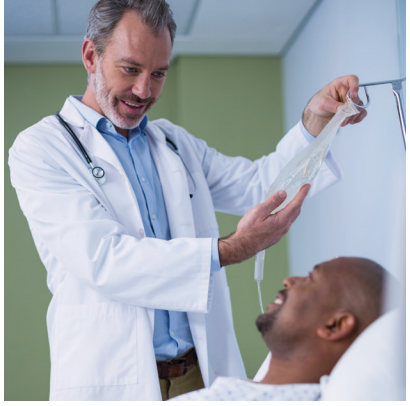
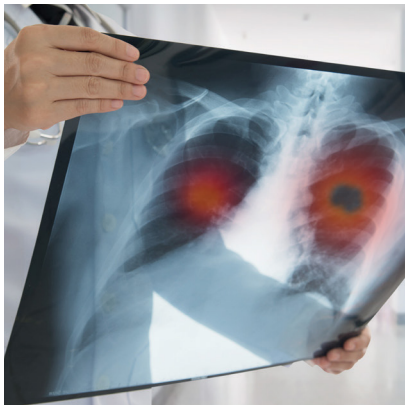
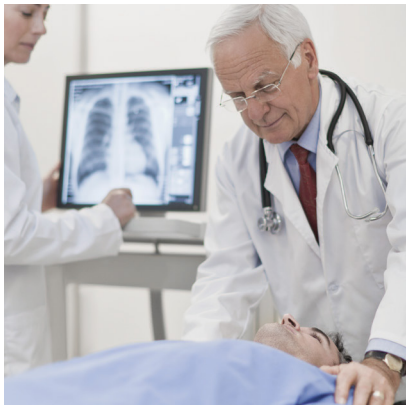



Society of Hospital Medicine

Supporting Hospitalists in Improving Care for Newly Diagnosed Lung Cancer Patients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Society of Hospital Medicine

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Introduction

As a hospitalist, you have likely treated a patient who came through the hospital doors complaining of chest pain or shortness of breath or chest discomfort coupled with a cough that has failed to resolve. In some of those instances, a diagnosis that was initially assumed to be a pneumonia or pleural effusion rapidly became a life altering diagnosis for that unsuspecting patient. Many hospitalists will encounter similar scenarios while treating patients.

We wrote this guide to provide hospitalists with evidence-based strategies and best practices for conducting patient-centered discussions with patients newly and incidentally diagnosed with lung cancer while hospitalized. The guide will provide a brief overview of lung cancer, including prevalence, diagnosis and treatment modalities. Additionally, it will discuss effective strategies for specialty consultation with oncology as well as how to facilitate effective co-management of hospitalized patients. Finally, it will review best practices for effective transitions of care for the patient to the outpatient setting for follow-up and treatment.

Background

Incidence and Survival

Lung cancer is the leading cause of cancer related death for both men and women in the United States. Lung cancer is the second leading cancer by incidence for both males and females. In 2021, estimated new cases of lung cancer were 235,760 with 131,880 deaths.[1] The incidence of lung cancer has declined in both men and women over the last decade with a smaller decrease in women.[2] Additionally, the death rate for lung cancer is declining due to reduction in smoking and advances in diagnosis and treatment. The pace of annual decline for lung cancer mortality recently doubled, from 2.4% during 2009 through 2013 to 5% from 2014 through 2019.[1] Despite these promising trends, lung cancer is estimated to remain the leading cause of cancer-related death in the United States in 2040.[3]

Smoking is the major risk factor for the development of lung cancer and smoking remains the leading preventable cause of death in the United States.[1] It is estimated that over 80% of lung cancers in men and women are related to smoking.[1,4,5] However, women have a higher incidence of nonsmoking-related lung cancer.[5] Racial and ethnic differences in lung cancer incidence and outcomes are related to socioeconomic factors, contributing to differences in risk factor exposures and medical care.[5] Black patients are more frequently diagnosed with distant disease compared with White patients. Black patients have lower survival rates for localized disease.[1,5] However, Hispanics and Asians have improved survival compared to non-Hispanic Whites.[6,7]

Lung cancer is broadly classified into two major histologic groups: non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). Roughly 85% of all lung cancer is NSCLC which includes adenocarcinoma, squamous cell carcinoma, and large cell carcinoma subtypes.[8,9] Adenocarcinoma is the most common subtype, accounting for roughly 50% of all new lung cancer diagnoses in the United States and has increased in incidence over the last few decades. It is the most frequent histologic subtype for nonsmokers.[8] Squamous cell carcinoma is decreasing in incidence in the United States which likely reflects the reduction in smoking prevalence.[8] SCLC is strongly related to smoking and rare in nonsmokers. The overall incidence of SCLC is decreasing. However, the incidence is increasing in women while it remains more prevalent in men.[8,10]

From 2010 through 2016, the 5-year relative survival rate for lung cancer during was 21%.[1] For NSCLC, roughly 50% of patients have advanced disease at diagnosis and for SCLC, over half have advanced disease at diagnosis.[11,12] Patients diagnosed with metastatic disease have a 5-year relative survival of only 6% versus 59% for localized disease.[1] However, the death rate has dropped by 54% among males since 1990 and by 30% among females since 2002. The improvement in lung cancer mortality is related to gains in survival for patients with NSCLC, in part due to advances in treatments based on molecular medicine. The 2-year relative survival for NSCLC increased to 42% diagnosed during 2015 through 2016 from 34% diagnosed during 2009 through 2010 and with increases at every stage of diagnosis.[1] Unfortunately, 2-year survival for SCLC remains at 14-15%.

Histology and Molecular Analysis

Routine histologic analysis is used to determine NSCLC versus SCLC. For NSCLC, a panel of histologic markers is often used to establish the histologic subtype, adenocarcinoma, squamous cell carcinoma, or large cell carcinoma.[8] In addition to histologic examination, molecular analysis is an essential component of diagnosis. Depending on the histologic subtype, NSCLC cancers should be evaluated for programmed death ligand (PD-L1) expression, specific oncogenic mutations and gene rearrangements.

