⚖ U.S. Preventive Services Task Force

Screening for Lung Cancer: Recommendation Statement

Summary of Recommendation and Evidence

The U.S. Preventive Services Task Force (USPSTF) recommends annual screening for lung cancer with low-dose computed tomography (CT) in adults 55 to 80 years of age who have a 30 pack-year smoking history and currently smoke or quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery *(Table 1)*. **B recommendation.**

Rationale
IMPORTANCE

Lung cancer is the third most common cancer and the leading cause of cancer-related death in the United States.[1] The most important risk factor for lung cancer is smoking, which results in approximately 85% of all U.S. lung cancer cases.[2] Although the prevalence of smoking has decreased, approximately 37% of U.S. adults are current or former smokers.[2] The incidence of lung cancer increases with age and is highest in persons 55 years or older. Increasing age and cumulative exposure to tobacco smoke are the most common risk factors for lung cancer.

Table 1. Screening for Lung Cancer: Clinical Summary of the USPSTF Recommendation

Population	Asymptomatic adults 55 to 80 years of age who have a 30 pack-year smoking history and currently smoke or who quit smoking within the past 15 years.
Recommendation	Screen annually for lung cancer with low-dose CT. Discontinue screening when the patient has not smoked for 15 years. Grade: B
Risk assessment	Age, total cumulative exposure to tobacco smoke, and years since quitting smoking are the most important risk factors for lung cancer. Other risk factors include specific occupational exposures, radon exposure, family history, and history of pulmonary fibrosis or chronic obstructive lung disease.
Screening tests	Low-dose CT has high sensitivity and acceptable specificity for detecting lung cancer in high-risk persons and is the only currently recommended screening test for lung cancer.
Treatment	Non–small cell lung cancer is treated with surgical resection when possible and also with radiation and chemotherapy.
Balance of benefits and harms	Annual screening for lung cancer with low-dose CT is of moderate net benefit in asymptomatic persons who are at high risk of lung cancer based on age, total cumulative exposure to tobacco smoke, and years since quitting smoking.
Other relevant USPSTF recommendations	The USPSTF has made recommendations on counseling and interventions to prevent tobacco use and tobacco-caused disease. These recommendations are available at http://www.uspreventiveservicestaskforce.org/.

NOTE: *For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement, and supporting documents, go to http://www.uspreventiveservicestaskforce.org/.*

CT = computed tomography; USPSTF = U.S. Preventive Services Task Force.

Lung cancer has a poor prognosis, and nearly 90% of persons with lung cancer die of the disease. However, early-stage non–small cell lung cancer (NSCLC) has a better prognosis and can be treated with surgical resection.

DETECTION

Most lung cancer cases are NSCLC, and most screening programs focus on the detection and treatment of early-stage NSCLC. Although chest radiography and sputum cytologic evaluation have been used to screen for lung cancer, low-dose CT has greater sensitivity for detecting early-stage cancer.[3]

BENEFITS OF DETECTION AND EARLY TREATMENT

Although lung cancer screening is not an alternative to smoking cessation, the USPSTF found adequate evidence that annual screening for lung cancer with low-dose CT in a defined population of high-risk persons can prevent a substantial number of lung cancer–related deaths. Direct evidence from a large, well-conducted, randomized controlled trial provides moderate certainty of the benefit of lung cancer screening with low-dose CT in this population.[4] The magnitude of benefit to the person depends on that person's risk of lung cancer, because those who are at highest risk are most likely to benefit. Screening cannot prevent most lung cancer–related deaths, and smoking cessation remains essential.

HARMS OF DETECTION AND EARLY INTERVENTION AND TREATMENT

The harms associated with low-dose CT screening include false-negative and false-positive results, incidental findings, overdiagnosis, and radiation exposure. False-positive low-dose CT results occur in a substantial proportion of screened persons; 95% of all positive results do not lead to a diagnosis of cancer. In a high-quality screening program, further imaging can resolve most false-positive results; however, some patients may require invasive procedures.

The USPSTF found insufficient evidence on the harms associated with incidental findings. Overdiagnosis of lung cancer occurs, but its precise magnitude is uncertain. A modeling study performed for the USPSTF estimated that 10% to 12% of screen-detected cancer cases are overdiagnosed—that is, they would not have been detected in the patient's lifetime without screening. Radiation harms, including cancer resulting from cumulative exposure, vary depending on the age at the start of screening; the number of scans received; and the person's exposure to other sources of radiation, particularly other medical imaging.

USPSTF ASSESSMENT

The USPSTF concludes with moderate certainty that annual screening for lung cancer with low-dose CT is of moderate net benefit in asymptomatic persons who are at high risk of lung cancer based on age, total cumulative exposure to tobacco smoke, and years since quitting smoking. The moderate net benefit of screening depends on limiting screening to persons who are at high risk, the accuracy of image interpretation being similar to that found in the NLST (National Lung Screening Trial), and the resolution of most false-positive results without invasive procedures.[4]

Clinical Considerations
PATIENT POPULATION

The risk of lung cancer increases with age and cumulative exposure to tobacco smoke, and decreases with time since quitting smoking. The best evidence for the benefit of screening comes from the NLST, which enrolled adults 55 to 74 years of age who had at least a 30 pack-year smoking history and were current smokers or had quit within the past 15 years. As with all screening trials, the NLST tested a specific intervention over a finite period. Because initial eligibility extended through 74 years of age and participants received three annual screening CT scans, the oldest participants in the trial were 77 years of age.

