Lung cancer is the leading cause of cancer death for both men and women, with an estimated 161,840 individuals expected to succumb to the disease in 2008 (Jemal et al., 2008). The overall five-year survival rate is 15% (National Cancer Institute [NCI], 2007).

A variety of treatment options have been developed since the mid-1990s that will hopefully result in improved survival rates. The general background information on lung cancer provided in this article is partially based on Walker (2003).

Lung cancer is divided into two major histologic types: non-small cell lung cancer (NSCLC) and small cell lung cancer. NSCLC is the most prevalent type, accounting for more than 80% of cases (NCI, 2007). NSCLC is further characterized by histology as adenocarcinoma, squamous cell carcinoma, or large cell carcinoma, with almost 20% of cases in the NCI SEER database (1975–2004) classified as not otherwise specified. Adenocarcinomas are the most prevalent NSCLC cases, representing about 40% (NCI) and typically present in the lung periphery and may metastasize rapidly to the liver, adrenal glands, bones, or brain (see Figure 1). Bronchioalveolar carcinoma is a form of adenocarcinoma which typically presents in a multifocal inflammatory pattern. Squamous cell carcinomas, accounting for about 20% of NSCLCs (NCI, 2007), typically are more centrally located, often resulting in endobronchial obstruction and hemoptysis. Squamous cell carcinomas tend to be more indolent (Schrump et al., 2005). Large cell carcinomas account for about 5% of all cases (NCI, 2007), but have declined in frequency, most likely from better diagnostic techniques, which may categorize them as adenocarcinoma or squamous cell carcinoma (Schrump et al.).

Etiology

Smoke from tobacco use accounts for about 80% of all deaths from lung cancer (Schrump et al., 2005). Most diagnoses are from active smoking, although chronic inhalation of passive secondhand smoke has been implicated in some cases. The U.S. Environmental Protection Agency (2007) has estimated that about 3,000 deaths from lung cancer per year are a result of secondhand smoke. Individuals with a history of chronic obstructive pulmonary disease also have an increased risk of developing lung cancer. The lower the forced expiratory volume in one second, the greater the risk of lung cancer (Wasswa-Kintu, Gan, Man, Pare, & Sin, 2005). Dietary deficiencies also may play a role, particularly diets low in fruits and vegetables (Alberg & Samet, 2003). Other contributing factors may include exposure to radon, asbestos, arsenic, chromium, nickel, air pollution, and family history (Alberg & Samet).
Prevention

In 2006, 20.1% of adults in the United States were current smokers and 24.5% were former smokers (Centers for Disease Control and Prevention, 2006). Many newly diagnosed patients with lung cancer are former smokers. Smoking cessation is the key to preventing lung cancer. Nurses can improve the likelihood of patients quitting through nursing intervention (Rice & Stead, 2006). Pharmacologic agents, such as nicotine replacement therapy (Etter & Stapleton, 2006) and bupropion (Hughes, Stead, & Lancaster, 2007), also are effective at improving smoking cessation rates. Varenicline, a nicotine receptor partial agonist, has been shown in two studies to be an effective smoking cessation aid with a mild toxicity profile (Gonzales et al., 2006; Williams, Reeves, Billing, Pennington, & Gong, 2007).

A guide for nurses to help smokers quit has been developed and made available through the Agency for Healthcare Research and Quality (2005). Patients who have been diagnosed with lung cancer but continue to smoke should be encouraged to stop as well. Current smokers may have a poorer prognosis than nonsmokers, former smokers, and individuals who have recently stopped smoking (Sardari Nia et al., 2005). Chemoprevention with antioxidants has been studied but, to date, no chemopreventive agents have been proven effective in preventing lung cancer. In fact, two studies initially revealed an increased risk of lung cancer in smokers who were supplemented with beta carotene (Albanes et al., 1995; Omenn et al., 1996). An Eastern Cooperative Oncology Group study in which patients with a history of stage IB NSCLC receiving selenium as a chemoprevention agent is ongoing.

