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Need for Standardized Lung Cancer Screening

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Executive Summary: Clinical Practice Guideline

Need for Standardized Lung Cancer Screening

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Summary

Lung cancer accounted for 1.8 million deaths worldwide in 2020. Annual lung cancer screenings play a critical role in early detection, improving survival rates, and reducing mortality, particularly among high-risk individuals such as long-term smokers. Low-dose computed tomography (LDCT) is the preferred screening method, offering a high sensitivity for detecting lung nodules in at-risk populations, such as long-term smokers and individuals with a significant history of tobacco use. Current practice at a Southeastern Veterans Affairs Medical Center (VAMC) does not use an annual screening tool to assess patients who meet the US Preventive Services Task Force (USPSTF) criteria for lung cancer. Standardized lung cancer screening, paired with LDCT, significantly improves early detection outcomes by identifying malignancies at an earlier, more treatable stage. This clinical practice guideline (CPG) aimed to validate the need for standardized lung cancer screening for eligible patients who meet the USPSTF criteria for early detection. Extensive literature review using evidence-based peer-reviewed journals led to the following practice-focused question: “Will a lung cancer screening clinical practice guideline receive an aggregate score of at least 80% in the six domains of the AGREE II tool by content experts?” The panel of four content experts reached a final score following the CPG guideline with a 92.7% aggregate score across all domains (scope and purpose: 98.6%; stakeholder involvement: 88.8%; rigor or development: 97.9%; clarity of presentation: 100%; applicability: 100%; editorial independence: 70.8%). The CPG can affect social change by standardizing annual lung cancer screenings into preventive healthcare; medical professionals can enhance early diagnosis, ultimately saving lives and improving the quality of care.

Background

Lung cancer is one of the most common and serious types of cancer (World Health Organization, 2023), originating in the tissues of the lungs—most often in the cells lining the air passages. It is primarily caused by long-term exposure to harmful substances such as tobacco smoke, though environmental factors like air pollution, exposure to radon gas, and occupational hazards also contribute. Lung cancer in the early stages generally involves surgical intervention with a high prognosis, whereas later staged diagnosis results in cojoined treatment options such as surgery, chemotherapy, and/or radiation, which does not always guarantee increased survival rates (American Cancer Society, 2023). Lung cancer has the highest mortality rate among colon, breast, and prostate cancers combined, but when found at an early stage during screenings, treatment is more effective (Kinsey et al., 2022).

Lung cancer is often asymptomatic in its early phases, leading to late-stage diagnoses with poor prognoses. Evidence supports that standardized screening protocol for high-risk populations, such as long-term smokers, increases the likelihood of detecting tumors before they metastasize, thereby improving survival rates and reducing mortality (Wolf et al., 2024). Studies have shown that annual incorporating LDCT screening reduces lung cancer deaths by enabling timely interventions, including curative surgeries and targeted therapies, enhancing patient outcomes and reducing the overall disease burden (Duer et al., 2023).

In recent years, the USPSTF expanded the age range from 55-77 to 50-80 for lung cancer screening (USPSTF, 2021). The USPSTF also reduced the pack-year history from 30 to 20 (USPSTF, 2021). Evidence from clinical trials, such as the National Lung

Screening Trial (NLST), demonstrates that LDCT screening can reduce lung cancer mortality by 20%, underscoring its value in public health initiatives (National Cancer Institute, 2014). However, the effectiveness of screening programs is contingent upon systematic implementation and timely access to diagnostic and treatment services.

Regular screenings facilitate timely medical intervention, reducing the progression of the disease and improving overall patient outcomes.

The NLST demonstrated that LDCT screening reduces lung cancer mortality by 20% compared to chest X-rays. The NLST proved that LDCT is the gold standard in diagnosing lung cancer and reduces mortality by 20% (Wolf et al., 2024). Evidence supports using LDCT when screened annually (Duer et al., 2023). A standardized screening tool ensures that high-risk individuals, typically heavy smokers aged 50-80, are systematically identified and screened. The screening tool helps reduce interpretation variability and ensures consistent application of risk assessment criteria. Standardized protocols for the follow-up of indeterminate nodules, such as those outlined by the Lung Reporting and Data System (Lung-RADS) classification system, improve diagnostic accuracy and reduce false positives (Huang et al., 2019). The LDCT minimizes unnecessary biopsies, psychological distress, and healthcare costs associated with overdiagnosis. By catching lung cancer in its early stages, treatment options such as surgery, radiation, and targeted therapies become more effective, significantly improving survival rates (Wolf et al., 2024).