The USPSTF used modeling studies to predict the benefits and harms of screening programs that use different screening intervals, age ranges, smoking histories, and times since quitting. A program that annually screens adults 55 to 80 years of age who have a 30 pack-year smoking history and currently smoke or quit within the past 15 years is projected to have a reasonable balance of benefits and harms. The model

assumes that persons who achieve 15 years of smoking cessation during the screening program discontinue screening. This model predicts the outcomes of continuing the screening program used in the NLST through 80 years of age.

Screening may not be appropriate for patients with substantial comorbid conditions, particularly those who are in the upper end of the screening age range. The NLST excluded persons who were unlikely to complete curative lung cancer surgery and those with medical conditions that posed a substantial risk of death during the eight-year trial. The baseline characteristics of the NLST showed a relatively healthy sample, and fewer than 10% of enrolled participants were older than 70 years.[5] Persons with serious comorbid conditions may experience net harm, no net benefit, or at least substantially less net benefit. Similarly, persons who are unwilling to have curative lung surgery are unlikely to benefit from a screening program.

ASSESSMENT OF RISK

Age, total exposure to tobacco smoke, and years since quitting smoking are important risk factors for lung cancer and were used to determine eligibility in the NLST. Other risk factors include specific occupational exposures, radon exposure, family history, and history of pulmonary fibrosis or chronic obstructive lung disease. The incidence of lung cancer is relatively low in persons younger than 50 years but increases with age, especially after 60 years of age. In current and former smokers, age-specific incidence rates increase with age and cumulative exposure to tobacco smoke.

Smoking cessation substantially reduces a person's risk of developing and dying of lung cancer. Among persons enrolled in the NLST, those who were at highest risk because of additional risk factors or a greater cumulative exposure to tobacco smoke experienced most of the benefit.[6] A validated multivariate model showed that persons in the highest 60% of risk accounted for 88% of all deaths preventable by screening.

SCREENING TESTS

Low-dose CT has shown high sensitivity and acceptable specificity for the detection of lung cancer in high-risk persons. Chest radiography and sputum cytologic evaluation have not shown adequate sensitivity or specificity as screening tests. Therefore, low-dose CT is currently the only recommended screening test for lung cancer.

TREATMENT

Surgical resection is the current standard of care for localized NSCLC. This type of cancer is treated with surgical resection when possible and also with radiation and chemotherapy. Annual low-dose CT screening may not be useful for patients with life-limiting comorbid conditions or poor functional status who may not be candidates for surgery.

OTHER APPROACHES TO PREVENTION

Smoking cessation is the most important intervention to prevent NSCLC. Advising smokers to stop smoking and preventing nonsmokers from being exposed to tobacco smoke are the most effective ways to decrease the morbidity and mortality associated with lung cancer. Current smokers should be informed of their continuing risk of lung cancer and offered cessation treatments. Screening with low-dose CT should be viewed as an adjunct to tobacco cessation interventions.

USEFUL RESOURCES

Clinicians have many resources to help patients stop smoking. The Centers for Disease Control and Prevention has developed a website with many such resources, including information on tobacco quit lines, available in several languages (http://www.cdc.gov/tobacco/campaign/tips). Quit lines provide telephone-based behavioral counseling and support to tobacco users who want to quit smoking. Counseling is provided by trained cessation specialists who follow standardized protocols that may include several sessions and are generally provided at no cost to users. The content has been adapted for specific populations and can be tailored for individual clients. Strong evidence shows that quit lines can expand the use of evidence-based tobacco cessation treatments in populations that may have limited access to treatment options.

Combination therapy with counseling and medications is more effective at increasing tobacco cessation rates than either

component alone. The U.S. Food and Drug Administration has approved several forms of nicotine replacement therapy (gum, lozenge, transdermal patch, inhaler, and nasal spray), as well as bupropion and varenicline. More information on the treatment of tobacco dependence can be found in the U.S. Public Health Service Reference Guide "Treating Tobacco Use and Dependence: 2008 Update" (available at http://www.ahrq.gov/professionals/clinicians-providers/guidelines-recommendations/tobacco/clinicians/update/treating_tobacco_use08.pdf). The National Cancer Institute has developed a patient and physician guide for shared decision making for lung cancer screening based on the NLST (available at http://www.cancer.gov/newscenter/qa/2002/NLSTstudyGuidePatientsPhysicians). This one-page resource may be a useful communication tool for physicians and patients.

In addition, the National Comprehensive Cancer Network has developed guidelines for the follow-up of lung nodules.[7] The appropriate follow-up and management of abnormalities found on low-dose CT scans are important given the high rates of false-positive results and the potential for harms. Lung cancer screening with low-dose CT should be implemented as part of a program of care, as outlined in the full recommendation statement (http://www.uspreventiveservicestaskforce.org/uspstf/uspslung.htm).

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The "Other Considerations," "Discussion," and "Recommendations of Others" sections of this recommendation statement are available at http://www.uspreventiveservicestaskforce.org/uspstf/uspslung.htm.

The U.S. Preventive Services Task Force recommendations are independent of the U.S. government. They do not represent the views of the Agency for Healthcare Research and Quality, the U.S. Department of Health and Human Services, or the U.S. Public Health Service.

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