Screening

No screening recommendations exist at present for lung cancer. Chest x-ray and sputum cytology have not been shown to reduce mortality (Aberle & Brown, 2008). Spiral computed tomography (CT) has detected tumors at an early stage; however, whether this will improve mortality rates is unknown (New York Early Lung Cancer Action Project Investigators, 2007). The National Lung Cancer Screening Trial, which compares low-dose spiral CT scans versus chest x-rays for the early detection of lung cancer in current and former smokers, is a randomized controlled trial designed to show an improvement in mortality with CT screening. The study was closed to accrual in February 2004 with an enrollment of about 50,000 subjects. Results are pending because data analysis is expected to take eight years. Although no specific screening guidelines have been recommended by the American Cancer Society (ACS), informed decision-making is advised for high-risk patients interested in pursuing screening (ACS, 2007).

Clinical Manifestations

Cough is the most common symptom of lung cancer, followed by dyspnea, chest pain, hoarseness, anorexia, weight loss, and fatigue. The metastatic pattern of NSCLC includes intrapulmonary, bones, brain, liver, and adrenal glands. Patients who present with bone metastases may experience bone pain. Patients who present with brain metastases may experience neurologic symptoms. Radiographically, NSCLC may present as a peripheral nodule (more common with adenocarcinomas) or in the central bronchi (more common with squamous histology).

Diagnosis and Staging

A transbronchial or transthoracic needle biopsy is the typical method used to diagnose NSCLC. Techniques to stage the disease may include a traditional CT scan of the chest and upper abdomen, positron emission tomography (PET) scan, or combined PET/CT, bone scan, and magnetic resonance image of the brain. PET is more accurate than CT in staging for mediastinal lymph node metastases (Birim, Kappetein, Stijnen, & Bogers, 2005). A PET/CT scan has improved sensitivity and accuracy over traditional PET with respect to tumor and nodal status (Cerfolio et al., 2004) (see Figure 2). PET/CT scanning, however, cannot replace mediastinoscopy in all patients. National Comprehensive Cancer Network (NCCN, 2008a) guidelines have recommended confirmatory pathologic staging when the mediastinal lymph nodes are PET positive.

NSCLC is staged according to the American Joint Committee on Cancer Tumor-Node-Metastasis system (see Tables 1 and 2). About 75% of NSCLC are diagnosed with either regional or metastatic disease, although fewer than 20% are considered localized (SEER, 2008). Five-year survival rates range from 67% for stage IA disease to 1% for stage IV disease (Mountain, 1997).

Treatment of Early-Stage Non-Small Cell Lung Cancer

The cornerstone of therapy for stage I, II, and select stage III NSCLC is surgery, either with lobectomy or pneumonectomy, depending on the location of the tumor. Lobectomy...
has been shown to be superior to wedge resection (Ginsberg, Rubinstein, & Lung Cancer Society Group, 1995). The standard of care for select resected NSCLC involves the addition of adjuvant chemotherapy. Several studies have demonstrated a survival advantage with the addition of adjuvant chemotherapy (see Table 3).

In general, adjuvant chemotherapy should be offered to fully resected patients with stage II and select stage III NSCLC (NCCN, 2008a). The NCCN (2008a) guidelines also recommended consideration of adjuvant chemotherapy for select high-risk stage IA and stage IB patients. Cisplatin-based regimens may be more efficacious than carboplatin and should be considered the platin of choice in the adjuvant curative setting (Ardizzoni et al., 2007). Studies examining the use of targeted therapies, such as bevacizumab and erlotinib in the adjuvant setting, are ongoing.

Treatment of Locally Advanced Non-Small Cell Lung Cancer

The typical approach to treatment of locally advanced stage IIIA or IIIB NSCLC is chemotherapy and radiation, with or without surgery. Median survival is usually 16–17 months (Curran et al., 2003; Furuse et al., 1999). A large, randomized phase III trial (N = 396) looked at patients with resectable stage IIIA NSCLC who were treated with either chemotherapy with concurrent radiation followed by surgery (triumodality) or a higher dose of radiation with concurrent chemotherapy (bimodality). A similar overall survival outcome was found, but a statistically significant difference in progression-free survival favored the trimodality arm, 12.8 months versus 10.5 months (Albain et al., 2005). No toxicity data were available.