The implementation of a standardized lung cancer screening tool is crucial in improving early detection, reducing mortality rates, and ensuring equitable access to care for veterans who have high exposure to environmental carcinogens and veterans with

smoking history. By standardizing screening protocols, healthcare systems can enhance diagnostic accuracy, reduce disparities, and optimize resource allocation, leading to better patient outcomes. Without a standardized lung cancer screening tool, disparities in healthcare access and outcomes persist. Standardization ensures that screening guidelines are universally applied across healthcare settings, minimizing the chances of underdiagnosis in marginalized populations. Additionally, integrating lung cancer screening into routine healthcare workflows, such as primary care visits and electronic health records, increases the likelihood of reaching at-risk populations who may otherwise go unscreened. The DNP project focuses on standardization for lung cancer screening within a Southeastern VAMC. The uniqueness of the veteran population puts them at an increased risk of smoking than their counterpart civilian, increases the risk of developing lung cancer, and data collection can be skewed (Núñez et al., 2023).

Systematic methods used to search for evidence involve structured and comprehensive approaches to identifying, evaluating, and synthesizing relevant research. Reputable websites and organizations include PubMed, Cochrane Library, Walden Library, EBSCO, medical journals, and peer-reviewed scholarly articles. Boolean words/phrases and citation track to ensure comprehensive coverage of the literature pertinent to this project topic. Screening of studies is conducted in multiple stages, including title and abstract review followed by full-text analysis. Quality assessment tools help ensure the reliability and validity of the selected evidence. Data extraction and literature synthesis provided a structured summary of findings to inform clinical guidelines, including strong, level I and III evidence-based information. Most sources were meta-analyses, randomized controlled trials, and retrospective observational studies.

The ACS released an updated guideline for lung cancer screening in 2023 to align with the recommended guidance from the USPSTF of lowering the age from 55 to 50 years and decreasing the pack-year smoking history from 30 to 20 years (Wolf et al., 2024). Patients who met the criteria but quit within less than 15 years are considered part of the inclusion population. Experts warranted changes in screening due to the lung cancer diagnosis being found in late stages, and early detection increases favorable response to treatment, thus increasing the 5-year survival rate.

Clinical Practice Guideline Development

The evolving studies with supporting evidence from over 40 years of systematic reviews have proven consistent in lung cancer screening and imperative to this project in constructing a CPG (Appendix) to promote standardized lung cancer screening. —no funding or competing interests were influenced in developing the CPG. After the final draft of the CPG was developed, four primary care providers (PCPs) served as appraisers of the CPG using the Appraisal of Guidelines for Research & Evaluation II (AGREE II) tool. The PCPs broad clinical experience enables them to assess guidelines' applicability, clarity, and relevance in real-world settings.

The AGREE II tool is designed to assess the quality, methodological rigor, and transparency of CPGs, aiming to improve their development and use in healthcare. It comprises 23 specific items organized into six domains: Scope and Purpose (3 items), Stakeholder Involvement (3 items), Rigour of Development (8 items), Clarity of Presentation (3 items), Applicability (4 items), and Editorial Independence (2 items). Each item is rated on a 7-point Likert scale, where 1 indicates strong disagreement and 7 indicates strong agreement. Domain scores are calculated by summing the scores of

individual items within the domain and then scaling the total as a percentage of the maximum possible score for that domain. This structured approach helps ensure consistency and objectivity in evaluating guideline quality, ultimately supporting better healthcare decision-making and policy development.

Results

The scope and purpose domain rates the CPG objective, explicit health concern, and targeted population. The domain consists of three item statements for a maximum score of 84 and a minimum score of 12. The CPG's scope and purpose received an overall score of 98.6%. The percentage indicates the expert panel rated the objectives were comprehensively met. See Figure 1.

Figure 1

Domain 1: Scope and Purpose

	Appraiser 1	Appraiser 2	Appraiser 3	Appraiser 4
Individual Total Score:	21	21	20	21
Total Domain Score for Content Experts: 83				
Max Domain Score (AGREE II Tool): 84		Min Domain Score (AGREE II Tool): 12		
Domain equation: $\frac{83 - 12}{84 - 12} \times 100 = 0.986$				
Final Domain Score: 98.6%				

The stakeholder involvement domain consists of three item statements that address key stakeholders and end users. The domain has a maximum score of 84 and a minimum score of 12. The CPG's scope and purpose received an overall score of 88.8%. One of the experts did not strongly agree the target users were clearly defined. The percentage indicates the expert panel rated the objectives were comprehensively met. See Figure 2.

Figure 2

Domain 2: Stakeholder Involvement

	Appraiser 1	Appraiser 2	Appraiser 3	Appraiser 4
Individual Total Score:	21	14	20	21
Total Domain Score for Content Experts: 76				
Max Domain Score (AGREE II Tool): 84		Min Domain Score (AGREE II Tool): 12		
Domain equation: $\frac{76 - 12}{84 - 12} \times 100 = 0.888$				
Domain Score: 88.8%				

The rigor of development domain consists of eight item statements that inquire about the evidence and synthesis used to support the CPG. The domain maximum score is 224 and has a minimum score of 32. The CPG's scope and purpose received an overall score of 97.9%. The percentage indicates the expert panel rated the objectives were comprehensively met. See Figure 3.

