVICES

There are several vascular access devices (VADs) that may be used for the administration of nutrients, fluids, and/or medications during the course of lung cancer management. They have different types of catheters and ports. The type of VAD used depends upon the length of treatment, the administration time, the patient's and physician's preferences, the required maintenance care, and the cost [151].

Nontunneled catheters are inserted through neck or chest veins and include central venous catheters (CVCs), subclavian catheters, and central venous pressure (CVP) lines. They are inserted in the neck area into the high internal jugular, external jugular, low internal jugular, supraclavicular, or infraclavicular veins. The lines are then sutured in place and are used for a maximum of two to three months. They may have single, double, or triple lumens and may be used for multi-infusional therapy when the capabilities of an existing CVC or implantable port has been exceeded. They are often used when emergency CVC is needed and they may augment existing VADs that have been dedicated for acute care or long-term use [152].

Peripherally inserted central catheters (PICCs) may be used long-term (i.e., several weeks to months) to fill the gap that exists between the trauma of subclavian catheters and the cost of long-term tunneled catheters or ports. PICCs are the most easily inserted long-term CVC; however, they require one-handed self-care capabilities, or a caregiver, which may limit patient mobility. PICCs are small-gauge, thin-walled catheters that are inserted through the peripheral venous system of the hand, arm, or foot into the cephalic or basilic vein. Some state boards of registered nursing permit nurses to insert PICC lines if they have had appropriate education and training. Advantages of these catheters include: a nurse may insert them; elimination of the risk of neck and chest insertions; easy removal at completion of therapy; and no surgery is required [152]. Midline catheters are used for intermediate-term therapy when a short-term IV is either unavailable or not advisable. No surgery is required [152].

Tunneled central venous catheters (i.e., Broviac, Hickman, Groshong, Neostar) are radiopaque silicone rubber catheters characterized by a cuff that holds the line in place. These catheters are tunneled into the subcutaneous tissue, which begins to adhere to the line in 7 to 10 days, providing a mechanical

barrier against infection. Tunneled central venous catheters are available in single, double, or triple lumens. Advantages of this type of catheter are secure placement, safe and reliable long-term access, decreased risk of infection (due to its unique design features), use without pain (due to external access site), ease of removal when no longer needed for care, and swimming and bathing may be allowed. Disadvantages include the external portion of the catheter is visible outside the chest, the need for daily dressing changes and heparin flushes, and the cost of equipment (i.e., needles, syringes, heparin or saline, dressing materials) [152].

Implanted ports are dense, self-sealing, silicone septums in a metallic or plastic housing with a catheter. They are surgically implanted, accessed intermittently, and intended for long-term use [151]. The entire system is subcutaneous, requiring no dressings and providing the freedom to swim, if desired. Implanted ports require flushes once a month when not in use and greatly increase patient mobility [151]. Disadvantages include the need for surgical insertion and removal, discomfort from the needle stick when the port is used, and the awkwardness of self-access [152]. Implantable titanium pumps are surgically implanted. A refillable reservoir provides for continuous infusions, usually at the patient's home [152].

TROUBLESHOOTING VASCULAR ACCESS DEVICES

Whether caring for patients in a hospital or outpatient setting, the nurse is likely to encounter questions about the use of VADs.

The inability to withdraw blood or infuse fluids may be the result of migration of the catheter, causing the tip to rest in a smaller vessel or against a vessel wall. Having the patient change position, breathe deeply, cough, or walk around to move the catheter is often effective. In some cases, the catheter is damaged between the clavicle and the first rib or within the subcutaneous tunnel. A gentle flush of 10–20 cc of normal saline solution may solve the problem [152]. Other problems may be a kink or knot in the catheter or clot formation within the tubing. In these cases, a physician should be notified to consider x-ray and/or removal of the VAD [151].

Arm or neck edema may indicate extensive thrombosis or SVCS. These conditions require the prompt attention of a physician [151].

Local infection may occur when poor technique is used for site care or when the needle is not well secured. This is evidenced by a reddened, edematous, and/or painful insertion site. If drainage is present, a culture should be taken. Do not use occlusive dressings until the infection resolves. If necessary, remove sutures. If not resolved, the VAD may require removal [151; 152]. A physician should be alerted of any infections.

Systemic infection is usually caused by a local infection that was not treated, by contaminated solutions or hubs, or by a cause unrelated to the VAD. Symptoms include fever, chills, diaphoresis, malaise, hypotension, oliguria, and change in mental status. A physician should be notified immediately of signs or symptoms of systemic infection [152].

THE TERMINAL PATIENT

Some patients may equate the diagnosis of any type of cancer with death. This is unfortunate, as there are many patients for whom cancer has become more of a chronic illness. Lung cancer, however, generally does not have a good prognosis. As previously noted, many patients with lung cancer have metastases at the time of diagnosis, which decreases survival time. For these patients, dealing with impending death is a reality to be considered. This is not to say that the patients should not be fighting the disease and, indeed, some do win the battle. Unfortunately, the overall five-year survival rate for lung cancer is only about 21.0% [2].

While patients with terminal lung cancer face tremendous psychologic and emotional anguish, it may also be a time for connection and personal growth [153; 154]. The time of life when the cancer strikes may be relevant to the degree of grace the patient exhibits. When occurring so as to interrupt plans of travel, marriage, child rearing, career, or other major events, the impact of cancer may be even more devastating to the patient and the patient's family. When hope begins to fade and it becomes apparent that the end is approaching, changes will occur in the patient and the patient's family. Ideally, this is a time when they can realize how important they are to one another and say those things that should be said.

Also at this time, palliative care will replace more aggressive therapies. Desperation may grip some individuals, while others seem resigned and content. This diversity of feelings may be the first step toward separation. Loved ones may be angry with what they perceive as the patient giving up and leaving them without a harder fight. Patients may want to make the transition as emotionally pain free as possible for their family members.

Through all of this, it may be helpful and even therapeutic if patients have an open dialogue with their loved ones. Occasionally, a family will insist that nothing be said to the patient regarding the terminal nature of the cancer. They may believe that they are protecting or somehow strengthening the patient. However, avoiding a discussion of the reality of the condition serves no healthy purpose. It is comforting to the dying patient to know that personal affairs are in order. Patients may want to talk about cremation versus burial or other topics that are difficult for families to confront. When the family avoids talking, they are depriving the patient of this comfort. Intervention may serve as a catalyst to open communication.

Family members may become exhausted by the increased need for care that their loved one now requires. They may not have realized how demanding the care would become, how long it would continue, or how rapidly the patient's needs would change. Dealing with feelings of anxiety is important to the well-being of patients and their families.

STAGES OF GRIEF: THE KÜBLER-ROSS MODEL

Learning about and recognizing the stages of grief may be helpful in developing a deeper understanding of death and dying. Dr. Elizabeth Kübler-Ross has identified the five stages of grief as [155]:

- Denial and isolation
- Anger
- Bargaining
- Depression
- Acceptance

These emotions do not necessarily occur in any particular order, and a patient may move back and forth between stages within a relatively short period of time [156].

Denial is, however, often the first response. It may be the initial reason there was a delay in seeking medical treatment or assessment. Patients may have known that their cough was very different from anything they had ever before experienced; they also know their smoking history and may be acquainted with others who have been diagnosed with cancer. Delays in treatment regardless of this knowledge may, in many cases, be attributed to denial. Patients who are deeply in denial may have a difficult time making wise decisions about health care. Ideally, patients will work through this stage quickly, so that there is time to accomplish goals before dying.

Anger is another step in the grief process. In this stage, patients still have plans for the future, family to care for, and work to accomplish. They may be angry that their lives are being disrupted and that the cancer is demanding so much time.

Bargaining is a toned-down response to anger. It is generally characterized by the patient promising to make a change in exchange for some improvement in their condition. Patients may want the disease to go away completely, or they may just want more time; in any case, it is all considered bargaining. Often, bargaining is linked to religion or to a relationship with religious figures.

Depression is an understandable and normal response. It should not be treated as something for which the patient should be ashamed, nor should the patient be told to cheer up. Feeling depressed is appropriate for the patient who has suffered losses and is coping with a terminal diagnosis. Patients in this state are sad that this is their fate and wish it could be different.

