TABLE 38. Management Recommendations for Solid Solitary Pulmonary Nodules Ranging from Greater than 8 mm to Less than 30 mm

Pretest Probability of Malignancy	Recommendation
Low (<5%)	Surveillance CT at 3 to 6, 9 to 12, and 18 to 24 months (re-evaluate for PET imaging, tissue diagnosis, or excision if evidence of growth)
Intermediate (5% to 65%)	PET/CT imaging: Tissue diagnosis or excision if the nodule demonstrates high metabolic activity, as defined by the concentration of uptake of the tracer (fluorodeoxyglucose) At least short-term surveillance if negative, but consider more aggressive evaluation depending on individual patient factors
High (>65%)	Surgical excision (consider PET/CT imaging for staging first)

Information from Alberts WM; American College of Chest Physicians. Diagnosis and management of lung cancer executive summary: ACCP evidence-based clinical practice guidelines (2nd Edition). Chest. 2007 Sep;132(3 Suppl):1S-19S. [PMID: 17873156]

KEY POINTS

- The first step in the management of a solitary pulmonary nodule is to assess the pretest probability of malignancy.
- HVC If prior imaging of the chest is available, it should be reviewed as a low-risk and inexpensive way to assess the stability or growth of the solitary pulmonary nodule.

Lung Cancer

Lung cancer is the second most common cancer diagnosed in the United States but is the leading cause of cancer deaths. Approximately 80% to 90% of lung cancers can be attributed to cigarette smoking or exposure to second-hand smoke. Therefore, smoking prevention and cessation may be the most important steps in preventing lung cancer. Additional risk factors for lung cancer include exposure to asbestos, ionizing radiation, radon, and arsenic. The relative risk for developing lung cancer significantly increases when a smoker is exposed to another carcinogen or risk factor, such as asbestos. The incidence of lung cancer is also increased in patients with a history of HIV infection, increasing age, and a history of comorbid lung conditions, including emphysema and idiopathic pulmonary fibrosis. Although still poorly understood, a familial predisposition of primary lung cancer has been observed as well.

KEY POINTS

- Lung cancer is the second most common cancer diagnosed in the United States but is the leading cause of cancer deaths.
- HVC Smoking prevention and cessation may be the most important steps in preventing lung cancer.

Lung Cancer Types

Lung cancers are classified by histologic type (**Table 39**). Most (80%) lung cancers are non-small cell lung cancers (NSCLC), with the most common type being adenocarcinoma of the lung. Adenocarcinoma typically presents in the periphery of the lung. Most squamous cell carcinomas, which represent the second most common form of NSCLC, are located in the central portions of the lung and are more common in patients with a smoking history. Current treatment options for both of these NSCLCs include surgical resection, radiation therapy, chemotherapy, and targeted therapies (see MKSAP 17 Hematology and Oncology). Small cell lung cancer (SCLC) tends to be more aggressive than NSCLC and is usually already disseminated at presentation but is usually more sensitive to chemotherapy and radiation therapy initially. It typically presents as a large hilar mass with bulky mediastinal lymphadenopathy.

Diagnosis and Staging

The evaluation of a patient with suspected lung cancer aims to confirm whether the patient indeed has lung cancer, to determine the pathology (NSCLC versus SCLC), and to assess the stage at presentation. Most patients typically undergo chest CT as the first imaging modality, either after an abnormal chest radiograph or as evaluation of a symptom. Initial chest CT imaging is used to determine the size and location of the primary tumor, the presence and location of regional lymph node involvement, and the presence of metastases, which include not only extrathoracic organs but also nodules within a contralateral lobe of the lung and pleural disease. The findings on the chest CT help determine whether a PET/CT is necessary. A PET/CT can help in staging and therefore also help guide where to biopsy. For example, if a patient has a solitary pulmonary nodule, a PET/CT may help determine if any lymph node involvement is present that was not visible on the chest CT.

TABLE 39. Histologic Classification of the Most Common Types of Lung Cancer

Histologic Type	Percentage of All Lung Cancers
Non-Small Cell Lung Cancer	
Adenocarcinoma	38%
Squamous cell carcinoma	20%
Large cell carcinoma	3%
Adenosquamous carcinoma	0.6% to 2.3%
Sarcomatoid carcinoma	0.3%
Neuroendocrine Tumors	
Small cell lung cancer	14%
Large cell lung cancer	3%
Typical carcinoid tumor	1% to 2%
Atypical carcinoid tumor	0.1% to 0.2%

H CONT.