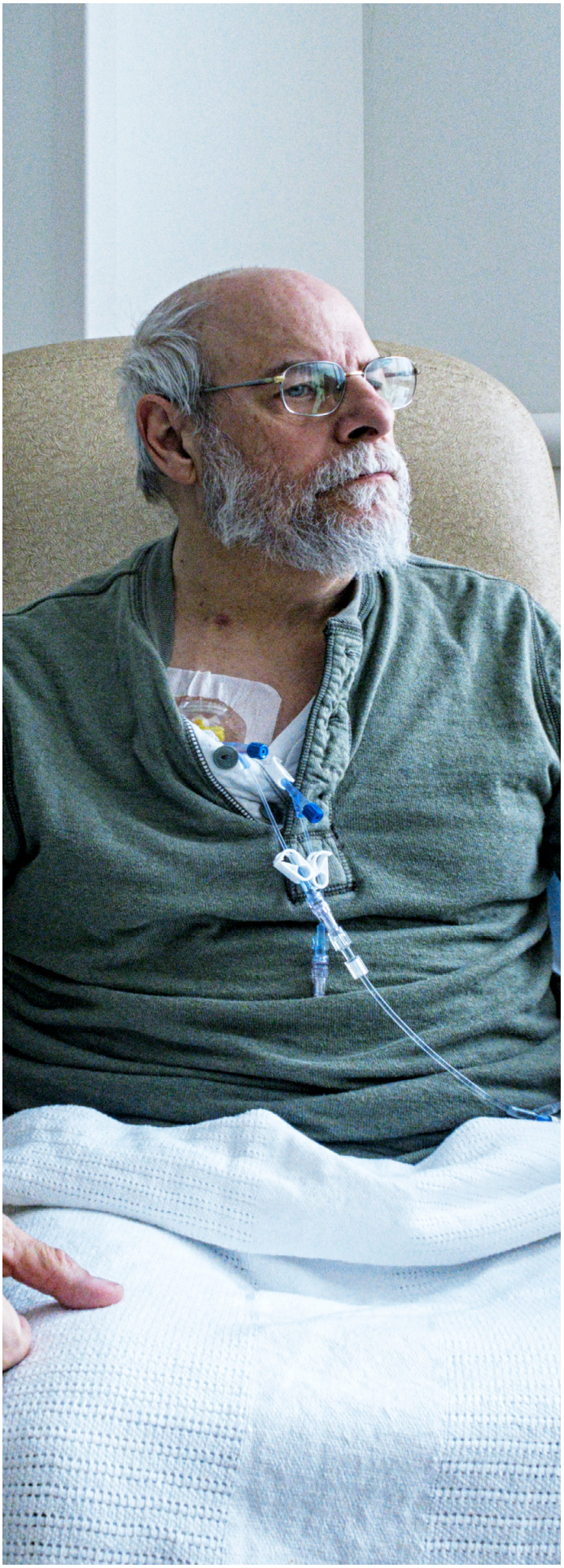
Inhibition of programmed death (PD-1) pathway causes activation of anti-tumor immune responses. In lung cancer, immune checkpoint inhibitors target this pathway and include monoclonal antibodies against the PD-1 receptor and its ligand, PD-L1.[8,9] In 2016, pembrolizumab was the first immune checkpoint inhibitor to receive FDA approval for treatment of NSCLC.[9] The expression of PD-L1 is a predictive marker used to guide treatment decisions and its expression is associated with increased likelihood of response to PD-1 pathway blockade by immune checkpoint inhibitors.[9,13] However, response to immune checkpoint inhibitors may also be seen in cases with no PD-L1 expression. Currently, multiple immune checkpoint inhibitors are now FDA approved for treatment of NSCLC.

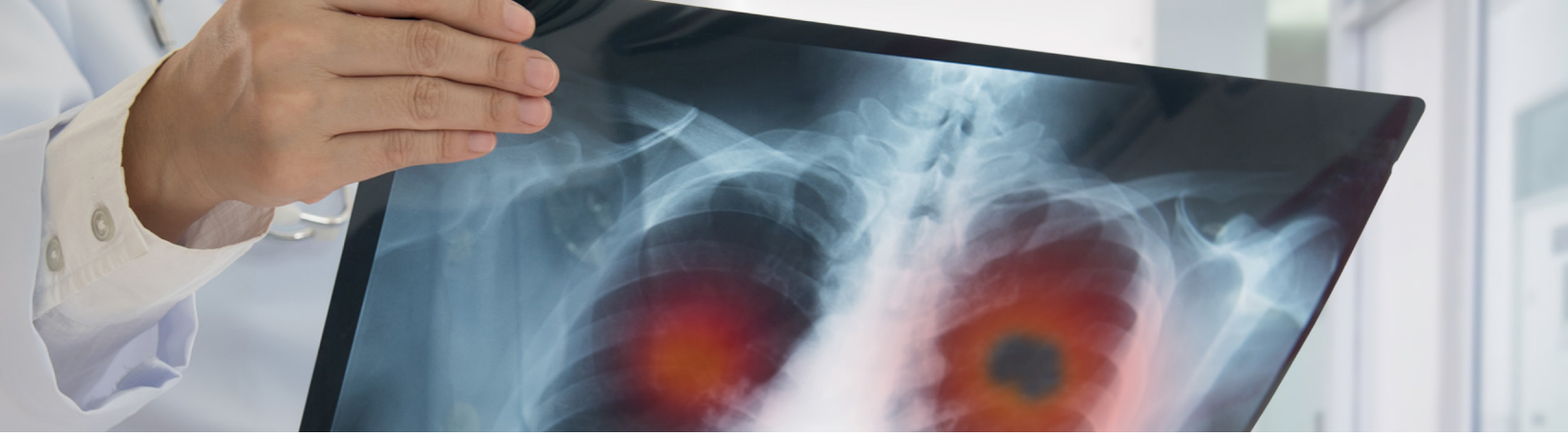
Specific molecular mutations and gene rearrangements act to drive abnormal cellular proliferation in lung cancer, termed driver mutations. Cancer cells become dependent on those molecular pathways for growth and proliferation so novel therapeutics have been developed to target those pathways. Molecular based therapeutics for lung cancer began in 2003 when EGFR inhibitors were first approved for treatment of NSCLC.[14] In 2011, crizotinib was the first FDA approved for treatment of NSCLC with *ALK* gene rearrangement.[9,14] Importantly, oncogenic mutations that can be targeted with specific therapeutics exist in roughly two-thirds of patients with lung adenocarcinoma.[8] For example, mutations in *EGFR* gene are found in 15% of White patients and 40% of Asian patients with lung adenocarcinoma.[8] These patients benefit from therapeutics which specifically target the EGFR protein (tyrosine kinase) and these drugs are called EGFR tyrosine kinase inhibitors. In a second example, *ALK* gene rearrangements occurs in roughly 5% of lung

adenocarcinoma and are associated with never smokers and younger age patients.[8] In these cases, patients benefit from treatment with ALK kinase inhibitors. Other mutations and rearrangements which can be found across histologic types which include: ROS-1 rearrangements, *BRAF* mutation (Val600Glu), *RET* rearrangements, *MET* exon 14 skipping mutation, *NTRK* fusions, *HER-2* mutations, *HER-2* overexpression.[9,13,15] Fortunately, genomic science continues to advance and it is now possible to perform "multiplex" testing for multiple molecular markers simultaneously using a limited tumor sample.[8,9] FDA approved therapeutics for NSCLC and SCLC for specific molecular targets are listed in Table 1.[9,16-19] The number of molecular targets is growing and additional therapeutics are part of the FDA accelerated approval pathway so molecular analysis will be crucial to determine a personalized treatment plan for individual patients.

Key Takeaways:

- Lung cancer is the leading cause of cancer related death in the United States.
- Both incidence and death rate for lung cancer are declining, but lung cancer is expected to remain the leading cause of cancer related death for many years.
- Lung cancer is classified as NSCLC and SCLC with NSCLC representing roughly 85% of lung cancers.
- Newer therapeutics for lung cancer include immune checkpoint inhibitors, such as monoclonal antibodies targeting PD-1 and PD-L1, and drugs which target specific molecular mutations or gene rearrangements, driver mutations that promote tumor cell proliferation. Therefore, histologic analysis and molecular profiling in NSCLC are crucial to the development of a personalized treatment plan.