Acceptance comes when the previous four stages have been worked through and the patient accepts and calmly acknowledges the reality of the situation. Patients in this stage do not seem fearful of death but may instead see it as a welcome rest from a long and tiring struggle [156].

Achieving acceptance does not necessarily mean that the patient will cease to feel anger or depression. Also, more than one stage can be felt at any one time. The patient's loved ones, particularly caregivers, will also experience disbelief, anger, bargaining, and depression. Acceptance is generally not as easily achieved by those who will be left as it is for those who are dying.

ADVANCE DIRECTIVES

As a result of medical technologic advancements, patients are living longer and in different circumstances than ever before. The introduction of life-sustaining treatments, such as parenteral feeding and hydration and mechanical ventilation, has also produced vigorous debate regarding care decisions. Several landmark court cases regarding these issues have prompted the creation of laws to protect the right of patients (or the designated proxy) to make their own medical decisions.

In 1990, the U.S. Congress passed the Patient Self-Determination Act (PSDA), which requires hospitals and other healthcare facilities to recognize the living will and durable power of attorney for health care to provide patients with written information about their rights [157; 158]. Facilities cannot require a patient to sign an advance directive, but they must make the information available. Because physicians will direct the care the patient receives, they should participate in the discussion, answer questions the patient may have, and when the forms are signed, be given a copy of the advance directive. An advance directive may help to eliminate family dissension about what steps should be taken during the course of a patient's care. This can be a great relief to many patients.

Advance directives vary based on state law and individual preferences within the states' legal requirements. Advance directives include the durable power of attorney for health care (also called the health care power of attorney or health care proxy), physician directives (living wills), and do not resuscitate (DNR) or "no code" orders [157]. All healthcare professionals should understand these documents in order to successfully discuss the options they offer patients.

The durable power of attorney for health care allows the patient to authorize another individual, called a proxy or agent, to make healthcare decisions if the patient becomes incapacitated. Some states restrict the ability of the agent to carry out some requests (e.g., to stop feeding). The durable power of attorney must specifically list the designated person(s) by name. It must also be in writing, signed by the patient choosing the proxy, and witnessed. A backup proxy is often named in case the first choice becomes unable or unwilling to act on the patient's behalf [157; 158].

Physician directives (also referred to as living wills) are designed to control future healthcare decisions at a time when the patient is unable to make them. They are guides for physicians that are meant to ensure that the care the patient desires is provided.

Physician directives may specify that all measures be taken to save the patient's life, or they may allow the physician to stop trying to prolong life in a terminally ill patient. If a patient has hope of recovery, the living will generally does not apply. There are endless variations on this, but the more specific a directive is, the easier it is to follow. Most states require that the document be witnessed and notarized by someone other than heirs, the attending physician, or employees of the healthcare facility. Where no written advance directive exists, some states recognize oral advance directives; others require a written and notarized form [157].

Physician/provider orders for life-sustaining treatment (POLST) is a set of portable medical orders that communicate patient wishes in emergency situations to healthcare facilities and providers, including emergency medical services [159; 160]. Although the POLST form helps describe a patient's wishes for health care, it is not an advanced directive. Emergency medical service personnel cannot use an advance directive, but they can use a POLST form. The POLST must be signed by a qualified member of the patient's healthcare team. The first POLST form was developed by a task force in Oregon in 1995. Since then, 40 states and the District of Columbia have codified their POLST programs into law or an official form [159].

DNR orders are written by physicians only, in accordance with the wishes of the patient and the family, and added to the patient's medical record [157]. As required by the Joint Commission, all healthcare facilities must have a DNR policy [161]. Laws vary from state to state as to when physicians may write these orders, but they are not advance directives in the strict definition. They are merely outward signs that the advance directive is being followed. Because a DNR order is valid only while the patient is hospitalized, some states have advance directives called "do not attempt resuscitation (DNAR)" orders that may be used outside the hospital, such as when emergency medical teams respond to 911 calls. This order allows the patient to refuse resuscitation in advance, even when emergency personnel have been summoned. This order must be signed by the patient and the patient's physician [157].

It is important for the patient to understand that these directives do not eliminate the provision of normal care. For example, a request for no cardiopulmonary resuscitation (CPR) means only that no chest compressions or mechanical breathing would take place should the patient have a cardiac arrest. It does not mean that the patient will be denied antibiotics for potential infections or refused hospitalization when necessary [157].

HOSPICE

Many patients with lung cancer are cared for at home with the assistance of a home health agency. There may be nurses coming in on an intermittent basis to check the patient's condition, monitor total parenteral nutrition (TPN), change dressings, or any number of other interventions. There will come a time, however, when hospice should be considered.

The American College of Chest Physicians recommends that all physicians caring for patients with advanced lung cancer should initiate conversations about the goals of care, the pros and cons of life-sustaining treatment, and end-of-life care options.

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Strength of Recommendation: 1B (Strong recommendation based on moderate-quality evidence that the benefits outweigh the risks/burdens)

The term hospice is used in this country to refer to a program, not necessarily an institution. Hospice is a type of care provided not only to the terminally ill patient, but to the patient's family as well. Hospice strives to meet physical, psychologic, and spiritual needs through an interdisciplinary team of physicians, nurses, social workers, therapists,

and volunteers. The goal of hospice is to allow the patient to die comfortably, surrounded by family, with the support that is needed to provide the best possible quality of life and death. Hospice nurses are adept in aggressive pain management and also in communicating effectively with family [154; 162].

It is not uncommon for a family caregiver to be afraid of not knowing what to do when death finally does occur. Hospice is able to educate the caregiver to relieve that anxiety, but will also have someone there to physically help with care when the time comes. The hospice team is attuned to the needs of the family and the patient and may provide support to all involved parties. This can be very comforting to patients who may be concerned about the effect their death will have on loved ones [162].

Hospice has certain rules for participation, but they are not rigid rules and may be adapted to a patient's special needs. The entrance requirements state that the patient's physician must certify that the disease is terminal and that the patient is in the last six months of life [154; 162]. The six-month time frame is simply an attempt to define the type of patient participating in the program; if a patient lives seven months, the hospice service is not cut off.

Another guideline is that there is a caregiver. This also is not an ironclad rule, but it certainly facilitates the program [162]. Under normal circumstances, a spouse, adult child, close friend, or significant other will step in to provide care for the last days.

Medicare hospice programs require the patient to switch their standard Medicare benefits for the Medicare hospice package. This provides broader coverage for the patient, including health problems unrelated to the terminal illness. It also requires that hospice care be given by a Medicare-certified hospice program [162]. Medicare coverage primarily provides for care at home but will allow hospitalization for illnesses other than the terminal illness. It also allows respite care, which is temporary relief to the caregiver.

CASE MANAGEMENT OF THE PATIENT WITH LUNG CANCER

Physicians, nurses, and other healthcare workers have all had to acknowledge the influence of finance on patient care. In an effort to work within the financial constraints that have been imposed, yet continue to deliver quality care, the concept of case management has evolved.

Defining case management may help to shape understanding of what it really is. Some confusion occurs with the term "managed care," partially because case management is based on similar ideas, but also because the two concepts rose in popularity at about the same time.

Managed care is a method of delivering health care that is focused on cost-effective, patient outcome-oriented concepts. It keeps costs under control and manages resources while continuing to strive for good quality in patient care. It encompasses the health maintenance organization, the preferred provider organization, and other methods of healthcare delivery [163].

Case management is a reorganized nursing structure that gives more responsibility and decision-making capacity to nurses. A nurse case manager follows all aspects of a patient's care and becomes more intensely involved in the creation of positive outcomes. A case manager may function in any number of settings, each of which will substantially differ in regards to daily operations. In each setting, however, the patient remains at the center of concern [163].

The hospital-based case manager is also called a "within the walls," or WTW, case manager. WTW case managers may deliver bedside nursing care for a small group of patients, or they may supervise the case management program. Whatever the assignment, the WTW case manager monitors adherence to critical pathways as well as cost- and time-effective delivery of care, with an emphasis on positive outcomes for the patient. Depending on the facility, nurse case managers may also complete discharge planning and utilization review functions [163].