The next step is to obtain tissue diagnosis. The choice of initial diagnostic testing should be aimed first at identifying potential lymph node involvement or metastatic disease. Tissue diagnosis should then be targeted at the lesion that would result in the highest potential staging. For example, a patient presenting with a concerning pulmonary mass and a pleural effusion would require diagnostic thoracentesis to provide accurate staging. The thoracentesis, however, may also provide a diagnosis if cytology is positive. If the patient underwent tissue diagnosis of the mass, a thoracentesis would still be required to provide staging information. The prognosis and treatment change based on the pathology and stage of the lung cancer. Consideration of both of these at the time of diagnosis can ultimately result in fewer tests for the patient. Conversely, in a patient who presents with an isolated pulmonary nodule or mass suspicious for NSCLC, biopsy or resection of this primary lesion is indicated. If the pretest probability of NSCLC is high, surgical resection may be the best strategy because this may be curative. Although SCLC can present as a SPN, this is incredibly rare. However, tissue biopsy to confirm the diagnosis of a NSCLC should be obtained prior to surgical resection if SCLC is a significant possibility (for example, in a patient with a hilar mass). If the pretest probability for NSCLC is low, CT-guided transthoracic needle aspiration or bronchoscopy with transbronchial biopsy could be considered depending on the location of the nodule. H

Lung Cancer Screening

The National Lung Cancer Screening Trial (NLST) demonstrated a 20% reduction in lung cancer deaths at 6.5 years of follow-up in a specific group of high-risk patients who completed 3 years of annual chest imaging with low-dose CT compared with chest radiograph. Based on these data, the United States Preventive Services Task Force (USPSTF) recommends screening patients between the ages of 55 and 79 years who have a 30-pack-year or more history of smoking and who are currently smoking or quit within the last 15 years. Annual low-dose CT imaging should continue until comorbidity limits survival or the ability to tolerate surgical resection, or the patient reaches the age of 80 years. The USPSTF guidelines also recommend that annual screening be discontinued in patients who have stopped smoking for 15 years. If nodules are identified, clinicians should follow established guidelines on how to manage solitary pulmonary nodules for patients at high risk for lung cancer.

The risks of screening, especially the risk of potentially false-positive findings on imaging, outweigh the benefit in patients at low risk for lung cancer. Therefore, lung cancer screening is not currently recommended for patients who do not meet the above criteria.

The Centers for Medicare and Medicaid Services (CMS) recently began reimbursing low-dose CT for lung cancer screening in patients aged 55 to 77 years who meet the above criteria.

KEY POINT

- HVC The United States Preventive Services Task Force recommends low-dose CT screening for lung cancer in patients between the ages of 55 and 79 years who have a 30-pack-year or more history of smoking and who are currently smoking or quit within the last 15 years.

Preinvasive Lung Lesions

Both categories of NSCLC and SCLC include preinvasive lesions that warrant, at a minimum, ongoing surveillance. A 2011 change in the pathologic classification of lung cancer eliminated the previous term of bronchoalveolar cell carcinoma, previously considered a type of NSCLC. This entity is now divided into three categories or subtypes of adenocarcinoma: atypical adenomatous hyperplasia, adenocarcinoma in situ (AIS), and minimally invasive adenocarcinoma. AIS most commonly presents as an incidental finding of ground-glass opacification on chest CT (**Figure 15**). Ground-glass opacifications appear as gray subsolid lesions within the parenchyma of the lung that do not obscure the underlying blood vessels or airways. A less common variant is mucinous AIS, which appears as a solid nodule on imaging. Minimally invasive adenocarcinoma presents similarly to AIS but has a small area of invasion on pathology (≤5 mm). For all three subtypes, the 5-year survival rate is 100% after surgical resection. Current Fleischner criteria recommend that solitary ground-glass nodules larger than 5 mm should be monitored with repeat chest imaging. Initial imaging is recommended at 3 months and then annually for at least 3 years. The guidelines are the same for multiple ground-glass nodules when at least one is larger than 5 mm, whereas multiple ground-glass nodules of 5 mm or smaller should be monitored with repeat imaging at 2 and 4 years. Surgical resection should be considered if a nodule increases in size or the density increases.

Diffuse idiopathic pulmonary neuroendocrine cell hyperplasia is a rare potential precursor of neuroendocrine tumors of the lung and is defined as the presence of multiple carcinoid tumorlets (<0.5 cm) or widespread neuroendocrine cell hyperplasia.

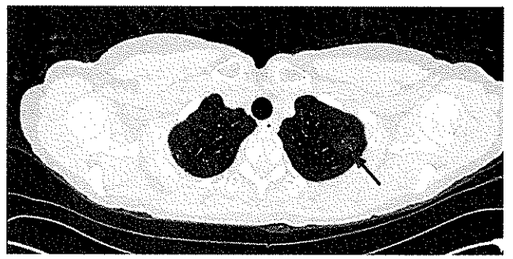

FIGURE 15. A large ground-glass opacification can be seen in the left lung apex on chest CT (*arrow*). It was later confirmed to be an adenocarcinoma in situ on surgical pathology.