Diagnosing Lung Cancer In The Hospitalized Patient

Patient Presentation and Index of Suspicion

Case Study:

A 72-year-old male with a past medical history of high blood pressure, and former 30 pack/year smoking history presented to an emergency room while on vacation with fevers and cough. He had recently driven from North Carolina to Florida to visit family. Over the preceding three days, he developed a worsening cough, now productive of greenish and yellowish sputum for the last day along with subjective fevers for the last day. His only medication was hydrochlorothiazide for hypertension. Upon evaluation he was a thin elderly male in mild distress. His temperature was 39 degrees Celsius, respiratory rate was 26 breaths per minute, pulse was 105 beats per minute, blood pressure was 110/75. His room air pulse oxygenation was 87%. Exam was notable for temporal wasting, tachypnea, focal crackles in the right upper long fields, with egophony, lymph node survey was unremarkable. Chest radiography revealed consolidation of the right upper lobe with question of a right hilar mass. Computed tomography revealed a mass the right hilum creating a near obstruction of the right upper lobe bronchus and narrowing of the bronchus intermedius.

As the case above demonstrates, patients diagnosed with lung cancer in the hospital often seek medical care for an issue other than their cancer specifically. The vast majority of patients diagnosed with lung cancer are symptomatic and likely to have advanced disease. It is estimated that only 10% of lung cancer cases overall are detected in an asymptomatic phase or diagnosed incidentally.[4] It is helpful to think of categories of symptomatic presentation.[20]

Nonspecific systemic symptoms are common such as fatigue, anorexia, and weight loss. Symptoms related to the primary tumor are very common such as cough, chest pain, dyspnea, and hemoptysis. Cough is the most common presenting symptom present in 50-75% of patients diagnosed with lung cancer. In current or former smokers, the complaint of a cough should prompt consideration of lung cancer. Hemoptysis is present in up to 35% of cases of lung cancer. Although acute bronchitis is the most common cause of hemoptysis, lung cancer is an important consideration in older patients in particular with risk factors such as smoking.

Pneumonia, in general, is common in patients with lung cancer.[21] This is likely attributable to altered immune function, altered lung architecture such as airway obstruction, and immunocompromise from the malignancy and/or treatments. Post-obstructive pneumonia, such as in our case above, presents similarly to community acquired pneumonia (CAP) with fever, cough, and dyspnea.[22] Older age, risk factors, and slow or non-resolving pneumonia raise the possibility of underlying malignancy.[23] SCLC and NSCLC Squamous subtype are more often centrally located and associated with proximal airway

obstruction. Emphysema, abscess and fistula formation are complications of post-obstructive pneumonia.

Smoking is the predominant risk factor for lung cancer and is directly linked to lung cancer in 90% of women and 79% of men.[15] Asbestos exposure is the most common occupational risk factor for the development of lung cancer. Less common exposures include radon, arsenic, chromium, nickel, vinyl chloride, and ionizing radiation.[4] Combination of risk factors is synergistic. COPD and Interstitial Pulmonary Fibrosis are associated with increased risk of lung cancer reflecting either genetic predisposition or shared risk factors.

Key Takeaway:

- Patients diagnosed with lung cancer most often present symptomatic from issues other than cancer and at advanced stages. Maintain a high index of suspicion in patients with risk factors for lung cancer such as smoking.

Initial Management of Complications of Lung Cancer

Case Study:

A 56-year-old male with no significant past medical history is evaluated for a complaint of chest pain. He describes the chest pain as sharp, over the center of his chest and worse with deep inspiration. The pain has been getting worse over the last 7 days and has made it difficult to work which prompted his evaluation. He is a current smoker with an approximately 45 pack/year history. He takes no medications. On examination, his pulse is 110 beats per minute, respirations are 18 breaths per minute, blood pressure is 115/65 and temperature is 37.1 degrees Celsius. He is well developed and nourished and appears slightly anxious. Breath sounds are diminished over the lower half of the left chest. His heart sounds are distant. His jugular vein is prominent up to the angle of the mandible while the patient is recumbent to 45 degrees. Chest radiography reveals a left sided pleural effusion, an enlarged cardiac silhouette, and mass in the left hilum.

As most patients diagnosed with lung cancer present at an advanced stage, a hospitalist will likely manage complications of lung cancer. There is a myriad of complications created by lung cancer but most frequently the management of pleural involvement, pain related to metastatic spread, and electrolyte abnormalities will be pressing issues at initial diagnosis. The hospitalist typically manages these complications initially without consultant involvement.

Pleural Involvement

Pleural involvement and pleural effusions of lung cancer is present overall in 10-15% of patients.[24] Symptoms are frequently cough and dyspnea. Up to one quarter of patients with malignant pleural effusions will be asymptomatic. The primary goal in managing a pleural effusion in a patient with suspected or known lung cancer is to confirm that it is malignant. Benign causes of effusions can include lymphatic obstruction causing chylous effusions, parapneumonic effusions and effusions caused by atelectasis. The distinction between benign and malignant effusions is important to determine staging and guide therapy.[25] The diagnostic yield from pleural fluid cytology is 75% after two separate samples. Higher volumes, more then 10 mL, are suggested to maximize yield. After two non-diagnostic pleural fluid samples, thoracoscopy should be performed.[26]

Observation for small and asymptomatic pleural effusions is reasonable although most will progress to require intervention. Symptomatic moderate to large volume malignant pleural effusions should undergo therapeutic thoracentesis, although the severity of symptoms does not perfectly correlate with the

size of effusion.[27] 1.5 liters is suggested in guidelines as the maximum amount to be removed during a single therapeutic thoracentesis.[24,28] Most malignant pleural effusions will recur unless the underlying malignancy has responded to therapy.[24,29] There are still several options for a rapidly reaccumulating effusion after initial thoracentesis.[24,26] The optimal choice is individualized based on multiple patient factors. Chest catheters can provide ongoing drainage, but effusions will usually recur once the catheter is removed. Chemical pleurodesis, such as with talc slurry, can be used at the time of catheter insertion. This will yield a variable response rate with resolution up to 75%. Thoracoscopy with talc pleurodesis yields a similar response rate. Long-term indwelling pleural catheters can control refractory effusions. Mechanical (i.e., abrasion) pleurodesis is an option but requires thoracoscopy or thoracotomy.

Skeletal Involvement

Bony metastases are a common problem in lung cancer. Goals of managing bone metastasis are pain control, preserving or restoring function, and minimizing skeletal complications such as fractures.[30,31] The first line for therapeutic analgesia is acetaminophen and/or non-steroidal anti-inflammatory medications. Opioids should be added for moderate or severe pain. When able, using NSAIDS and opioids concomitantly will act synergistically. With opioid therapy, consider utilizing long and short acting opiates for basal and breakthrough pain control, respectively. In certain instances, utilizing adjunctive glucocorticoids and gabapentin may be beneficial. Osteoclast inhibitors, as bisphosphonates and denosumab, offer modest analgesic effects. They are most helpful for hypercalcemia associated with malignancy and preventing fractures. External beam radiation therapy can achieve significant and durable pain control.[31] Pain control and reduction is estimated to be achieved in 50-80% of patients. Treatment of the underlying malignancy with systemic therapy will reduce the disease burden and generally improve pain and skeletal outcomes. Surgical consultation is recommended when skeletal stabilization is needed. Early involvement by radiation oncology and neurosurgery is crucial if spinal cord compression is suspected.