Patients with stage IIIB NSCLC are not candidates for surgery and, therefore, receive chemotherapy with concurrent radiation. Concurrent chemoradiotherapy is superior to sequential (Curran et al., 2003; Furuse et al., 1999) but yields more toxicity, requiring more aggressive symptom management in patients. The addition of three cycles of consolidation docetaxel in Gandara et al. (2003) revealed a median survival of 26 months; however, a confirmatory phase III study did not reveal an improvement in survival and, therefore, the treatment is not recommended (Hanna et al., 2007). The NCCN (2008a) recommended the use of cisplatin-based regimens for patients receiving combination chemoradiotherapy. The role of targeted agents, such as bevacizumab, cetuximab, and sorafenib in combination with standard chemotherapy and radiation, currently is being investigated.

Treatment of Advanced Non-Small Cell Lung Cancer

Initial therapy: Chemotherapy versus best supportive care reveals an advantage to chemotherapy with improved survival and quality of life (Marino, Pampallona, Pretoni, Cantoni, & Invernizzi, 1994) in patients with stage IIIB with malignant pleural effusion and stage IV NSCLC. Combination chemotherapy is the gold standard for patients with a good performance status. Single-agent chemotherapy may be reserved for select older adult patients and those with poor performance status and multiple comorbidities; however, a trial by Obasaju et al. (2007) suggested that standard doublet therapy with gemcitabine and carboplatin may be superior to single-agent gemcitabine in patients with a poor performance status, with patients in the doublet arm having better response rates.

Schiller et al. (2002) compared four standard platin-based regimens (see Table 4) and found that none offered a significant advantage over the others. Non-platin-containing doublets, such as gemcitabine and paclitaxel, also are effective (Treat et al., 2005). Duration of therapy with the same regimen beyond four cycles has not improved survival or quality of life in a statistically significant way (Socinski et al., 2002).

Novel targeted therapies for NSCLC have been studied. Bevacizumab, an antivascular endothelial growth factor (anti-VEGF) compound, in combination with paclitaxel and carboplatin, has shown superiority to paclitaxel and carboplatin alone in the frontline setting. Patients in the bevacizumab arm had a median survival of 12.5 months, versus 10.2 months in the paclitaxel and carboplatin arm (Sandler et al., 2005). Because patients in the bevacizumab arm also had an increased risk of hemorrhage, the treatment is contraindicated in patients at risk for bleeding.
including squamous histology or brain metastases, and in patients receiving anticoagulation. Studies on patients with brain metastases taking bevacizumab are ongoing.

Second-line therapy: Docetaxel was compared to best supportive care for patients with NSCLC who were treated previously with platin-based chemotherapy. Patients in the docetaxel arm experienced a survival advantage (7 months in the docetaxel arm versus 4.6 months in the best supportive care arm) (Shepherd et al., 2000) and docetaxel is approved by the U.S. Food and Drug Administration (FDA) for second-line therapy in patients with NSCLC. The approved dose is 75 mg/m² every three weeks (sanofi-aventis, 2006).

Pemetrexed, a multitargeted antifolate, was compared to docetaxel in previously treated patients with NSCLC in a phase III study. No differences were found in overall response rates, but patients in the pemetrexed arm experienced fewer adverse effects (Hanna et al., 2004). Pemetrexed is FDA approved for locally advanced or metastatic NSCLC after prior chemotherapy. Patients who receive pemetrexed must receive vitamin supplementation with folic acid and vitamin B₁₂ to reduce hematologic and other toxicities. Premedication with dexamethasone also is recommended to prevent cutaneous toxicity. Pemetrexed is administered at 500 mg/m² in 10-minute IV infusions every 21 days (Eli Lilly and Company, 2007).

Erlotinib is a human epidermal growth factor receptor type 1/epidermal growth factor receptor (HER1/EGFR) tyrosine kinase inhibitor. Erlotinib was compared to placebo in 731 patients with advanced or metastatic NSCLC treated with one or two prior chemotherapies. Patients in the erlotinib arm experienced a statistically significant improvement in overall survival (6.7 months in erlotinib arm versus 4.7 months in placebo arm) (Shepherd et al., 2005). Most commonly occurring adverse effects were rash and diarrhea (Shepherd et al., 2005). Erlotinib is FDA approved for patients with locally advanced or metastatic NSCLC who have failed at least one prior chemotherapy regimen. The recommended daily starting dose is 150 mg orally on an empty stomach (OSI Pharmaceuticals, 2007).