Due to the nature of the disease, patients with lung cancer may have many hospitalizations. Having the same case manager for each admission helps patients feel a continuity of care that allays anxiety and promotes a more effective therapeutic relationship. The following case study and discussion illustrate the role of case management in the care of a patient with lung cancer.

Patient H is a man, 60 years of age, who has been admitted twice previously to City Memorial Medical Center for treatment of his small cell lung cancer. Nurse S has been his WTW case manager each time. This admission, she greets Patient H like an old friend. She knows his history, family situation, and health insurance plan from past admissions, plus she has been kept informed regarding his status by telephone calls. Now, she has only to assess his current status and be apprised as to what has been happening to him recently. This not only reassures Patient H that he is in familiar and caring hands, but it eliminates the time required for Nurse S to learn about him.

WTW case managers not only start IVs and administer medications, they also check with radiology about the delay in chest film reports, call physicians with lab results, and ask dietitians to see patients about their weight loss. These interventions and others not only improve the quality of care, but decrease the length of stay, saving the hospital and insurance companies unnecessary expenses. The WTW case manager will also interface with other case managers.

Those who are employed outside the acute care hospital are called "beyond the walls," or BTW, case managers. The majority of working BTW case managers are employed by insurance companies or some sort of managed care group, but they may also be found in home healthcare agencies and other organizations [163]. It should be noted that some progressive hospitals have established BTW case managers to remain with patients after the patients have been discharged. These case managers do not provide hands-on care, but they do assess patients who have returned home and make referrals to home health or other agencies as necessary. This has proven to be cost-effective to hospitals by reducing the number of readmissions.

When Patient H was admitted to City Memorial, the information about his admission was transmitted from the admitting department to his insurance carrier, Western States Preferred Provider Organization (WSPPO). The particular policy, a PPO, reimburses at a better rate when those providers that are part of a network of hospitals, physicians, and other healthcare agencies listed in his provider directory are used. These providers have signed contracts with WSPPO to accept a lower reimbursement in exchange for the increased number of patients they will be receiving because of being included in the PPO provider directory.

Nurse M, a BTW case manager for Western States, contacted the hospital asking to speak with the patient's case manager, Nurse S. From this conversation, she garnered enough information about the patient's condition to authorize the insurance company to pay for the admission. She was able to determine that Patient H met the criteria established by WSPPO for admission to an acute care hospital.

Nurse S will not only be doing traditional nursing activities, but will provide the utilization review information to Nurse M. This reassures Patient H that his care is being paid for, and it allows Nurse S to maintain authorization for her patients.

As soon as a patient is admitted to the hospital, and perhaps before, if it was a scheduled admission, the WTW case manager will work with the patient and the patient's family to meet the discharge planning needs. A WTW case manager assesses the patient's physical, emotional, psychologic, and financial status. Then, using this assessment as a basis, he or she will identify potential needs for continued care posthospitalization. WTW case managers ask physicians, patients, and families many questions that will help them develop a discharge plan. Important discharge planning questions may include [164]:

- Will there be a need for home health care? (This may include nursing, home medical equipment, therapy services, social services, or nutritional support.)
- Do you know where you will get care and who will be helping you after you are discharged?

- Do you understand your health condition?
- Does the patient have transportation needs? Will assistance be required to get to radiation therapy appointments? Physician appointments? Pharmacy? Supermarket?
- Do you know what each of your prescription drugs does? Do you know how to take them and what side effects to watch for?
- Is placement in a long-term care facility indicated?
- Is a referral to hospice warranted?

After the discharge planning questions were answered, Nurse S began to formulate a plan for Patient H. Before the discharge plan could be put into effect, however, it had to be authorized by Nurse M at WSPPO. In order for referral to be made for durable medical equipment, home health care, or any other of a number of services, the authorization had to come from Nurse M.

One of the helpful aspects of BTW case management is the flexibility BTW case managers are given in an effort to control costs. As previously noted, WSPPO has contracts with specific providers (e.g., they have an agreement with a specific rental company to provide hospital beds to WSPPO patients for a discounted rate). This saves both Nurse M and Nurse S from searching for a hospital bed provider; they both know immediately that they must first check with the designated rental company.

BTW case managers may also take advantage of the substitution of benefits. This means that if a patient needs a hospital bed at home, but the patient's healthcare plan does not include a benefit provision for durable medical equipment, a bed may still be provided if it can be proven that the equipment would shorten the hospital stay. BTW case managers often have the authority to approve a bed as a method of controlling costs; it is less expensive for insurance providers to pay for a bed rental than to pay for an additional day or more of acute hospitalization.

Some third-party payers have developed programs for disease management. This is essentially case management with patient participation in the program based solely on their diagnosis. The patient may have asthma, diabetes, heart disease, acquired immunodeficiency syndrome (AIDS), cancer, or other major illness. The purpose of a disease management program is to teach patients methods to control their chronic illness, recognize possible complications so early intervention can be provided, and reduce costs from frequent hospitalizations and costly treatments [165].

CLINICAL PATHWAYS

Whether they are called clinical pathways, critical pathways, case management plans, treatment plans, or care maps, they are all similar methods for managing patient care. As a vital part of the managed care environment, clinical pathways have often been the catalyst for hospitals to move to a case management type of nursing. It is important to note that the clinical pathway may or may not be part of the medical record.

Clinical pathways are multidisciplinary, sequential guides to patient care that are created through a collaboration of healthcare professionals. Anticipated events are included in a day-by-day grid, allowing the nurse, patient, and family members to know what can be expected on any given day [163]. This serves many purposes:

- Routine procedures are not overlooked, which could delay discharge.
- Communication between staff members, as well as between staff and patient, is facilitated.
- Daily goals help motivate patients to achieve better results.
- Awareness of quality management goals is increased.
- Teaching goals are enhanced.

Factors to consider when creating clinical pathways include [15]:

- Leadership of the staff
- Design format
- Patient population
- Assignments for implementation
- Variance reporting
- Method of documentation

Although each of these factors may vary to meet the specific needs of the individual hospital, they all have certain common traits.

The pathway is usually posted within patients' rooms, so they and their families can follow along to see if their progress is as expected. It is motivating to a patient to see, for example, that he or she is expected to walk from the bed to the bathroom the afternoon of surgery or to successfully self-administer an insulin injection by the third day of instruction. Whatever the task, most patients make an effort to do what is expected of them.

The pathway may also be useful to the nurse case manager. For example, a patient's culture and sensitivity report comes back from the laboratory indicating that the patient is receiving the incorrect antibiotic. The report is ordinarily left on the patient's chart for the physician to review during the next rounds, but this might not occur for several hours or into the next day. However, if the nurse sees on the pathway that the patient is expected to be afebrile by the next day and homeward bound the day after, the nurse might be motivated to contact the physician for orders for a new antibiotic.

Clinical pathways are also particularly helpful to the relief nurse. It is always difficult to be the nurse called in to substitute for a nurse who has the day off, is ill, or is on vacation. The patients are new to the relief nurse, and it takes time to learn about the idiosyncrasies and needs of each one. The clinical pathway provides a way for the relief nurse to quickly determine each patient's point on the route to recovery.

Not every patient will have a clinical pathway. They are normally assigned by common diagnosis or diagnosis-related group (DRG) or by clinical unit. Most often, those patients who have been chosen for inclusion are those with high risk and/or high cost illness that can effectively use clinical resources for cost savings. The more generic the pathway, the more patients that may be included [163].

The pathway may be a tool for the nursing staff; however, just as important is its ability to increase security and confidence for patients who are part of a case management program [163].

NURSING OUTCOMES

Evaluating the efficacy of WTW or BTW case management programs depends on how well the chosen outcomes have been met. If outcomes were thoughtfully considered, they should be indicative of the success of case management. For example, if one of the chosen standards of care is that the patient admitted for chemotherapy is educated about exposure to hazardous waste, and procedures are used to reduce that possibility, then a desired daily outcome may be, "No spills of chemotherapeutic agents." Whether this goal was met will be recorded in the medical record and/or in the clinical pathway. If the desired outcome is not met, it is identified as a variance [163].