Paraneoplastic Syndromes

Two important paraneoplastic syndromes with lung cancer are Syndrome of Inappropriate Anti-Diuretic Hormone (SIADH) secretion and Hypercalcemia of Malignancy.[32] SIADH will manifest in approximately 10% of patients with SCLC.[33] Symptoms of the hyponatremia will depend on the degree of hyponatremia and the rapidity of the fall of serum sodium. Treatment of the malignancy is the definitive therapy for malignancy related SIADH.[34] Chronic hyponatremia or unclear duration hyponatremia may be treated with isotonic fluid to ensure euvolemia, fluid restriction, democlocycline, or vasopressin-receptor antagonist.

Tumor secretion of parathyroid hormone-related protein is the likely etiology of Hypercalcemia of Malignancy.[32] Extensive bony metastases will also contribute to hypercalcemia. Symptoms of hypercalcemia include anorexia, nausea, vomiting, constipation, lethargy, polyuria, polydipsia, and dehydration. Hydration and bisphosphonate therapy are the mainstays of therapy. In one study of consecutive patients with lung cancer diagnosis, 6% of patients had hypercalcemia.[35] Among these patients with hypercalcemia, Squamous cell, adenocarcinoma, and SCLC were responsible for 51, 22, and 15 percent of the cases, respectively.

Key Takeaways:

- Pleural effusions are common in patients with lung cancer. Thoracentesis is important to perform to diagnose malignant effusions.
- Bowel or bladder dysfunction and lower extremity neurologic abnormalities should prompt rapid evaluation for spinal cord compression from metastatic disease.
- Common paraneoplastic syndromes associated with lung cancer are SIADH and hypercalcemia.

Diagnostic Modalities

Case Study:

A 65-year-old woman presented to the emergency department because of chest pain and trouble breathing. She describes pain on the right side of her chest and right flank that is made worse with deep inspiration. The pain with respiration has progressively limited her activity. On physical exam, her vital signs and SpO2 were normal. She had lymphadenopathy in her right supraclavicular region. Lung exam was limited by pain with lung expansion. Abdominal exam was significant for hepatomegaly. Chest radiography was significant for a spiculated nodule in the right lung, with right hilar prominence. Positron-emission tomography and CT (PET-CT) revealed foci of 18F-fluorodeoxyglucose (FDG) avidity in the mass in the right upper lobe, the right hilum and mediastinum, the right eight rib, and the right supraclavicular lymph node.

The diagnostic evaluation, tissue confirmation and staging of lung cancer usually begins when a patient has a suspicious finding for lung cancer or incidental findings on imaging. The initial focus is accurate histologic diagnosis and staging with tissue sampling. This is crucial to facilitate an individualized approach to treatment. Multiple factors impact this stage of care. A thorough history and physical along with selected imaging and laboratory evaluation is suggested. This will usually involve CT or PET-CT. In addition, patient values should be explored, and functional status assessed. Early consultation with oncology specialists is beneficial.

Given the complexity of selecting the optimal modality to ensure appropriate diagnosis and staging, a multi-disciplinary approach is recommended.[36] Multiple factors influence the choice of diagnostic and staging modality. These factors include tumor location, tumor characteristics, patient co-morbidities, patient values and preferences, local expertise, and availability of technology. Multi-disciplinary teams are usually comprised of the following members: pulmonologist, interventional pulmonologist, medical and radiation oncologist, thoracic surgeon, pathologist, and radiologist. Ideally, these teams can develop hospital and clinic specific protocols.[37]

Major treatment options are based on histologic features. Histologic confirmation is obtained via tissue sampling through surgical biopsy or bronchoscopic biopsy or with cytology from effusions, aspirates or brushings. The discovery of treatable oncogenic alterations led to the recommendation to include molecular testing in the standard approach in order to further classify NSCLC, and detect the ever-expanding list of alterations with targeted therapy.[15] Immunocytochemical or immunohistochemical analysis, mucin staining, or molecular data can aid distinguishing types of NSCLC. Importantly, fine needle aspirations may not provide adequate sampling for molecular studies. The biopsy site and modality should aim to simultaneously confirm the diagnosis and determine the stage.

Staging of disease is important as large differences in survival are related to the stage of the disease. The Tumor-Node-Metastasis classification determines staging. Tumor size is determined by imaging. The presence and location of lymph node involvement as determined by imaging along with endoscopic, mediastinoscopy or intraoperative sampling determines the node rating, the presence, location, and number of metastases determines the Metastasis ranking. The grouping of these three categories determines the stage of disease.

Radiographic staging of patients facilitates decisions regarding biopsy modality and location. Guidelines and most groups recommend computed tomography of the chest and upper abdomen to include the liver and adrenals.[38] Additional screening with imaging or laboratory evaluation should be directed by symptoms and signs exhibited by a patient.[39] While there is no clear evidence or consensus, Positron Emission Tomography/Computed Tomography is widely used.[40] Using small amounts of metabolically active radiotracers enhances detection of hypermetabolic

tissue and occult malignancy. FDG PET/CT reveals involved lymph nodes and soft tissue.[41] Lymphatic involvement, particularly of the mediastinum and the hilum, are important in determining the TNM status and thus staging.[42] The higher sensitivity of PET/CT for nodal involvement and metastases leads to more discovery of occult disease, upstaging, and reduces futile thoracotomies. However, there is no clear impact on patient mortality.[37,40,42,43]

If radiographic staging suggests central chest lesions or mediastinal or hilar involvement, endobronchial ultrasound and endoscopic ultrasound with needle aspiration is recommended.[44,45] These less invasive approaches have been shown to reduce time to treatment decisions.[46] However, if suspicion remains high after negative sampling with EBUS or EUS, surgical staging is recommended with a cervical mediastinoscopy or intraoperative sampling.[47]

TNM staging is available for SCLC but most treatment decisions are based on the Veterans' Administration lung group classification scheme.[48,49] This incorporates the schema of Limited Stage SCLC (limited to one hemithorax) versus Extensive Stage SCLC defined as disease that cannot be encompassed in a tolerable external beam radiation field.[50]

Key Takeaways:

- Establish diagnosis and stage with one procedure if possible.
- Multidisciplinary care for lung cancer patients is standard and important to enhance patient outcomes.
- Involvement of an oncologist early on when lung cancer is suspected can aid selection of diagnostic and staging modalities.

Treatment

Depending on the histologic group (NSCLC or SCLC) and stage, potential therapeutic options include surgery, radiation therapy, chemotherapy, targeted therapies, and immune checkpoint inhibitors. In review of the SEER-18 database, about 23% of all NSCLC patients received no treatment and almost half received single modality treatment.[2] Roughly 75% of patients in the no treatment category were aged 65 or older. As experience and the evidence base evolves, patients who were not previously eligible for standard therapy with surgery, chemotherapy or radiation therapy will be candidates for immunotherapy or targeted molecular therapy.