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**Table 1. Definition of the Tumor-Node-Metastasis Staging System**

<table>
<thead>
<tr>
<th>TUMOR</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX</td>
<td>Primary tumor cannot be assessed or the tumor is proven by the presence of malignant cells in sputum or bronchial washings but not visualized by imaging or bronchoscopy</td>
</tr>
<tr>
<td>T0</td>
<td>No evidence of primary tumor</td>
</tr>
<tr>
<td>Tis</td>
<td>Carcinoma in situ</td>
</tr>
<tr>
<td>T1</td>
<td>Tumor 3 cm or less in greatest dimension, surrounded by lung or visceral pleura, without bronchoscopic evidence of invasion more proximal than the lobar bronchus (i.e., not in the main bronchus)</td>
</tr>
<tr>
<td>T2</td>
<td>Tumor with any of the following features of size or extent: more than 3 cm in greatest dimension; involves main bronchus, 2 cm or more distal to the carina; and invades the visceral pleura. Associated with atelectasis or obstructive pneumonitis that extend to the hilar region but does not involve the entire lung</td>
</tr>
<tr>
<td>T3</td>
<td>Tumor of any size that directly invades any of the following: chest wall (including superior sulcus tumors), diaphragm, 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</td>
</tr>
</tbody>
</table>
| T4    | Tumor of any size that invades any of the following: mediastinum, heart, great vessels, trachea, esophagus, vertebral body, carina; or separate tumor nodules in the same lobe; or tumor with a malignant pleural effusion 

---

**Regional Lymph Nodes**

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

**Distant Metastasis**

<table>
<thead>
<tr>
<th>METASTASIS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MX</td>
<td>Distant metastasis cannot be assessed</td>
</tr>
<tr>
<td>M0</td>
<td>No distant metastasis</td>
</tr>
<tr>
<td>M1c</td>
<td>Distant metastasis present</td>
</tr>
</tbody>
</table>

---

*The uncommon superficial tumor of any size with its invasive component limited to the bronchial wall, which may extend proximal to the main bronchus, also is classified T1.*

*Most pleural effusions associated with lung cancer are cause by a tumor. However, a few patients with multiple cytopathologic examinations of pleural fluid are negative for tumor. In these cases, fluid is non-bloody and is not an exudate. Such patients may be further evaluated by videotorhorscopy and direct pleural biopsies. When these elements and clinical judgment dictate that the effusion is not related to the tumor, the effusion should be excluded as a staging element and the patient should be staged T1, T2, or T3.*

*Includes separate tumor nodule(s) in a different lobe (ipsilateral or contralateral)*

Non-Small Cell Lung Cancer and Older Adult Patients

Lung cancer primarily is a disease that affects older patients, with a median age of 70 at diagnosis (NCI, 2007). The Elderly Lung Cancer Vinorelbine Italian Study (ELVIS) compared single-agent chemotherapy with vinorelbine to best supportive care and demonstrated improvements in survival and quality of life with vinorelbine (28 weeks in vinorelbine arm and 21 weeks in supportive care arm) (ELVIS Group, 1999). The Multicenter Italian Lung Cancer in the Elderly trial was a phase III three-arm trial that compared single-agent vinorelbine to single-agent gemcitabine and combination gemcitabine and vinorelbine in older adult patients. The combination therapy showed no improvement over the single agent and actually had more toxicity (Gridelli et al., 2003). Retrospective analyses of various two-drug regimens, however, appear safe in fit older adult patients with a good performance status (Ansari et al., 2007; Langer et al., 2002). Surgery also has been shown to be safe in older adult patients, with no differences in overall survival between older and younger patients (Yamamoto et al., 2007). Toxicty in older adult patients who receive concurrent chemoradiotherapy for locally advanced NSCLC is more severe; however, survival rates are similar to younger patients (Schild et al., 2005). The benefits versus the risks of concurrent chemoradiotherapy should be fully explained to the patient prior to treatment.