Patients are not removed from the case management program or even from the use of clinical pathways if there is a variance. Ideally, the pathway will tend to be more generic than specific and will be applied to a homogeneous group of patients. Within that group of patients, however, there may be a wide range of differences. For example, chemotherapy patients may be considered a homogeneous group, but within that group are men, women, young adults, the elderly, those on their first course of chemotherapy, and those on their sixth course. These patients may live in their own home with several loving relatives, or they may live in a nursing home and have no one. It is natural and expected that there will be variances among them.

Variances should be analyzed to determine why the outcomes were not met [163]. Was it a patient problem (e.g., refusal to cooperate)? Was it a clinical problem (e.g., the patient's condition changed)? Was it a staff problem (e.g., failure to give the chemotherapeutic agent as scheduled)? Or was it a facility problem (e.g., the equipment failed)? If, when checking variances, something stands out as preventable, then that is an opportunity to change either the practice or the pathway.

After all the data has been collected, it can be reviewed while considering the various components of the quality improvement program [163]. For example, if it is found that 61% of all patients developed a nosocomial infection, then practice patterns should be reviewed and evaluated.

Good quality health care is less costly in the long run. It only makes sense to deliver the best care possible while also taking into consideration the cost benefits. Reviews and evaluations of variances are easy ways to assess costs associated with errors, misuse of staff, delays, or dissatisfaction [163].

PATIENT TEACHING GOALS

Nurses are teachers in every sense of the word, constantly teaching patients about their disease, their medications, possible complications and side effects, testing and treatment procedures, and other aspects of care. The case manager is also very much an educator, whether in a WTW or BTW role. The WTW case manager should discuss the immediate issues facing patients as well as the long-range implications of their disease. A patient cannot be taught everything on the first admission; early goals are different from the follow-up that occurs during subsequent visits. ***Appendix 1*** contains nursing care plans for various teaching and disease management goals, including those for patients with nausea and vomiting, mucositis, and myelosuppression.

PATIENT TEACHING FOR SURGERY

Preoperative teaching can be done prior to admission. In the past, patients were admitted the evening before surgery, partially in order to carry out teaching before the patient went to surgery. Now, with patients being admitted the morning of surgery, very little time is available for teaching, let alone for allowing patients to absorb and understand what to expect. A better time for patient teaching is at the preoperative visit, when the electrocardiogram (EKG), lab work, and other testing are done. Nurses can use this visit as an opportunity to meet with the patient, begin preoperative teaching, and obtain useful history, which can assist in an early start to discharge planning. It has been found that preoperative patient teaching is very useful and comforting for the patient. This establishes a connection that will continue through future admissions as well.

There is a great deal of fear experienced by the patient and the patient's family when lung cancer is diagnosed. On the first admission, when pathology and staging have not been completed, there is anxiety associated with not knowing what the prognosis may be. There is also an understanding that this may be the beginning of the end. The rapport that is built between the nurse and the patient/family can greatly reduce anxiety and facilitate teaching goals.

Prior to surgery, patients should be able to explain the reasons for their surgery and the benefits of the particular type chosen. They should also be able to articulate what is involved in the type of surgery, whether it is a lobectomy, pneumonectomy, or wedge resection. This method of testing gives nurses confidence in patient knowledge. When patients explain what they believe is happening, misconceptions become evident and may be corrected.

Surgery that involves the lung can easily result in postoperative respiratory distress. It will be painful to breathe, cough, and move; yet, all of these activities will be vital to the patient's well-being. A thorough discussion and practice sessions prior to surgery will help the postoperative transition go more smoothly.

Ideally, patients will have stopped smoking preoperatively. This will enable them to have maximum ventilatory capability at the time of surgery. Patients should know that they will be expected not to smoke after the procedure is completed. Additionally, they should be trained in how to turn, cough, and breathe deeply, so these maneuvers will seem more natural after the procedure.

Positioning for lung surgery involves moving the arm on the affected side out of the surgical field. This usually results in a very painful shoulder and/or arm. It is helpful to warn the patient about this and stress the importance of exercising the affected arm. A review of exercise techniques may be done preoperatively and should include information about the leg exercises that will be required to prevent thrombophlebitis.

Patients will most likely have thromboembolic deterrent or pneumatic inflating stockings on their legs after surgery to discourage clot formation. These stockings may be fitted prior to surgery, which will then present an opportunity to teach the patient about their purpose and let the patient know that they will be changed during each shift.

Patients are often concerned about the amount of pain that they will encounter postoperatively. Some are fearful of it, while others present a stoic demeanor. It is beneficial for patients to know that there will be pain, but that measures will be taken to alleviate it as much as possible. Patients should be told what type of analgesia will be ordered and that it should be taken or requested before their pain becomes so severe that it depresses their ability to fully expand their lungs during respiration. If a patient will be receiving PCA, the patient should be taught how to use it and reassured that it will eliminate any delay in relief.

A chest tube is not pleasant but is more tolerable if the patient is prepared to have one. Teaching should include a simple explanation of its necessity and how it will be handled when moving about in bed and ambulating in the room. Some patients are fearful that the tube may fall out or be pulled into their chest, causing damage. Nurses should provide reassurance that neither will happen, and exercise should not be restricted because of the tube. Patients should also be encouraged to seek assistance to correctly position or move the tube.

Specific routine postoperative procedures should also be discussed with the patient. Patients will feel better if they know where their family will be during and immediately after surgery. It is also helpful for patients to know that they will go to the recovery room and, in most cases, continue on to the intensive care unit (ICU). If a patient is unaware that he or she is expected to be in ICU, the placement may cause apprehension regarding the severity of the condition. Understanding vital sign monitoring, dietary restrictions, and other routine care will also make for a more confident and relaxed patient. These procedures should be outlined on the clinical pathway, if possible.

There should be a reinforcement of the applicable teaching goals in the first few hours after surgery. Patients should be reminded about the necessity of coughing, breathing deeply, exercising in bed, ambulating, and being properly medicated for pain. The transitional time will go more quickly and smoothly if the patient is well prepared for this period.

When a patient is thoroughly awake and has the ability to communicate and concentrate, more extensive training can take place. This usually begins the first postoperative day and may be expanded and reinforced as the patient progresses. Teaching should be repeated often in order for the patient to absorb all of the information completely during such a stressful time.

Dressings and wound care are of primary importance to most patients. They may be concerned about the amount of drainage on the dressing, especially if blood is present, or about the risk of infection. Reassurance during wound care is helpful to the patient's overall well-being. If, however, there is a wound infection or complication, there should be reassurances given that home health care can address these issues at the time of discharge, if necessary.

Some patients suffer emotionally from the sight of the wound and the fear that the scar, as well as the diagnosis, will have an adverse effect on relationships and sexuality. Patients can be reassured, allowed to explore feelings, and, if necessary, referred to a social worker or staff psychologist for counseling.

Prior to discharge, it is important to reinforce several teaching points. Primarily, patients should know which medications have been prescribed for them at the time of discharge, their purpose, the correct dosage, administration schedule, and side effects. Signs of possible complications, emergency telephone numbers, and other safety information should also be provided.

PATIENT TEACHING FOR CHEMOTHERAPY

Chemotherapy creates additional patient education needs. The chemotherapeutic agents that will be used should be discussed, including details regarding their mechanisms of action and instructions on how to use verbal information and written instructions. Booklets or pamphlets that might be available should be reviewed and distributed.

Patients and families should be taught about the side effects that can be anticipated with chemotherapy. They should understand that there are immediate side effects as well as delayed symptoms, which may arise one to two weeks after treatment. They should also be taught which effects can be expected as normal and which should be reported to the physician.

Emotional support is also extremely important during this time. Patients and families will have questions, fears, and misunderstandings that should be discussed. They should be encouraged to express those feelings and articulate the worries, anger, or frustrations they feel.

All of this information will obviously not be given to the patient in the first chemotherapy session. The education process takes time. Some patients are eager to learn all they can about their disease and treatment, while others must be encouraged. If a patient is not receptive to learning, it makes the process more difficult; however, teaching can still progress if clues are taken and acted upon. For example, when the patient complains of nausea, this is the cue to discuss prevention and treatment of nausea.