For NSCLC, surgical resection is utilized in early-stage disease, typically stages I and II. Radiation may be considered in patients who are not surgical candidates. Chemotherapy and chemoradiation are utilized in most stages of disease and chemotherapeutics include taxanes, platinums, and pemetrexed.[8,9] Newer therapeutics include drugs that target oncogenic mutations and gene rearrangements which may be present in tumor cells as well as immune checkpoint inhibitors which target the PD-1 pathway in NSCLC (see Table 1).[9,16-19] Functional status, age, and comorbid medical conditions also impact treatment options, particularly surgery and chemotherapy. Patients being considered for surgery should undergo routine pre-operative evaluation and pulmonary function tests. Ideally, a multidisciplinary team (MDT) at a lung cancer treatment center evaluates the patient and develops an individualized treatment plan. MDT may include specialists in medical oncology, radiation oncology, thoracic surgery, pulmonology and palliative care. MDTs are often used outpatient but depending on the clinical circumstances, hospitalized patients with newly diagnosed lung cancer may benefit from involvement of MDT specialists.

For medically operable stage I, stage II, and stage IIIB NSCLC, surgical resection with curative intent is the standard of care.[9,51] Video-assisted thoracoscopic surgery (VATS) may be used as an alternative to open thoracotomy. Lobectomy is the standard based on prior trial but there have been advances in imaging and surgical techniques so ongoing trials are evaluating sub lobar resection.[8] In inoperable stage I NSCLC, stereotactic body radiation therapy (SBRT) or stereotactic ablative body radiotherapy (SABR) is preferred treatment method.[8,9] Treatment includes adjuvant chemoradiation for stage II and concurrent or sequential chemoradiation for stage IIIB.[8]

For unresectable stage III NSCLC, treatment consists of chemoradiation followed by adjuvant PD-L1 inhibition.[9,52,53] The PACIFIC trial investigated the role of the immune checkpoint inhibitor durvalumab, an anti-PD-L1 monoclonal antibody in unresectable stage III NSCLC which did not have disease progression after concurrent chemoradiation. Treatment with durvalumab demonstrated significant improvements in progression free survival and overall survival.[52,53] For stage IV NSCLC, treatment is highly individualized. Immune checkpoint inhibitors have a role in initial management. Patients may be treated with PD-1 blockade with or without chemotherapy or even dual immune checkpoint blockade.[9,13,15] Serious immune -related adverse events occur in 3-6% of NSCLC patients treated with PD-1 pathway blockade.[9] Depending on the molecular profile, targeted therapies are used such as EGFR tyrosine kinase inhibitors for patients with cancers harboring an EGFR mutation. Radiation may be used for symptom palliation in cases of brain metastases, spinal cord compression, airway obstruction, or pain.[8] Patients with metastatic NSCLC also benefit from early palliative care. Patients with early involvement of palliative care had better quality of life and longer survival with less aggressive care at the end of life.[54] In the hospitalized patient with new diagnosis of lung cancer, palliative care specialists may help provide support for the patient and family and provide expertise in the management of cancer related pain or other symptoms. Hospitalists have an opportunity to introduce patients to palliative care and its role in patient centered care.

Several recent studies have demonstrated the expanding role of targeted molecular therapeutics based on gene mutations and immune checkpoint inhibitors in adjuvant treatment of early stage NSCLC after surgery.[16,55,56] The ADAURA trial was a phase III trial comparing the adjuvant therapy with the EGFR inhibitor osimertinib, a third generation EGFR tyrosine kinase inhibitor, with placebo in EGFR-positive NSCLC after surgical resection. In patients with stage IB-IIIA NSCLC, treatment with osimertinib resulted in significantly longer disease-free survival.[55,57] Additionally, the role of adjuvant PD-L1 blockade was established in IMpower010, a phase III trial comparing treatment with the PD-L1 inhibitor atezolizumab with best supportive care in patients with NSCLC after surgical resection and adjuvant chemotherapy. In patients with stage II-IIIA NSCLC with >1% PD-L1, treatment with atezolizumab resulted in statistically significant improvements in disease free survival.[55,58] The use of therapeutics based on molecular mutations and is expected to grow as more studies evaluate their use as therapeutic options in early stage NSCLC.

For SCLC, treatment is typically determined based on Limited Stage SCLC (limited to one hemithorax) versus Extensive Stage SCLC. Unfortunately, SCLC is highly metastatic and most patients present with advanced metastatic disease.[10] Limited disease with peripherally located tumor may be amenable to surgery and stereotactic ablative radiotherapy with adjuvant chemotherapy.[10] Limited disease with centrally located tumor or locally advanced is typically treated with concurrent chemoradiotherapy followed by prophylactic cranial radiation.[9,10,59] For extensive disease and depending on functional status, treatment may consist of palliative chemotherapy (platinum with etoposide) or palliative radiotherapy.[59] Since most patients present with advanced metastatic disease, early involvement of palliative care is strongly recommended.

Key Takeaways:

- Treatment of lung cancer consists of surgery (early-stage disease), radiation, chemotherapy, targeted molecular therapies based on gene mutations or rearrangements, and immune checkpoint inhibitors.
- Recent studies have demonstrated a role for immune checkpoint inhibitors in unresectable stage III NSCLC after chemoradiation and in stage II-IIIA NSCLC after surgical resection and adjuvant chemotherapy.
- SCLC typically presents with advanced metastatic disease which is treated with palliative chemotherapy or radiation therapy. Treatment targeting PD-L1 blockade in addition to chemotherapy has been shown to improve survival.

Communication Strategies

Case Study:

A 70-year-old woman is brought to the emergency room by her family over concerns of somnolence. By report of the family over the past several weeks, the patient has complained of a worsening headache and has been sleeping more. Upon further questioning, the patient has had a dry cough for several months, has unintentionally lost 10 kg over the last 2 months, and occasionally will experience scant hemoptysis. Chest radiography reveals an enlarged left hilum and a possible mass in the left upper lobe. Non-contrasted head CT reveals multiple lesions throughout consistent with metastatic disease.

The case study is illustrative of how a positive diagnosis of lung cancer might be confirmed for the hospitalized patient. The hospitalist will ultimately be responsible for sharing the diagnosis and prognosis with his or her patient. It is important to employ patient-centric, thoughtful methods for conveying this urgent and life-altering information. Communication is one of the most important ways that clinicians influence the quality of medical care that patients and their families receive.[60] Clinicians must communicate information clearly and realistically in a non-threatening and compassionate manner, build trust with patients and their families, and actively listen to the perspectives and concerns of their patients. When discussing a diagnosis, prognosis or treatment plan, potential pitfalls include communicating too quickly, using medical terminology or jargon, lecturing patients, blocking or avoiding emotional reactions, missing emotional cues, overlooking cultural differences, failing to give patients time to process information and ask questions, providing premature reassurance, and failing to consider patient values and goals.[60-62] Communicating important information poorly can negatively impact shared decision making, health outcomes, quality of life, and can contribute to health disparities.

