Screening for Lung Cancer: CHEST Guideline and Expert Panel Report

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Abstract

Background: Low-dose chest CT screening for lung cancer has become a standard of care in the past few years, in large part due to the results of the National Lung Screening Trial. The benefit and harms of low-dose chest CT screening differ in both frequency and magnitude. The translation of a favorable balance of benefit and harms into practice can be difficult. Here, we update the evidence base for the benefit, harms, and implementation of low radiation dose chest CT screening. We use the updated evidence base to provide recommendations where the evidence allows, and statements based on experience and expert consensus where it does not.

Methods: Approved panelists developed key questions using the PICO (population, intervention, comparator, and outcome) format to address the benefit and harms of low-dose CT screening, as well as key areas of program implementation. A systematic literature review was conducted using MEDLINE via PubMed, Embase, and the Cochrane Library. Reference lists from relevant retrievals were searched, and additional papers were added. The quality of the evidence was assessed for each critical or important outcome of interest using the GRADE approach. Important clinical questions were addressed based on the evidence developed from the systematic literature review. Graded recommendations and un-graded statements were drafted, voted on, and revised until consensus was reached.

Results: The systematic literature review identified 59 studies that informed the response to the 12 PICO questions that were developed. Key clinical questions were addressed resulting in 6 graded recommendations and 9 ungraded consensus based statements.

Conclusions: Evidence suggests that low-dose CT screening for lung cancer results in a favorable but tenuous balance of benefit and harms. The selection of screen-eligible patients, the quality of imaging and image interpretation, the management of screen detected findings, and the effectiveness of smoking cessation interventions, can impact this balance. Additional research is needed to optimize the approach to low-dose CT screening.

SUMMARY OF RECOMMENDATIONS

1. For asymptomatic smokers and former smokers age 55 to 77 who have smoked 30 pack years or more and either continue to smoke or have quit within the past 15 years, we suggest that annual screening with low-dose CT should be offered. (Weak recommendation, moderate-quality evidence)

Remark: Age 77 represents the oldest age of participants in the NLST at the end of the screening period. Age 77 also matches the oldest age of CMS coverage for low-dose CT screening. Age 80 has been recommended by the USPSTF based on modeling studies. Recommendation #2 can be applied to individuals age 78 to 80.

Remark: Asymptomatic refers to the absence of symptoms suggesting the presence of lung cancer.

2. For asymptomatic smokers and former smokers who do not meet the smoking and age criteria in Recommendation #1 but are deemed to be at high risk of having/developing lung cancer based on clinical risk prediction calculators, we suggest that low-dose CT screening should not be routinely performed. (Weak recommendation, low-quality evidence)

Remark: It is recognized that clinical risk prediction calculators may be slightly more efficient at identifying individuals who have or will develop lung cancer than the eligibility criteria listed in Recommendation #1. It is also recognized that the variables included in the clinical risk prediction calculators are risk factors for morbidity from the evaluation and treatment of screen detected findings, and death from any cause. Thus a cohort at high risk for lung cancer based on a clinical risk prediction calculator may be less likely to benefit and more likely to be harmed by lung cancer screening than the cohort identified by the eligibility criteria listed in Recommendation #1. Thus, we do not believe the evidence supports a policy to screen this group.

Remark: It is also recognized that there will be individuals within the cohort deemed to be at high risk for lung cancer from a clinical risk prediction calculator who are healthy enough to benefit from lung cancer screening, and that low-dose CT screening could be considered in these individuals.

Remark: A risk threshold of 1.51% over 6 years on the PLCOm2012 calculator is an example of high risk.

Remark: Insurance coverage of low-dose CT screening may not be provided for those who do not meet the eligibility criteria listed in Recommendation #1.

Remark: Additional lung cancer screening trials that include patients who do not meet the eligibility criteria listed in Recommendation #1 but have a high risk of having/developing lung cancer based on clinical risk prediction calculators are needed.

3. For individuals who have accumulated fewer than 30 pack years of smoking or are younger than age 55 or older than 77, or have quit smoking more than 15 years ago, and do not have a high risk of having/developing lung cancer based on clinical risk prediction calculators, we recommend that low-dose CT screening should not be performed. (Strong recommendation, moderate-quality evidence)

4. For individuals with comorbidities that adversely influence their ability to tolerate the evaluation of screen detected findings, or tolerate treatment of an early stage screen detected lung cancer, or that substantially limit their life expectancy, we recommend that low-dose CT screening should not be performed. (Strong recommendation, low-quality evidence)

Remark: At very severe stages of a comorbid condition it can be clear that low-dose CT screening is not indicated (e.g. advanced liver disease, COPD with hypoventilation and hypoxia, NYHA class IV heart failure) because competing mortality limits the potential benefit, and harms are magnified. At less severe stages it can be difficult to determine if an individual's comorbidities are significant enough that they should not receive low-dose CT screening. Further research is required to assist clinicians with this decision.

5. We suggest that low-dose CT screening programs develop strategies to determine whether patients have symptoms that suggest the presence of lung cancer, so that symptomatic patients do not enter screening programs but instead receive appropriate diagnostic testing, regardless of whether the symptomatic patient meets screening eligibility criteria. (Ungraded Consensus-Based Statement)

Remark: In centralized low-dose CT screening programs, the provider that meets with the patient prior to the low-dose CT should ask about symptoms that would suggest diagnostic testing is indicated.