Patients involved in clinical trials will also require teaching to assist them through the process. They should know about the drug, its action, method and time of administration, side effects, and other information that would be available with the use of any drug. Due to the nature of clinical trials, there will likely be a diary to be kept or other special instructions from the group that is conducting the trial.

PATIENT TEACHING FOR RADIATION THERAPY

Radiation therapy treatments provide similar opportunities for teaching. Again, the first concept that patients will learn is when and where their appointments are scheduled. There may already have been a preliminary session in which the positioning and markings are accomplished. Patients should be alerted that subsequent sessions will be shorter. This will help with planning and transportation arrangements.

Patients who have been taught well will understand the process of radiation therapy, be aware of potential side effects, and know how to combat the symptoms of those side effects. These patients will know to notify a healthcare professional when there are symptoms that should be addressed in order to prevent those symptoms from escalating into a more serious problem. Furthermore, they will recognize that the amount and duration of radiation will affect their response. For example, skin changes are expected, as are fatigue and myelosuppression. Radiation to the chest can lead to local problems such as esophagitis, dysphagia, or radiation pneumonitis [117]. The combination of both radiation and chemotherapy treatments will undoubtedly lead to symptoms that must be controlled.

CASE MANAGEMENT AND PATIENT TEACHING

As soon as the BTW case manager has been notified of the diagnosis, he or she will contact the patient and the WTW case manager to begin the teaching program. This contact should include an explanation of the program to the patient and/or family, stressing that the goals are to improve the quality of care, reduce hospitalizations, and smooth the logistics of care. Some individuals will be anxious to participate; others will not want the intervention of a stranger into their lives. Depending on the specifics of the insurance carrier, those patients who choose not to participate may still be case managed, but indirectly and less extensively. The case manager will still work to approve care providers, but will not be conducting the interviews and teaching required with a fully participating case management patient.

BTW case managers often have an initial admission questionnaire to assist in providing a baseline as to the disease stage and progression, patient understanding, and potential knowledge deficit and opportunities for teaching. The case manager will alert the patient that there will be future contact and provide a telephone number for any questions.

CASE STUDY

Nurse W is the WTW nurse case manager at City Memorial Hospital. She is assigned to the Oncology Unit on the day shift. Nurse B is a BTW case manager working in the oncology disease management division of Western States Health Maintenance Organization. This case study will examine how each of the case managers works to help care for the patient with lung cancer.

Patient P is a white man, 58 years of age, who worked as a sales representative for a nationally known greeting card company. He traveled by car over a wide area and spent a great deal of his time driving and smoking. The patient was first seen at his primary care physician's office for a routine physical that his wife had insisted he schedule.

When Patient P met the physician for the first time in September, he denied any major complaints and stated that he was there to appease his wife. His medical history revealed no major illness or injuries, apart from an appendectomy at 14 years of age. He admitted he had smoked two packs of cigarettes every day for the last forty years.

When the office nurse observed a frequent, nonproductive cough, she questioned Patient P about it. The patient claimed it was simply a tickle in his throat that came about every spring due to an allergy to budding trees and flowers. Because it was no longer spring and the cough remained, the office nurse made a note for the physician to check into the cough when he examined the patient.

The physician found nothing remarkable on Patient P's physical examination, even though he listened to the patient's chest to assess the cough. As a precaution, however, he ordered a chest x-ray and some routine lab work.

Three days later, the results of the exams were returned. The chest film showed an infiltrate in the patient's right lower lobe. Laboratory work showed mild anemia with a hemoglobin of 10.0 and hematocrit of 31. The patient was contacted and asked to return to the office to discuss the findings.

The next day at the office, the physician explained the results and showed Patient P and his wife the x-rays. He said that while he suspected lung cancer, he hoped he was wrong. A definitive diagnosis required further testing. The physician ordered sputum for cytology, an MRI of the chest, and scheduled a bronchoscopy with biopsy for later in the week, contingent upon approval from the insurance company.

Nonetheless, Patient P and his wife were cheerful when they left the office. They were sure that the physician was wrong, but glad that he was being so thorough. Patient P also agreed that it was time to stop smoking and begin a healthier lifestyle.

Patient P was given instructions for collecting the sputum specimens. The Western States HMO utilization review office approved both the MRI and bronchoscopy as "urgent," which meant it was not routine, but also not an emergency. The diagnosis on the authorization request was possible lung cancer, so a copy was automatically routed to Nurse B in the oncology disease management division.

Three days later, Patient P, accompanied by his wife, went to the outpatient department at City Memorial, the contracted hospital for Western States HMO. Patient P had been NPO since midnight. Once out of his clothes and into a gown, Patient P was taken into the procedures suite for the bronchoscopy.

After the bronchoscopy was completed, the physician explained to Patient P's wife that everything appeared normal with the procedure, but he still wanted the MRI. After the MRI was completed, Patient P recovered from the procedure and sedation and was ready for discharge. Just before they left, the physician came back into the room with a frown on his face.

The MRI showed a peripheral lung tumor. Based on the lung scan, the physician believed the mass was likely cancer, but he also wished to get a consult from a thoracic surgeon and obtain a biopsy to determine exactly what they were dealing with.

The biopsy was scheduled for the following Wednesday, but on Sunday evening the patient's wife, sounding frantic, called the physician. She related that Patient P had had a seizure and that she had called the paramedics. By the time the ambulance had arrived, her husband was awake and had refused to go with them. The paramedics insisted that the family physician be contacted immediately. Per the physician's instructions, Patient P was driven to the emergency room at City Memorial where he was examined and admitted to the Oncology Unit.

Monday morning, when Nurse W arrived on duty, she found she had a new patient, Patient P, who carried the diagnosis of probable adenocarcinoma of the right lung with brain metastasis. At their initial meeting, she noted that he was 6 feet 2 inches tall, weighed 220 pounds, and seemed physically fit. He was awake and cheerful. He told Nurse W that he had a spot on his lung but that he was here now because he had "some sort of freak seizure or something." He thought it was due either to the medication he had taken for the bronchoscopy or perhaps just stress. He repeated several times that he believed he was fine. The patient also expressed a need to get everything settled so he could concentrate on the impending birth of his first grandchild, who was due to be born in December.

Shortly after their conversation, a transporter arrived to take Patient P to the imaging department for a MRI of the brain. While having the procedure, Patient P suffered another tonic-clonic seizure. That afternoon, the physician, accompanied by Nurse W, went to the patient's room to speak with him and his wife. The physician related the findings of the brain MRI, which showed several areas in the brain that appeared to be metastases. He also emphasized the need to begin medication and radiation treatments. First, Patient P would be referred to a neurosurgeon for further examination and possible surgical intervention.

When Patient P's wife asked about the lung tumor, the physician stated that the first priority for treatment would be the brain metastases. The neurosurgeon would determine whether a biopsy would be necessary.

After having the physician write specific orders on the patient's chart, Nurse W returned to Patient P's room. She found both the patient and his wife smiling and upbeat. Patient P's wife expressed relief that they did not need to worry about the patient's lung tumor and stated that they would be happy when the neurosurgeon had Patient P's epilepsy under control.

Unsure whether the couple was in total denial or simply had misunderstood what the physician had said, Nurse W attempted to explain the physician's recommendations. She clarified that the physician did not say he had found epilepsy. She also asked the couple if they knew what metastasis was. The couple looked confused and Patient P shook his head.

Nurse W explained that metastasis occurs when a tumor from one place in the body, for example the lung, sends out cells that grow in another part of the body, such as the brain. She also elaborated that the physician believed that the abnormalities in the brain were caused by Patient P's lung cancer. Although it was confusing to the couple that the physician stated that they would not be treating the lung tumor, Nurse W emphasized that they would still be treating the cancer; the brain metastasis was just considered a more urgent matter.

Patient P sat stunned through the entire conversation. When Nurse W returned to the nurses' station, she noted the variances on the clinical pathway for lung cancer. Patient P was not following the path at all, but his variances were not due to mistakes or omissions; they were due to a changing clinical status.