Future Trends

Cancer treatments have become increasingly sophisticated since the 1990s, with a shift in paradigm from generic cytotoxic chemotherapy to the development of agents targeted to specific tumor pathways. The goals of targeted therapy are to improve specificity and, hopefully, limit toxicity.

Targeted Combinations

Erlotinib and bevacizumab have shown activity in patients with advanced NSCLC. Although bevacizumab has shown efficacy in combination with standard chemotherapy (Sandler et al., 2005), studies incorporating erlotinib with chemotherapy have been disappointing (Gatzemeier et al., 2004; Herbst, Prager, et al., 2005). Erlotinib and bevacizumab are targeted agents with different mechanisms of action. The combination of the agents, therefore, offers unique clinical trial opportunities. Two phase II studies have shown promising results in patients with advanced NSCLC (Fehrenbacher et al., 2006; Herbst, Johnson, et al., 2005) and phase III trials are ongoing. The ATLAS trial (NCI, 2008b) will compare chemotherapy plus bevacizumab followed by bevacizumab and erlotinib versus bevacizumab plus erlotinib placebo. The BeTa trial (NCI, 2008a) will explore erlotinib plus placebo versus erlotinib plus bevacizumab.

Dual Inhibitors

Sunitinib and sorafenib, anti-VEGF receptor agents, have been approved by the FDA for treatment of renal cell carcinoma, gastrointestinal stromal tumors (sunitinib only), and hepatocellular carcinoma (sorafenib only). Sorafenib 400 mg twice daily has shown activity in two phase II trials in patients with advanced NSCLC (Gatzemeier et al., 2006; Liu et al., 2006). Common side effects included cutaneous reactions, nausea, and diarrhea (Gatzemeier et al., 2006). Phase III trials combining sorafenib with chemotherapy in the front-line

Table 2. Grouping of the Tumor-Node-Metastasis Staging System

<table>
<thead>
<tr>
<th>STAGE GROUPING</th>
<th>TUMOR</th>
<th>NODE</th>
<th>METASTASIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occult carcinoma</td>
<td>TX</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage 0</td>
<td>Tis</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IA</td>
<td>T1</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IB</td>
<td>T2</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIA</td>
<td>T1</td>
<td>N1</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td>T2</td>
<td>N1</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td>T3</td>
<td>N0</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIA</td>
<td>T1</td>
<td>N2</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIA</td>
<td>T2</td>
<td>N2</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIA</td>
<td>T3</td>
<td>N1</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIA</td>
<td>T3</td>
<td>N2</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td>Any T</td>
<td>N3</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td>T4</td>
<td>N3</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IIIB</td>
<td>Any N</td>
<td>Any N</td>
<td>M0</td>
</tr>
<tr>
<td>Stage IV</td>
<td>Any T</td>
<td>Any N</td>
<td>M1</td>
</tr>
</tbody>
</table>


Table 3. Summary of Modern Adjuvant Chemotherapy Trials in Non-Small Cell Lung Cancer Showing a Survival Advantage

<table>
<thead>
<tr>
<th>TRIAL</th>
<th>SOURCE</th>
<th>ABSOLUTE SURVIVAL BENEFIT (%)</th>
<th>REGIMEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>IALT (International Adjuvant Lung Trial)</td>
<td>Ariagada et al., 2004</td>
<td>4</td>
<td>Cisplatin with etoposide, vindesine, vinblastine, or vinorelbine</td>
</tr>
<tr>
<td>ANITA (Adjuvant Navelbine International Trialist Association)</td>
<td>Douillard et al., 2005</td>
<td>8</td>
<td>Cisplatin and vinorelbine</td>
</tr>
<tr>
<td>NCIC (National Cancer Institute of Canada)</td>
<td>Winton et al., 2005</td>
<td>15</td>
<td>Cisplatin and vinorelbine</td>
</tr>
</tbody>
</table>
setting are ongoing. Sunitinib with intermittent dosing (Socinski et al., 2006) and continuous dosing (Brahmer et al., 2007) has shown activity in patients with NSCLC in two phase II studies. Patients with a history of gross hemoptysis or brain metastases were excluded from the sunitinib studies.