Prototypical communication styles include patient-centered, disease centered, and emotion centered with patient centered communication receiving the highest satisfaction scores.[63,64] Patient centered communication provides medical information and emotional support according to the needs of the patient. Active listening and allowing time for the patient to speak are important aspects of patient centered communication.[61]

Patient-clinician communication may directly impact healthcare disparities.[65] Patients who are members of a racial/ethnic minority, have limited English proficiency, and have low health and digital literacy often experience lower quality communication with the clinicians that are treating them. On the clinician level, factors associated with lower quality communication included being less culturally competent, lacking communication skills for shared-decision making, and holding unconscious biases.[65] For lung cancer patients, patient-clinician communication may be strongly impacted by bias and stigma, influencing individual patient experiences, health outcomes, and disparities in care. Implicit bias occurs without conscious awareness when cultural stereotypes influence how information is processed and leads to unintended bias in decision making. Implicit bias has been demonstrated for race, ethnicity, sex/gender, and obesity.[66] Patients diagnosed with lung cancer may also experience more stigma, specifically the stigma of being self-induced given the relationship of smoking to lung cancer.[67] Stigma can adversely impact mental health and quality of life and contribute to delays in seeking care and to poor adherence to treatment. Clinicians should be cognizant of potential biases and emotions which may impact their discussions with patients, and should guide discussions based on patient preferences, education, and health literacy. Hospitals should provide adequate translation services for patients when requested, and accommodate reasonable requests to have family members or support individuals present.

Communicating Uncertainty

In the case of lung cancer, the emergence of precision medicine using molecular testing to guide treatment decisions has proven extremely beneficial but may create even more uncertainty for both patients and hospitalists due to limited knowledge or experience in molecular medicine and rapid progress in the field, as well as limited knowledge about how molecular profiling impacts treatment decisions and prognosis.

The practice of medicine is subject to varying degrees of uncertainty in all situations and addressing uncertainty should be individualized for the patient. Some clinicians may wish to avoid acknowledging or discussing uncertainty. Uncertainty occurs throughout the diagnostic process, from initial presentation to information gathering to diagnostic evaluation to communication of the diagnosis to prognosis and treatment plan.[68] Improving Diagnosis in Health Care[69] articulates that "health care professionals and organizations should partner with patients and their families as diagnostic team members and facilitate patient and family engagement in the diagnostic process, aligned with their needs, values, and preferences."[69] Clinicians should communicate the diagnostic process as well as the uncertainty associated with the diagnostic reasoning. In the case of the hospitalized patient, uncertainty regarding the diagnosis of lung cancer arises while waiting for biopsy or study results. In some cases, the biopsy results may not become available during the hospitalization. Once the histologic diagnosis is obtained, it may take several days or weeks for the molecular analyses required to guide treatment options. Although communicating uncertainty is crucial for patient centered communication, clinicians may be reluctant to communicate uncertainty and lack training in communication skills.[70] Some management strategies for diagnostic uncertainty include acknowledging uncertainty and communicating that uncertainty to patients; creating "diagnostic safety nets" so patients know when to follow-up, what to expect in terms of time course and when to seek help for worsening symptoms; and obtaining more contextual knowledge of the patient such as family and social situation, medical literacy, and cultural considerations.[68,70] Clinicians should recognize other sources of uncertainty in the management of hospitalized patients with lung cancer. Once the biopsy results are obtained, patients may have uncertainty about how much they would like to know about the diagnosis and prognosis. Patients may have uncertainty about what the diagnosis means for them and their families, including concerns about caring for their family, working and financial issues. For clinicians, other sources of uncertainty include their own mastery of the relevant medical knowledge and communication skills.[68] For hospitalized patients with lung cancer, hospitalists may coordinate with their oncology colleagues to facilitate patient centered discussions, especially when there is uncertainty about diagnosis, prognosis or treatment plan.

Key Takeaways:

- Communication with patients is crucial for shared decision making and optimal outcomes. Patient centered communication focuses on the needs of the patient and provides both medical information and emotional support.
- Communication may be subject to unconscious biases which may impact medical care.
- Clinicians should understand uncertainty in the diagnostic process and clearly address areas of uncertainty with patients.

Communication Regarding A Confirmed Diagnosis

Case Study:

Our 72-year-old male admitted by Dr. Ramos for post obstructive pneumonia is clinically improved after three days of IV hydration and IV antibiotics. He undergoes flexible bronchoscopy. An endobronchial lesion is found and tissue samples are obtained from the right upper lobe bronchus. Pathology is consistent with small cell lung cancer. Family have gathered at the patient's bedside for a meeting with the care provider. When Dr. Ramos shares the patient's diagnosis with him and his family, they will have to employ some core best practices to convey essential information, support the patient and ensure they can work together to identify key next steps to facilitate treatment and follow up care.

For physicians, one of the most difficult tasks is delivering "bad" or life-altering news to patients. Communicating bad news is stressful for physicians and importantly, years in practice, training and experience in delivering bad news did not impact stress scores for physicians.[71,72] Counseling patients regarding new diagnoses of cancer in the hospital is particularly challenging due to a variety of factors including diagnostic and prognostic uncertainty and limited time for discussions and to build physician-patient relationships. Additionally, hospitalization is often a stressful time for patients and they may or may not have their usual support system available. For some cancer patients, the greatest patient satisfaction was associated with receiving some indicator that bad news was forthcoming, receiving the difficult news in a comfortable location without interruption and a clear demonstration of clinician empathy.[73] Patient preferences for communication may differ. Hospitalists will often be the first clinician to discuss the new diagnosis of lung cancer with a patient and the success of that discussion may have significant impact on future care.

It is important to rely on patient-physician communication protocols for the delivery of life-altering news. Hospitalists should allow adequate time for these important discussions, minimize interruptions, employ clear nonmedical, health-literate language, check for patient understanding, and address emotions with empathy.[74] Inability to clearly communicate information and ensure patient understanding can lead to confusion for patients. Surveys from metastatic lung cancer patients demonstrated that 67% of patients believed that radiation therapy "was very or somewhat likely to help them with problems related to their cancer" yet 43% of patients inaccurately felt that radiation therapy "was very or somewhat likely to cure their cancer".[74] In another study of metastatic lung cancer, the majority of patients did not understand that chemotherapy was not at all likely to cure the cancer.[96] Effective communication can mitigate against misunderstanding about prognosis and the patient's goals of care while better supporting the patient's engagement in shared decision-making.[75]

Tools have been developed to help oncologists communicate effectively with patients. The SPIKES protocol was developed to "enable the clinician to fulfill the six most important objectives of the interview, disclosing bad news, gathering information from the patient, transmitting the medical information, providing support to the patient, and eliciting the patient's collaboration in developing a strategy or treatment plan for the future".[76]

The SPIKES Protocol
Includes Six Distinct Steps.[76, 77]

1. **Setting Up**
   In setting up the interview, arrange for a private area, include family and caregivers if the patient requests it, build rapport, manage time constraints, limit interruptions and silence electronic devices.
2. **Perception**
   For assessing the patient's perception, use open-ended questions to determine understanding, correct misinformation and misunderstandings, and identify potential for illness denial, wishful thinking and unrealistic expectations.
3. **Invitation**
   For obtaining the patient's invitation, allow the patient to express a desire for information, determine how much information and detail the patient desires, and obtain the patient's preferences for the disclosure of information.
4. **Knowledge**
   When giving knowledge and information to the patient, warn the patient about discussion to lessen shock and promote understanding, assess the level of comprehension for the patient, use nonmedical terms, and check with the patient to confirm understanding.
5. **Emotions**
   When addressing your patient's emotions with empathic responses, allow patients to express feelings and validate responses, observe for emotional responses, identify and name emotions, identify the reason for the emotion, ask questions to better understand the emotion, and connect the emotion to the reason for that emotion. This step may prove more difficult for both patients and clinicians but allows patients to express their feeling and emotions and allows the clinician to validate patients experience and provide support.
6. **Strategy and Summary**
   In strategy and summary, summarize the discussion to confirm understanding, arrange a follow-up plan, provide contact information for questions, and emphasize the plan for continuity of care.