The neurosurgeon saw Patient P later in the day and scheduled a biopsy of the brain using stereotactic surgery for Tuesday, the next day. Results from the biopsy confirmed metastatic adenocarcinoma from the lung.

Patient P was discharged from the hospital two days later. Before leaving, the physician spoke with the patient and his wife regarding immediate plans. He told them that there was no way Patient P could return to work. The physician stated that he would fill out the forms to declare the patient disabled for Social Security and that he wanted them to proceed with the forms the applicant needed to fill out.

Nurse W had extensive conversations with the couple to assess their home situation. She discovered that the patient's wife was no longer able to drive due to a visual problem, and now, because of the seizure disorder, Patient P could not either. She contacted the local branch of the American Cancer Society, where a volunteer arranged for daily transportation to the hospital outpatient department where the patient would receive his chemotherapy and radiation treatments. The supermarket and pharmacy were only one block from the couple's home, so they were able to walk there, and their two married children volunteered to help with other shopping on the weekends when they were available.

There did not seem to be a need for any durable medical equipment. Nurse B called Nurse W daily during the hospital admission to collect information to authorize the stay and also to begin to obtain baseline data for the oncology case management program.

The day after Patient P returned home, Nurse B called the house and spoke with him on the telephone. She explained who she was and that Western States was interested in having him participate in their oncology case management program. She told him that hopefully this would lead to fewer hospitalizations and a more supportive atmosphere during his illness.

Patient P agreed and asked Nurse B to explain everything to his wife, who also thought it sounded like a good program. By the end of the conversation, Nurse B had completed preliminary forms that recorded the best times to call and basic demographic information. She also set an appointment for a phone visit every Wednesday morning at 11 o'clock. During those calls she would complete questionnaires that were aimed at identifying signs and symptoms of possible complications or problems. It also gave her an opportunity to educate Patient P regarding lung cancer, brain metastasis, radiation therapy, chemotherapy, and other issues that presented. She gave Patient P and his wife her telephone number and asked them to call whenever they had questions or concerns.

Early on a Monday morning, two weeks into radiation, the patient's wife called Nurse B crying. She was concerned about her husband. He was sitting in his recliner watching sports on television all day. He said he was tired, but never would go to bed. He only left his chair to go for his treatment and to go to the bathroom. His wife had tried to talk with him about their future, but Patient P refused to answer. He was also eating poorly, and she believed he had lost weight.

Nurse B arranged to have a contracted home health agency send out a nurse for an assessment and then report back with the results. The home health nurse reported that Patient P weighed 208 pounds, a 12-pound loss since he had been in the hospital. He had sores in his mouth and seemed depressed. Nurse B then spoke again to both the patient and his wife on the telephone. She reinforced the oral hygiene measures that the home health nurse had shared with them and also spoke to them about measures to ease the mouth pain. She stressed the importance of adequate food and fluid intake and offered to send a dietitian to the home. They declined. Nurse B reported her findings to the patient's physician. Chemotherapy was ending, and the physician felt it probably was not advisable to begin another course.

A month later, Patient P was still in a decline. Still depressed, he was watching endless hours of television and eating poorly. His weight was now down to 196 pounds. His fatigue was a continued problem, and now he was having some shortness of breath, even at rest. At his doctor's appointment, arterial blood gases were drawn, and he was found to have a pO_2 of 78 mm Hg. Home oxygen was ordered, which was arranged by Nurse B.

The next week when Nurse B called, she inquired about the status of the oxygen system. The patient was angry and asked when they were actually going to help him. He did not feel that he was getting adequate care. The patient's wife was also annoyed when she spoke to Nurse B. She was fed up with Patient P's bad attitude and said she was sick of being treated like hired help. She wondered why this had to happen to them. After speaking to the couple for several minutes, Nurse B could see they were both at the anger stage of grief. Frustration over Patient P's condition and an underlying fearfulness were apparent.

Nurse B was also concerned about the breathlessness that seemed to persist, despite the oxygen concentrator that was delivering oxygen at 2 liters per minute. She once again called the home health agency, which arranged for an initial assessment, followed by twice weekly nurse visits. The home health nurse recommended physical therapy to improve the patient's strength and endurance, as well as a hospital bed, as he refused to use his own bed. She felt that he liked the recliner because he could have his head up, which eased his respiratory effort. Nurse B approved both the physical therapy and the bed after consulting with the patient's physician.

Right before Thanksgiving, Patient P experienced marked swelling in his face and neck. The patient's wife contacted the physician, who authorized transport to the hospital for evaluation of possible superior vena cava syndrome.

After determining that the lung tumor had spread to the area blocking the flow through the superior vena cava, the physician, along with Nurse W, presented several options to Patient P, including surgery, more radiation and chemotherapy, or returning home with hospice to help with the final days.

The patient's wife was tearful, but said she wanted everything possible that could be done to save or prolong the patient's life. Patient P's demeanor had changed from the last time Nurse W had seen him. He was no longer upbeat, depressed or angry; he seemed tired, resigned, and at peace. He refused further treatment, stating that he wanted to go home for the holidays and enjoy his family. He had things he wanted to say to his children and he wanted to see his grandchild.

Nurse W stayed with the couple after the physician left the room. She reassured them both that if that was their choice, they would be given all the support and assistance they needed. Later, Nurse W spoke with Nurse B to obtain the needed authorization for hospice.

A hospice case manager came to the hospital and spoke with Patient P and his wife prior to discharge. She arranged for daily nurse visits to assess for pain control, respiratory problems, nutrition, and medications. She also spoke to them about advanced directives. Patient P told her that he had already signed a durable power of attorney for health care, appointing his wife as his spokesperson, and specifying that he wished to have no intubation or ventilator support. Both Nurse W and Nurse B followed the patient regularly by telephone. They answered questions and recommended nursing measures for problems that arose.

Christmas was a bittersweet time for Patient P's family. On December 21, his first grandchild, a girl, was born. She met her grandfather the next day and then spent a wonderful Christmas Day with the extended family. During the early morning of December 27, Patient P died as he slept. His wife was at his bedside, as was the hospice nurse.

Throughout this illness, the patient was kept informed of all the tests, treatments, procedures, and processes that occurred. Patient P was allowed to express his feelings, make choices, and exert some control over his life that had, in actuality, become very out-of-control. Because of this, he was better able to cope with the illness, his wife was better able to cope and to help him, and costs were kept to a minimum. Numerous hospitalizations were avoided and minor problems were prevented from escalating.

CONCLUSION

Although advancements in the diagnosis and treatment of lung cancer have been made in the last few decades, it remains the second deadliest cancer in the United States [2]. Identifying risk factors and screening for lung cancer at the earliest possible point is one of the most effective ways to improve the clinical course and survival time associated with the disease. The two main categories of lung cancer, SCLC and NSCLC, have distinctive pathophysiologies, which also affect the available treatment and management options. A comprehensive understanding of the different lung cancer types, how they present, and how they may be treated is an important step in providing the best possible care for patients. Disease progression and/or cancer treatments may result in various conditions, which should be discussed and managed with the patient as much as possible. Eventually, many patients will require palliative or hospice care. A knowledge of lung cancer and its effects on patients will better prepare healthcare professionals for the realities of the disease process and the necessity for compassionate care and patient teaching.

RESOURCES

A number of resources are available for healthcare providers and patients diagnosed with lung cancer and their caregivers. These resources cover a wide range of services and are located throughout the United States. Although every community has programs available, those listed here are available nationwide. National organizations listed may have local branches, so it may be useful to check with their headquarters or your local directory. All are nonprofit organizations.

University of Colorado Cancer Center Fund
1665 North Aurora Court 2004
Aurora, CO 80045
(720) 848-0300
https://medschool.cuanschutz.edu/colorado-cancer-center
Provides direct fundraising support for cancer research.

American Cancer Society
(800) 227-2345
https://www.cancer.org
Provides many services to patients with a diagnosis of cancer, including information, classes, support groups, transportation for medical appointments, home care products, and more.