**Predictive Modeling**

The excision repair cross-complementation group 1 (ERCC-1) is a DNA repair protein, which has been implicated in resistance to cisplatin chemotherapy (Larminat & Bohr, 1994). Olaussen et al. (2006) studied 761 tumors of patients enrolled in the International Adjuvant Lung Trial and found that patients with ERCC-1 negative tumors experienced a survival benefit from the addition of adjuvant chemotherapy, whereas ERCC-1 positive patients did not. A randomized, prospective phase III trial revealed that patients with NSCLC who received chemotherapy tailored to ERCC-1 levels had improved response rates (50.7% in the ERCC-1 arm and 39.3% in the control arm) (Cobo et al., 2007). This may lead to the possibility of tailoring chemotherapy for patients who may benefit from platin-based therapy and lead to other choices of drugs for those with high ERCC-1 expression.

**Ribonucleotide reductase subunit M1 (RRM1)** is a tumor suppressor gene involved with DNA synthesis and repair (Gautam & Bepler, 2006). **RRM1** overexpression has been noted in gemcitabine-resistant tumor cells (Bergman et al., 2005; Davidson et al., 2004). Rosell et al. (2004) studied the relationship between median survival and levels of **RRM1** in patients receiving gemcitabine-based chemotherapy and found that patients with low levels of **RRM1** had significantly improved survival (13.7 months versus 3.6 months). A prospective randomized phase II study stratified patients to receive various chemotherapy regimens based on gene expressions of **RRM1** and ERCC-1 (Simon et al., 2007). Response rates and overall survival were promising, with larger confirmatory trials planned.

The role of testing for EGFR mutations offers another possibility for tailoring therapy. Patients who experience the mutation may have improved response rates and survival with the use of EGFR-inhibitor agents (Mitsudomi et al., 2005). Characteristics of patients with the mutations include women who never smoked, were of Asian ethnicity, and were diagnosed with adenocarcinoma (Bell et al., 2005). Although much of the data are based on retrospective analyses, the potential clinical applications are intriguing.

Also of great interest is the ability to develop specific genetic blueprints that will predict the sensitivity or resistance of individual tumors to a variety of available cancer treatments. Balko et al. (2006) developed a genetic profile to predict response to EGFR tyrosine kinase inhibitor, with a predictive value more accurate than single-mutational testing. This opens the door for a single test to predict which agents will be most efficacious against individual tumors. However, additional studies are necessary to confirm the preliminary but provocative data.

**Implications for Practice**

Most patients with lung cancer are diagnosed at an advanced stage of disease (NCI, 2007) and, consequently, experience more symptom distress than patients with other malignancies (Degner & Sloan, 1995). Commonly reported symptoms in patients with lung cancer include cough, fatigue, pain, dyspnea, hemoptysis, and anorexia (Corner, Hopkinson, Fitzsimmons, Barclay, & Muers, 2005; Hamilton, Peters, Round, & Sharp, 2005). Nurses are in a key position to assess and manage these disease-related sequelae (see Table 5). The Oncology Nursing Society’s Putting Evidence Into Practice (PEP®) cards provide evidence-based guidelines for managing a variety of symptoms experienced by patients with cancer. With regard to common lung cancer symptoms, PEP cards are available for dyspnea (DiSalvo, Joyce, Culkin, Tyson, & Mackay, 2007) and fatigue (Mitchell, Beck, Hood, Moore, & Tanner, 2006) and are available at www.ons.org/outcomes.

Some oncology practices have palliative care services dedicated to managing a variety of patient symptoms and side effects, such as those with lung cancer. Because patients with lung cancer experience such a significant degree of symptom distress, palliative care may be initiated at the time of diagnosis for some individuals. Some homecare agencies also have programs designed to meet the palliative care needs of patients with advanced cancer who are not ready to discontinue cancer-directed therapies. Many patients with advanced lung cancer who are not receiving or interested in receiving active therapy will receive such services through independent hospice agencies. Both inpatient and outpatient options exist. The median length of service for all hospice patients (about 26 days) has been rising since 2004 (National Hospice and Palliative Care Organization, 2006). The National Hospice and Palliative Care Organization attributed this improvement to a combination of more patients enrolled for more than six months and fewer patients enrolled for less than seven days. The median length of service for patients with lung cancer is similar, ranging from 24 days for fee-for-service insured patients to 34 days for managed care recipients (McCarthy, Burns, Ngo-Metzger, Davis, & Phillips, 2007). Twenty-two percent of patients with lung cancer, however, are enrolled within only seven days of death (McCarthy et al.)