Employ the appropriate strategies articulated in previous steps to facilitate difficult conversations with patients even when the physician is uncomfortable in discussing prognosis and treatment options and other subject matter with the patients.

The stepwise SPIKES protocol can be a useful tool for guiding discussions but should be tailored to patient preferences and it is important to remember that most patients will benefit from more than one discussion.[76-79] Hospitalists may also utilize the "ask-tell-ask" method to assess comprehension of the patient's diagnosis by asking the patient about their understanding and articulating clinical information clearly in a patient-centered way.[62]

As discussed earlier, potential deficiencies and pitfalls include communicating too quickly, using medical terminology or jargon, lecturing patients, blocking or avoiding emotional reactions, missing emotional cues, overlooking cultural differences, failing to give patients time to process information and ask questions, providing premature reassurance, and failing to consider patients values and goals.[60-62]

When communicating with patients, physicians should actively avoid blocking, lecturing, collusion, and premature reassurance.

Communication Deficiencies When Talking to the Newly Diagnosed Lung Cancer Patient	
Blocking	In an instance when a physician uses a blocking behavior, a newly diagnosed cancer patient states a concern, and the hospitalist fails to address the concern.
Lecturing	The hospitalist shares a significant amount of information with the patient, but does not allow the patient an opportunity to ask questions or express understanding.
Premature Reassurance	It is important for the hospitalist to resist offering premature reassurance early in the medical encounter with the newly diagnosed lung cancer patient.
Collusion	When a collusion tactic is employed, the hospitalist may fail to adequately address difficult topics and discussions about prognosis, end of life care or other crucial issues.

The aforementioned communication tactics can cause more harm than good in supporting the newly diagnosed lung cancer patient with addressing a new clinical reality. Instead, the hospitalist may attempt the "ask-tell-ask" method to assess comprehension of the patient's diagnosis by asking the patient about their understanding and articulating clinical information clearly in a patient-centered way.

Training and education can provide specific skills to address communication difficulties for individuals.[60] Best practices for communication should be promoted for clinicians, teams, and systems or institutions.[60] In oncology, education and training in communication improves clinicians ability to deliver information, provide emotional support and utilize empathic communication with patients.[80-82] Education and training as well as regular practice of newly acquired communication skills is important to help clinicians avoid deficiencies and pitfalls in communication and provide optimal communication and care for patients.

Key Takeaways:

- Delivering "bad" or life-altering news to patients is a difficult task for clinicians and the hospital environment presents unique challenges for difficult discussions with patients.
- Providing clear, accurate information to patients is crucial for shared decision making and to avoid misunderstandings or unrealistic expectations.
- Hospitalists should be diligent about avoiding communication tactics that do not improve patient centered care for patients or improve care outcomes.
- Communication methods or protocols have been developed to assist clinicians in delivering "bad" or life-altering news.
- Clinicians should employ empathic communication skills and may benefit from additional training.

Timeliness of Diagnosis

Case Study:

A 55-year-old woman presented to the emergency department for evaluation of a persistent dry cough and chest pain that is worse with coughing and deep inspiration. She takes no medications and has no past medical history. She is a current smoker with an approximately 45 pack/year history. Physical exam is notable only for cough and chest pain during deep inspirations. Otherwise, vitals and exam are normal. Her chest radiograph is remarkable for a 2 cm nodule in the right upper lobe and a widened mediastinum. Computed tomography of the chest shows the irregular 2 cm nodule in the right upper lobe and mediastinal lymphadenopathy. You are consulted for admission and further work up but the patient and her family request not to be admitted.

Many factors influence the timeliness of medical evaluation and treatment including comorbid conditions, access to care, socioeconomic status, age, gender, race or ethnicity. Patients hospitalized for probable lung cancer and its complications are more likely to have a rapid diagnostic evaluation. Comorbid conditions may also impact time to diagnosis, staging, and initiation of treatment.[66] However, not all patients are diagnosed while hospitalized. Patients are often discharged with pending test results and it is crucial that any biopsy results be conveyed to the patient with a clear plan for continuity of care. Failure to follow-up test results ranges from roughly 20-60% for inpatients which may lead to missed diagnoses.[83] Delays in diagnosis may cause anxiety and stress for patients and their families as well as potential for missed opportunities for treatment or cure.[84] For lung cancer, the impact of delays likely varies by stage with highest impact in stage II.[66] Delays may impact whether or not patient remains a surgical candidate if cancer progresses. Many academic medical centers have comprehensive thoracic oncology centers which provide multidisciplinary care in a patient-centered, efficient manner. However, physicians should be aware of the local barriers to care in their area.

Transitions And Team-Based Care

A transition of care for a patient suspected of or newly diagnosed with lung cancer would comprise the same essential components for all patients leaving the hospital. Like other transitions of care and discharges it should be a patient centered process. Establishing discharge readiness, facilitating appropriate patient understanding and education to ensure timely follow up are important. The transition of care process should include meaningful engagement and activation of the frontline clinical care team, patient, family, and primary care provider and a robust discharge summary with specific instructions for follow up with an outpatient oncologist. The additional aspect is the plan for lung cancer related follow-up. Timeliness of follow-up is particularly important in this patient population. It is recommended that less than six weeks elapse between presentation and therapy.[85] If evaluation, diagnosis, and therapy is delayed beyond 8 weeks, restaging is suggested.[86]

For the hospitalist, coordination with oncology and pulmonary subspecialists is important. Reliable co-management strategies should be implemented and adhered to with the goal of optimizing patient care. Shared responsibility, authority, and accountability is vitally important. Roles should be defined, clarified, and communicated regarding who is responsible for care in the inpatient setting versus the outpatient setting. Bi-directional communication is necessary between the oncologist and the hospitalist. Clear expectations regarding connecting with multidisciplinary teams or clinics need to be established. Typically, oncology or pulmonology are the points of contact for the hospitalist. MDT caring for patients with lung cancer or suspected of having lung cancer have become the standard of care at many centers worldwide.[36] These teams are typically include a pulmonologist, interventional pulmonologist, medical and radiation oncologist, thoracic surgeon, pathologist, radiologist, and specialist nurse.[37]

The suggested benefits of this team-based approach include optimal mediastinal staging, evidenced based and patient-centered approach to diagnosis, timely investigation and treatment. One single institution study found a 29% reduction in time from presentation to first treatment with the implementation of a MDT approach.[84] A meta-analysis evaluating MDT and lung cancer patients did not find a survival benefit but did show an increase in surgical resections, chemotherapy, and radiation therapy with curative intent.[87] For NSCLC patients, it is particularly important for thoracic surgeons, medical, and radiation oncologists to collaborate in a team setting.[88] There is variability in hospitals pertaining to the composition of the MDT. One review found that MDTs can tailor treatment to older populations which are typically at risk for undertreatment.[89]