American Lung Association
(800) 586-4872
(800-LUNGUSA)
https://www.lung.org
Offers programs to reduce the hazards of lung disease, such as classes to stop smoking, as well as information, support groups, and research programs. Some local groups have oxygen concentrators on loan.

CancerCare
275 Seventh Avenue
New York, NY 10001
(800) 813-4673
https://www.cancercare.org
Includes educational programs, psychologic counseling, and financial support for patients with cancer.

Corporate Angel Network, Inc.
Westchester County Airport
One Loop Road
White Plains, NY 10604-1215
(914) 328-1313
https://www.corpangelnetwork.org
Provides free air transportation for patients traveling to receive cancer treatment.

National Cancer Institute
(800) 4-CANCER
(800-422-6237)
https://www.cancer.gov
Answers questions, provides information, and makes resource referrals for those with cancer.

National Hospice and Palliative Care Organization
1731 King Street, Suite 100
Alexandria, VA 22314
(703) 837-1500
https://www.nhpco.org
Offers information nationwide on local hospices to assist patients in finding the service in their community or nearby.

GO_2 Foundation for Lung Cancer
(800) 298-2436
https://www.lungcanceralliance.org
Provides information and referral services for patients and caregivers, and facilitates a peer support network.

Implicit Bias in Health Care

The role of implicit biases on healthcare outcomes has become a concern, as there is some evidence that implicit biases contribute to health disparities, professionals' attitudes toward and interactions with patients, quality of care, diagnoses, and treatment decisions. This may produce differences in help-seeking, diagnoses, and ultimately treatments and interventions. Implicit biases may also unwittingly produce professional behaviors, attitudes, and interactions that reduce patients' trust and comfort with their provider, leading to earlier termination of visits and/or reduced adherence and follow-up. Disadvantaged groups are marginalized in the healthcare system and vulnerable on multiple levels; health professionals' implicit biases can further exacerbate these existing disadvantages.

Interventions or strategies designed to reduce implicit bias may be categorized as change-based or control-based. Change-based interventions focus on reducing or changing cognitive associations underlying implicit biases. These interventions might include challenging stereotypes. Conversely, control-based interventions involve reducing the effects of the implicit bias on the individual's behaviors. These strategies include increasing awareness of biased thoughts and responses. The two types of interventions are not mutually exclusive and may be used synergistically.

APPENDIX 1: SAMPLE CASE MANAGEMENT CARE PLANS

SAMPLE CASE MANAGEMENT CARE PLANS	
ALTERATION IN NUTRITION—DEFICIENCY DUE TO ANOREXIA, NAUSEA, VOMITING, DIARRHEA, WEIGHT LOSS **GOALS**: Maintain appropriate weight; prevent nutritional depletion; treat existing nutritional deficiencies; meet increased need for nutrition; maintain/improve patient's quality of life.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess patient/family understanding of prescribed diet.	Obtain baseline knowledge level upon which to build.
Assess presence of anorexia, nausea, vomiting, and diarrhea and cross-reference symptoms to medications/treatments.	Report to physician.
Instruct patient/family in maintaining food diary as needed.	Identify trends of poor intake and be able to intervene.
Assist patient/family to identify ways to maintain adequate nutrition. Identify preferred high carbohydrate foods and drinks.	Take antiemetics before meals.
Review sample menus with patient/family. Recommend small, frequent meals. Identify bland foods to eat when nauseated.	Assist in problem solving to provide means of easing discomfort while increasing oral intake.
Encourage good oral care before and after meals.	Will enhance the taste of food.
Instruct patient to weigh daily at same time of day with same clothing.	Monitor weight.
Instruct in monitoring intake and output.	Monitor and report to physician as necessary.
Refer to nutritional consultation as necessary.	Will have appropriate support systems in place.
KNOWLEDGE DEFICIT—RELATED TO DISEASE PROCESS OF LUNG CANCER **GOAL**: Demonstrate understanding of disease process by complying with treatment regimen and identifying significant signs and symptoms.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess present level of understanding, desire, and ability to learn.	Obtain baseline data upon which to build; dispel fears and misconceptions.
Assess level of compliance with treatment regimen and any reasons for noncompliance.	Emphasize importance of compliance with prescribed plan.
Teach risk factors, disease process, complications, usual treatment modalities, and treatment options.	Provides basis for understanding importance of being an active partner in managing care.
Discuss follow-up care during and after treatments.	Will be actively involved in monitoring condition.
Identify and review with patient/family pertinent education plans.	Modification of controllable risk factors may result in better management of disease process.
Assist patient/family to identify community resources that may be of value.	Will have adequate support systems in place.

APPENDIX: SAMPLE CASE MANAGEMENT CARE PLANS *(Continued)*	
KNOWLEDGE DEFICIT—RELATED TO MEDICATIONS **GOAL**: Understand prescribed medication regimen through compliance.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess level of patient/family understanding of medication plan.	Obtain baseline to determine precise knowledge deficits.
Assess level of compliance with medication regimen and any reasons for noncompliance.	Obtain baseline data upon which to build.
Assess patient/family level of understanding of actions and side effects of medications.	Obtain baseline data upon which to build.
Teach importance of following prescribed medication regimen. Ask patient to record when medications are given.	Adequate information will enhance compliance. Documentation may prevent inadvertent misuse of medications.
Teach actions, common side effects, signs, and symptoms requiring physician attention.	Medical attention will be obtained in a timely manner.
Teach questions to ask physician.	Patient will be prepared to discuss medications with physician.
Assess compliance and knowledge in follow-up visits/ telephone calls.	Ongoing monitoring and education will enhance management of lung cancer.
HIGH RISK FOR INFECTION—RELATED TO IMMUNOSUPPRESSION, BONE MARROW SUPPRESSION, AND/OR POOR NUTRITION **GOAL**: Remain free of infection.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess patient/family level of understanding regarding importance of avoiding infection and ways to prevent infection.	Obtain baseline knowledge and skill level upon which to build.
Teach patient/family to monitor temperature in presence of chills, increased fatigue, dyspnea, and presence of body fluids of unnatural color or with odor.	Will recognize early symptoms of infection and obtain prompt medical attention.
Assist patient/family to identify ways to prevent infections, including: • Maintain adequate nutrition. • Maintain adequate oral and skin care. • Practice good handwashing technique. • Avoid exposure to people with colds or other infections. • Obtain adequate rest. • Obtain flu and pneumonia vaccines per physician's advice. • Take temperature if symptoms present. • Take full course of antibiotics as ordered. • Maintain clean environment. • Maintain highest activity level possible. • Cough and deep breathe regularly if sedentary.	Will understand how to avoid infections; will participate in methods to avoid infections.
Reinforce with patient/family the signs and symptoms to report to physician when infection is suspected.	Will obtain medical attention promptly through precise communication of signs and symptoms of infection.

APPENDIX: SAMPLE CASE MANAGEMENT CARE PLANS *(Continued)*	
KNOWLEDGE DEFICIT—RELATED TO TREATMENT MODALITIES USED **GOAL**: Improve understanding of treatment modalities by asking appropriate questions and actively participating in management of the treatment process.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess patient/family present level of understanding, desire, and ability to learn.	Obtain baseline data upon which to build. Dispel fears and misconceptions.
Assess level of compliance with treatment regimen and any reasons for noncompliance.	Emphasize importance of compliance with treatment regimen.
Teach risk factors, disease process, and complications of patient's treatment modalities and treatment options.	Provides basis for understanding importance of being an active partner in managing care.
Teach signs and symptoms that require physician attention.	Early detection of acute episode allows medical attention to be obtained in a timely manner.
Discuss follow-up care during and after treatments.	Patient will be actively involved in monitoring his or her condition.
Assist patient/family to identify community resources that may be of value.	Will have adequate support systems in place.
Schedule follow-up visits or telephone calls.	Provides for continued support.
ALTERED ROLE PERFORMANCE—DISEASE HAS CHANGED PATIENT AND FAMILY ROLES **GOAL**: Patient and family will exhibit empathy and a supportive environment to assist one another in making role changes.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Encourage patient to make a list of individual strengths, goals, and responsibilities.	Identifies realistic perception of abilities, accepts limitations, and discusses ways to change lifestyle to assist in attaining goals.
Assist to explore new ways to accomplish goals with existing limitations.	Fosters new ways to perceive patient and family roles.
Refer to counseling as needed.	Assist with mastery of new role.
ANTICIPATORY GRIEF—RELATED TO POTENTIAL LOSS OF WELL-BEING AND/OR LIFE **GOALS**: Have adequate support systems in place; make decisions regarding care.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess stages of grief. Acknowledge normalcy of feelings and concerns.	Identify baseline stage of grief. Provide sense of control.
Assess patient/family mental and emotional status noting signs of denial, depression, noncompliance, dependency, etc.	Will determine level of support required.
Provide opportunity for expression of feelings.	Verbalization will assist in the grieving process.
Set limits with maladaptive coping mechanisms and provide positive support for effective coping.	Reinforces adaptive coping mechanisms.
Reinforce the value of treatment.	Provides sense of realistic hope.
Encourage patient/family to make simple decisions regarding care.	Provides a sense of control.
Provide follow-up visits or calls.	Provides for continued support and reassurance.