### Table 4. Summary of Comparison of Chemotherapy Regimens in Eastern Cooperative Oncology Group

<table>
<thead>
<tr>
<th>REGIMEN</th>
<th>MEDIAN SURVIVAL (MONTHS)</th>
<th>SIDE EFFECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisplatin and paclitaxel</td>
<td>7.8</td>
<td>Febrile neutropenia, anemia, nausea or vomiting, weakness</td>
</tr>
<tr>
<td>Cisplatin and gemcitabine</td>
<td>8.1</td>
<td>Nausea or vomiting, thrombocytopenia, anemia</td>
</tr>
<tr>
<td>Cisplatin and docetaxel</td>
<td>7.4</td>
<td>Febrile neutropenia, nausea or vomiting, weakness</td>
</tr>
<tr>
<td>Carboplatin and paclitaxel</td>
<td>8.1</td>
<td>Neuropathy, weakness</td>
</tr>
</tbody>
</table>

*Note. Based on information from Schiller et al., 2002.*
Patients may fear that enrolling in hospice care may hasten death, but a study by Connor, Pyenson, Fitch, Spence, and Iwasaki (2007) found that patients with lung cancer enrolled in hospice actually had improved survival (279 days versus 240). Nurses who treat patients with lung cancer must be comfortable discussing end-of-life issues with these patients and realize that hospice is a reasonable option for some.

Treatment for patients with NSCLC has undergone dramatic changes since the 1990s. Nurses must remain abreast of current treatment options to provide state-of-the-art care to their patients. Patients with NSCLC face significant disease-related symptoms and treatment-related side effects. Nurses play a key role in assisting patients to manage these sequelae.

### Conclusion

Lung cancer is responsible for more cancer-related deaths than breast, prostate, and colorectal cancers combined (Jemal et al., 2008). Two major areas of research hold the greatest hope for advances in the treatment of NSCLC. One is the development of novel therapeutic agents with unique mechanisms of action against malignant cells using specific molecular targets. The second area is the prospective testing of individual tumors for molecular markers or the development of genetic signatures to tailor drug therapy. These advances may translate into improvements in survival as well as quality of life for patients with NSCLC.

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**References**


**Table 5. Common Symptoms in Non-Small Cell Lung Cancer and Interventions**

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>INTERVENTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyspnea</td>
<td>Immediate release opioids, oxygen therapy, benzodiazepines (for anxiety), cool air or fans, stress reduction, relaxation techniques, and support for patients and families</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Exercise, screening for and managing treatable causes (i.e., anemia, pain, depression, and thyroid dysfunction), energy conservation and activity management, patient education, sleep measures, relaxation techniques, and massage</td>
</tr>
<tr>
<td>Cough</td>
<td>Opioids, non-narcotic cough suppressants (benzotinate), assessment and treatment of underlying cause (i.e., gastroesophageal reflux disease, bronchospasm, and infection), and steroids if secondary to radiation pneumonitis</td>
</tr>
<tr>
<td>Hemoptyis</td>
<td>Usually mild and self-limiting; bronchoscopic procedures, and radiation therapy</td>
</tr>
<tr>
<td>Pain</td>
<td>Nonsteroidal anti-inflammatory drugs or acetaminophen, opioids, non-narcotic adjuvant medications, corticosteroids, palliative radiation, and bisphosphonates</td>
</tr>
<tr>
<td>Anorexia or cachexia</td>
<td>Assessment and treatment of underlying causes (i.e., nausea or vomiting, pain, depression, and thyroid dysfunction), nutritional counseling, oral supplements, exercise, and pharmologic management (megesterol acetate, corticosteroids for short-term use)</td>
</tr>
</tbody>
</table>

*Note.* Dyspnea and fatigue based on DiSalvo et al., 2007; Mitchell et al., 2006. Other symptoms based on Caro et al., 2007; Jatoi, 2006; Kvale et al., 2003; National Comprehensive Cancer Network, 2007b.