Palliative Care and Lung Cancer

Patients diagnosed with lung cancer most often present with later stage disease. The value of early integration of palliative care into standard oncologic care is gaining greater recognition. Patients with advanced lung cancer experience improved quality of life measurement, better symptom management, enhanced mood, and greater caregiver satisfaction with care when palliative care is integrated early after diagnosis.[90] Exploration of values and goals of care leads to more goal concordant care and greater understanding of prognosis as well. However, patient and physician perceptions along with a lack of providers skilled in palliative care remain barriers to utilization. In a seminal study, Temel and colleagues examined the impact of early palliative care among patients with metastatic NSCLC.[54] When compared to standard oncologic care alone, the addition of early palliative care led to an improvement of quality-of-life measures, fewer depressive symptoms, less aggressive end of life care, and prolonged survival. These findings support the current recommendations for simultaneously delivered palliative care as an adjunct to disease focused treatment.[91]

The American College of Chest Physicians Evidence-Based Clinical Practice Guidelines for Palliative and End-of-Life Care in Lung Cancer recommends[61]:

- For patients with stage IV lung cancer and/or a high symptom burden, it is suggested that palliative care combined with standard oncology care be introduced early in the treatment course.
- It is recommended that all physicians caring for patients with lung cancer should begin conversations about the patient's prognosis and goals of care at the time of the diagnosis, and continue these throughout the course of the illness.
- It is recommended 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.

Impact of COVID-19 Pandemic on Lung Cancer Care

The COVID-19 pandemic disrupted health care around the world. Time sensitive diagnosis and treatment such as in lung cancer was particularly impacted. The true impact of the pandemic is yet to be fully determined.[92] Screening efforts for lung cancer were largely halted in the early portions of the pandemic. Vaccination of patients with lung cancer remains a priority. Early in the pandemic, the team-based nature of care in lung cancer was seen as a strength.[93] MDTs were encouraged to make every effort to maintain the standard of care. However, a necessity of triage and prioritization was recognized.[94,95] Surgery, visits, and therapy for those who would have compromised survivorship with delays were prioritized. This was balanced with a recognition of the need to minimize exposure of lung cancer patients to SARS CoV-2.

Summary

Both incidence and death rate for lung cancer are declining but lung cancer is expected to remain the leading cause of cancer related death for many years. Patients diagnosed with lung cancer most often present for issues other than cancer and at advanced stages. This may make conversations with these patients particularly delicate if they did not anticipate a serious illness diagnosis during hospitalization. Hospitalists will be a part of the care of many patients initially diagnosed with lung cancer and they should maintain a high index of suspicion in patients with risk factors for lung cancer such as smoking. The hospitalist should not hesitate to involve an oncologist early on when lung cancer is suspected to aid selection of diagnostic and staging modalities. Working as part of the MDT, the hospitalist has a unique opportunity to meet the unique and complex needs of the newly diagnosed lung cancer patient.

Newer therapeutics for lung cancer include immune checkpoint inhibitors, such as monoclonal antibodies targeting PD-1 and PD-L1, and drugs which target specific molecular mutations or gene rearrangements that promote tumor cell proliferation. These newer therapies are contributing to significant improvements in survival. Therefore, histologic analysis and molecular profiling in NSCLC are crucial to the development of a personalized treatment plan. Delivering "bad" or life-altering news to patients is a difficult task for clinicians, and the hospital environment presents unique challenges for difficult discussions with patients. Providing clear, accurate information to patients in a patient-centered, empathetic manner is crucial for shared decision making and to avoid misunderstandings or unrealistic expectations about their diagnosis and prognosis.

Table 1*:
Certain Therapeutics Approved For Use In NSCLC and SCLC[1-5]

Immune Checkpoint Inhibitors	Target	Clinical Use
Atezolizumab	PD-L1	Adjuvant NSCLC after surgery with PD-L1 expression Metastatic NSCLC Extensive SCLC with chemotherapy
Durvalumab ± Tremelimumab	PD-L1	Stage III NSCLC (unresectable) after chemoradiation Metastatic NSCLC with chemotherapy Extensive SCLC with chemotherapy
Nivolumab ± Iplimumab	PD-1	Metastatic NSCLC with PD-L1 expression Metastatic or recurrent NSCLC Early resectable disease
Pembrolizumab	PD-1	Metastatic NSCLC with chemotherapy Metastatic NSCLC alone with high PD-L1 expression Stage III NSCLC (if no other treatment options)
Targeted Therapeutics	**Target**	**Clinical Use**
Erlotinib Geftinib (1st generation EGFR inhibitor)	EGFR	Metastatic NSCLC 1st line for certain *EGFR* gene mutations
Afatinib	EGFR	Metastatic NSCLC, previously treated, metastatic, squamous NSCLC progressing after platinum-based chemotherapy
Dacomitinib (2nd generation EGFR inhibitor)	EGFR	1st line for certain *EGFR* gene mutations, previously treated, metastatic squamous NSCLC
Osimertinib (3rd generation EGFR inhibitor)	EGFR	Adjuvant treatment after complete resection in patients with EGFR mutation 1st line treatment of metastatic NSCLC with EGFR mutation 2nd line treatment of metastatic NSCLC with EGFR T790M mutation
Necitumumab (recombinant antibody)	EGFR Receptor 1	Metastatic squamous NSCLC with gemcitabine and cisplatin
Crizotinib (1st generation ALK inhibitor)	ALK, ROS1	Metastatic NSCLC, ALK positive or ROS1 positive
Alectinib Brigatinib Certinib (2nd generation ALK inhibitor)	ALK	Metastatic NSCLC, ALK positive
Lorlatinib (3rd generation ALK inhibitor)	ALK	Metastatic NSCLC, ALK positive
Entrectinib	ROS1, NTRK	Metastatic NSCLC, ROS1 positive
Dabrafenib + Trametinib	BRAF	Metastatic NSCLC, *BRAF* V600E mutation positive
Bevacizumab	VEGF	Metastatic NSCLC with chemotherapy
Ramucirumab	VEGF	Metastatic NSCLC, used with erlotinib or docetaxel

**does not include therapeutics in FDA Accelerated Approval Program*

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Suggested format for reference #5 but could not figure out how to use that format in Endnote

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Patient Advocacy Organizations

After sharing a new or suspected lung cancer diagnosis with your patient, it may be helpful to share the names of a few patient advocacy organizations with them upon discharge. The organizations below may better acquaint them with key information and connect them to needed resources as they navigate their new diagnosis.

American Lung Association

The American Lung Association advocates for much-needed resources for the fight against lung cancer at federal, state and local levels.

https://www.lung.org/

LUNGevity

LUNGevity is driving change and improving outcomes for all people diagnosed with lung cancer.

https://www.lungevity.org/

GO2 Foundation for Lung Cancer

The foundation works to change the reality of living with lung cancer by ending stigma, increasing public and private research funding, and ensuring access to care.

https://go2foundation.org/

American Cancer Society

The American Cancer Society is a nationwide, community-based voluntary health organization dedicated to eliminating cancer as a major health problem.

https://www.cancer.org/cancer/lung-cancer.html

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