APPENDIX: SAMPLE CASE MANAGEMENT CARE PLANS *(Continued)*	
ANXIETY—RELATED TO CHANGE IN HEALTH, THREAT OF DEATH **GOAL**: Effectively cope with identified lifestyle changes.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assist patient/family in identifying sources of stress.	Obtain baseline data upon which to build.
Identify level of stress and follow appropriate action: Mild stress – increased awareness and able to focus. No action required. Moderate stress – decreased awareness of environment and concentration span. May have difficulty thinking clearly. Severe stress – major decrease in awareness of environment. May focus on one detail at a time. Refer to physician. Panic – is unable to attend to or integrate environment, unable to function. Refer to physician. Identify effective manners to cope with stress (e.g., assertive techniques, creative problem solving, expression of feelings).	Determine if patient/family is ready and willing to learn. Assess ability as related to stress to actively participate in management of chronic illness. Provide support by conveying attitude of acceptance and through active listening. Develop individualized plan to effectively cope with situation.
Identify relaxation techniques and alternative ways to relax (e.g., exercise, progressive relaxation, guided imagery, hobbies).	Develop individualized plan to assist patient to relax.
Monitor progress with follow-up visits or telephone calls.	Management of stress is an ongoing process.
ALTERATION IN COMFORT—RELATED TO CHRONIC PAIN FROM NEOPLASM, METASTASIS, ETC. **GOALS**: Verbalize relief from discomfort; identify resources to assist in pain management.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess patient/family complaints of discomfort in terms of frequency, location, intensity, and how relief is obtained.	Patient/family will identify source of discomfort.
Assist patient/family to identify alternative methods of pain relief including: position changes, relaxation techniques, guided imagery, diversionary activities, rest, etc.	Enhances nonpharmacologic methods of pain relief.
Evaluate use and effect of pain medications. Encourage compliance with medication regimen.	Determine if follow-up with the physician is warranted for good pain management
Assist patient/family to identify community resources that may be of assistance.	Will have adequate support systems in place.
Schedule follow-up visit or telephone call.	Monitor discomfort as an ongoing process.
ALTERED ORAL MUCOUS MEMBRANE—CAUSED BY TREATMENTS, INFECTIONS, POOR ORAL INTAKE **GOALS**: Demonstrate ability to maintain good oral hygiene; maintain adequate fluid and nutritional intake; oral mucous membranes intact and without lesions.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess condition of oral membranes.	Obtain baseline status.
Instruct patient/family in proper technique to maintain good oral hygiene, such as: use soft toothbrush, do not use mouthwash with alcohol, keep lips well-lubricated, avoid spicy, citrus, or hot foods.	Patient/family will be able to demonstrate/explain proper technique.
Encourage patient to drink adequate fluids	Helps to maintain membranes in good condition.

APPENDIX: SAMPLE CASE MANAGEMENT CARE PLANS *(Continued)*	
IMPAIRED PHYSICAL MOBILITY—RELATED TO FATIGUE, GENERALIZED WEAKNESS, MALNUTRITION, INFECTION, IMBALANCE BETWEEN OXYGEN SUPPLY AND DEMAND, BRAIN METASTASIS **GOAL**: Maintain optimal level of physical activity and functional ability.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess patient baseline level of activity in terms of type, response, and emotional response.	Obtain baseline data upon which to build. Determine compliance with prescribed activity level.
Assist patient in setting daily schedules/goals as needed.	Promote sense of control.
Help to prioritize and pace activities, providing for rest periods.	Tailor activity level to patient's lifestyle and needs.
Assist patient/family to identify energy-conserving techniques.	Will develop skills to increase strength and endurance.
Assist patient/family to identify activity tolerance by monitoring pulse and respiration before activity and assessing during and after for shortness of breath.	Will accurately identify activity tolerance and precisely report changes to physician to monitor progress.
Instruct patient/family to slowly increase activity.	Will progressively build strength and endurance, as tolerated.
Assist patient/family to recognize signs of activity intolerance that may necessitate need for medical attention.	Early medical attention may prevent exacerbation of acute episode.
Monitor progress with follow-up visit or telephone call.	Progress will be monitored and support provided to attain goals.
INEFFECTIVE BREATHING PATTERN—RELATED TO ACTUAL LOSS OR POTENTIAL LOSS OF VENTILATION **GOALS**: Exhibit improved respiratory status; cooperate with care that reduces dyspnea.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess rhythm, depth, and quality of respirations.	Obtain baseline data.
Identify factors that contribute to breathing difficulties.	Assist in problem solving for sources of dyspnea.
Assess level of compliance with methods of reducing dyspnea, complying with oxygen regimen, and any reasons for noncompliance.	Obtain baseline data.
Teach signs and symptoms that may require physician attention.	Early detection of acute episode allows medical attention to be obtained in a timely manner.
Instruct patient/family to suction as necessary to remove secretions.	Facilitates breathing.

APPENDIX: SAMPLE CASE MANAGEMENT CARE PLANS *(Continued)*	
KNOWLEDGE DEFICIT—RELATED TO OXYGEN DELIVERY SYSTEMS **GOAL**: Demonstrate understanding of prescribed oxygen regimen through compliance.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess level of patient/family understanding of oxygen system.	Obtain baseline data.
Assess level of compliance with oxygen data.	Obtain baseline regimen and any reasons for non-compliance.
Teach signs and symptoms that may require physician intervention.	Medical attention will be obtained in a timely manner.
Instruct in emergency safety procedures.	Patient/family will be able to avoid and/or properly respond to emergency situations.
Assess compliance in follow-up visits or telephone calls.	Ongoing monitoring will enhance management of cancer.
BODY IMAGE DISTURBANCE—RELATED TO SURGERY, WEIGHT LOSS, EDEMA, AND/OR TREATMENT REGIMENS **GOAL**: Develop a realistic, accepting, and positive self-concept regarding body image.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Allow patient to verbally express feelings about the changes seen.	Discussion will help to identify areas of concern.
Suggest ways to improve body image, such as grooming, posture, etc.	Involvement in improving the situation will motivate patient.
IMPAIRED SKIN INTEGRITY—RELATED TO RADIATION THERAPY AND/OR SURGICAL INTERVENTION **GOAL**: Skin will remain intact and free of lesions, rashes, or other irritations.	
ACTION	**RATIONALE/DESIRED OUTCOME**
Assess status of skin condition.	Obtain baseline information.
Suggest methods of improving dry, itching, or peeling skin, such as: • Use a mild soap without perfumes or deodorants; • Avoid creams or lotions with perfumes or deodorants; • Avoid the use of cornstarch or petroleum jelly; • Avoid tight-fitting garments that rub against the skin; • Use hydrophilic creams or lotions to ease dryness.	Maintain or restore skin integrity.
Avoid exposure to sun, heat, or cold and use sunblock when sun exposure is not avoidable.	Prevent exacerbation of skin problems.
Treat moist desquamation with saline irrigations or cool compresses.	Prevent skin breakdown and infection.
Monitor progress with follow-up visits or telephone calls.	Provides continued monitoring of progress.

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