Remark: In de-centralized low-dose CT screening programs, the screening program should assist the ordering provider through educational outreach and/or the provision of clinical tools (e.g. reminders built into electronic medical records).

6. We suggest that screening programs define what constitutes a positive test on the low-dose CT based on the size of a detected solid or part-solid lung nodule, with a threshold for a positive test that is either 4 mm, 5 mm, or 6 mm in diameter. (Weak recommendation, low-quality evidence)

Remark: A positive test is defined as a test that leads to a recommendation for any additional testing other than to return for the annual screening exam.

Remark: Nodule diameter is the average of long- and short-axis diameters obtained on the same sagittal, coronal, or transverse image. For part-solid nodules, nodule diameter should be based on the size of the solid component of the nodule.

Remark: An equivalent volumetric threshold can also be considered.

Remark: The LungRADS structured reporting system currently uses 6 mm at the baseline scan and 4 mm if a new nodule is found on the annual scan for solid nodules; and 6 mm at the baseline scan and any size if a new nodule is found on the annual scan for part-solid nodules.

7. We suggest that low-dose CT screening programs develop strategies to maximize compliance with annual screening exams. (Ungraded Consensus-Based Statement)

Remark: Additional research is needed to better understand the factors that influence compliance, and to develop tools to help screening programs maximize compliance with annual screening exams.

8. We suggest that low-dose CT screening programs develop a comprehensive approach to lung nodule management, including multi-disciplinary expertise (Pulmonary, Radiology, Thoracic Surgery, Medical and Radiation Oncology), and algorithms for the management of small solid nodules, larger solid nodules, and sub-solid nodules. (Ungraded Consensus-Based Statement)

Remark: For programs without lung nodule management expertise available on site, collaborations with centers capable of high quality lung nodule management can be formed (e.g. referral, distance evaluation).

9. We suggest that low-dose CT screening programs develop strategies to minimize overtreatment of potentially indolent lung cancers. (Ungraded Consensus-Based Statement)

Remark: It is important to educate patients about the potential to detect an indolent lung cancer to help mitigate the psychological distress that could result from living with an indolent untreated lung cancer.

10. For current smokers undergoing low-dose CT screening, we recommend that screening programs provide evidence-based tobacco cessation treatment as recommended by the US Public Health Service. (Strong recommendation, low-quality evidence)

Remark: Further research about the ideal approach to tobacco treatment specific to the lung cancer screening setting is needed.

11. We suggest that low-dose CT screening programs develop strategies to provide effective counseling and shared decision-making visits prior to the performance of the LDCT screening exam. (Ungraded Consensus-Based Statement)

Remark: Components of the counseling and shared decision making visit include a determination of screening eligibility (age, smoking history, the absence of symptoms, confirmation of overall health), the use of decision aids with information about benefits and harms of screening, a discussion about the potential CT findings and need for follow-up testing, the need for annual screening exams, confirmation of the willingness to accept treatment for a screen detected cancer, and counseling about smoking cessation.

Remark: In centralized low-dose CT screening programs, a screening program provider may meet with the patient prior to the low-dose CT to perform the counseling and shared decision-making visit.

Remark: In de-centralized low-dose CT screening programs, the screening program should ensure that ordering providers are trained, and/or have the tools necessary, to deliver an effective counseling and shared decision-making visit. These tools may include decision aids, information brochures, videos, and links to electronic resources.

Remark: Additional research about the most effective way to conduct counseling and shared decision-making visits is needed.

12. We suggest that low-dose CT screening programs follow the ACR/STR protocols for performing low radiation dose chest CT scans. (Ungraded Consensus-Based Statement)

Remark: An awareness of the potential for radiation related harm can help programs thoughtfully plan ways to minimize this risk through proper patient selection, the performance of the CT scan, and appropriate management of screen detected findings.

13. We suggest that low-dose CT screening programs use a structured reporting system to report the exam results. (Ungraded Consensus-Based Statement)

Remark: The structured reporting system should include a description of the number, location, size, and characteristics of all lung nodules, guideline based recommendations for surveillance of small lung nodules, and a description of other incidental findings.

Remark: The ACR LungRADS structured report is the most prevalent system used today. LungRADS categories translate directly into data requests from the ACR National Registry.

14. We suggest that low-dose CT screening programs develop strategies to guide the management of non-nodule findings. (Ungraded Consensus-Based Statement)

Remark: Examples include coronary artery calcification, thyroid nodules, adrenal nodules, kidney and liver lesions, thoracic aortic aneurysms, pleural effusions, and parenchymal lung disease.

Remark: A lung cancer screening program should anticipate such incidental findings and have a system in place to address it. Examples include evidence based guidance within the structured report to assist the ordering provider, or centralized management of all incidental findings by the screening program. Clear communication between providers is important to prevent misunderstandings about who will assume responsibility for deciding what needs attention and ensuring appropriate follow-up evaluation.

Remark: The wording of how incidental findings are reported should be systematically developed to minimize anxiety and misunderstanding.

15. We suggest that low-dose CT screening programs develop data collection and reporting tools capable of assisting with quality improvement initiatives and reporting to the current National Registry. (Ungraded Consensus-Based Statement)

Remark: Data categories include patient eligibility criteria, imaging findings and their evaluation, results of the evaluation of imaging findings including complications, smoking cessation interventions, and lung cancer diagnoses including histology, stage, treatment, and outcomes.