Figure 3

Domain 3: Rigor of Development

	Appraiser 1	Appraiser 2	Appraiser 3	Appraiser 4
Individual Total Score:	54	56	54	56
Total Domain Score for Content Experts: 220				
Max Domain Score (AGREE II Tool): 224		Min Domain Score (AGREE II Tool): 32		
Domain equation: $\frac{220 - 32}{224 - 32} \times 100 = 0.979$				
Final Domain Score: 97.9%				

The clarity of the presentation domain consists of three item statements to rank the proper format and precision. The domain maximum score is 84, and the minimum score is 12. The CPG's scope and purpose received an overall score of 100%. In Figure 4, the percentage indicates the expert panel rated the objectives were comprehensively met.

Figure 4*Domain 4: Clarity of Presentation*

	Appraiser 1	Appraiser 2	Appraiser 3	Appraiser 4
Individual Total Score:	21	21	21	21
Total Domain Score for Content Experts: 84				
Max Domain Score (AGREE II Tool): 84		Min Domain Score (AGREE II Tool): 12		
Domain equation:	$\frac{84 - 12}{84 - 12} \times 100 = 100$			
Final Domain Score: 100%				

The applicability domain concerns barriers, methods to overcome challenges, and application suggestions. The domains consist of four item statements for a maximum score of 664 and a minimum score of 16. The CPG's scope and purpose received an overall score of 100%. The percentage indicates the expert panel rated the objectives were comprehensively met. See Figure 5.

Figure 5*Domain 5: Applicability*

	Appraiser 1	Appraiser 2	Appraiser 3	Appraiser 4
Individual Total Score:	28	28	28	28
Total Domain Score for Content Experts: 112				
Max Domain Score (AGREE II Tool): 112		Min Domain Score (AGREE II Tool): 16		
Domain equation:	$\frac{112 - 16}{112 - 16} \times 100 = 100$			
Final Domain Score: 100%				

The applicability domain addresses any bias or external influences. The domain consists of two item statements for a maximum score of 56 and a minimum score of 8. The CPG's scope and purpose received an overall score of 70.8%. The percentage indicates the expert panel rated the objectives as not being comprehensively met. See Figure 6.

Figure 6*Domain 6: Editorial Independence*

	Appraiser 1	Appraiser 2	Appraiser 3	Appraiser 4
Individual Total Score:	14	0	14	14
Total Domain Score for Content Experts: 42				
Max Domain Score (AGREE II Tool): 56		Min Domain Score (AGREE II Tool): 8		
Domain equation:	$\frac{42 - 8}{56 - 8} \times 100 = 0.708$			
Final Domain Score: 70.8%				

The six domains determine whether the CPG should be recommended or not. The overall collective domains consist of 23 item statements. The experts all agreed the objective was clearly defined, but the geographic location of the patient population was not provided. One expert did not rate the editorial independence, referencing the CPG, which lacked clarity in that domain. Another expert expressed there was no procedural methods discussed on how the CPG was to be updated. The CPG's overall aggregate score is 92.7%. The percentage indicates the expert panel rated the objectives were comprehensively met. All experts agreed to implement the CPG overall. See Figure 7.

Figure 7*Overall Aggregate Score*

All Six Domains Total:	$\frac{0.986 + 0.888 + 0.979 + 1 + 1 + 0.708}{6}$	$\times 100 = 0.927$
Overall Aggregate Score: 92.7%		

Conclusions

Adopting the CPG can significantly enhance early detection efforts within the organization, potentially reducing mortality rates and improving patient outcomes through timely interventions. However, limitations such as limited access to low-dose CT

scanners, variability in provider adherence, and patient hesitancy may affect consistent implementation and the overall effectiveness of the guideline. These limitations can lead to underutilization or inconsistent results across populations. Despite these challenges, the project holds importance beyond the local site by contributing to broader public health goals, promoting standardized care, and informing future guideline adaptations or policy decisions at regional and national levels.

A standardized lung cancer screening tool improves early detection, reduces healthcare disparities, and optimizes resource utilization. By establishing clear guidelines, ensuring equitable access, and leveraging technological advancements, healthcare systems can significantly lower lung cancer mortality rates. A well-structured screening program saves lives and enhances lung cancer care's efficiency and effectiveness. Developing a well-crafted CPG promotes positive social change by improving healthcare quality, reducing disparities, and enhancing patient outcomes across populations. When based on rigorous evidence and inclusive of diverse stakeholder perspectives, CPGs guide providers in delivering consistent, effective, and equitable care. This leads to more informed decision-making, better resource utilization, and increased patient trust in the healthcare system. A well-developed CPG supports systemic improvements beyond individual care, fostering a more just and health-conscious society.

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Appendix

Lung Cancer Screening Clinical Practice Guidelines

1. Introduction

Lung cancer remains the leading cause of cancer death globally. Early detection through **low-dose computed tomography (LDCT)** has been shown to significantly reduce mortality by detecting lung cancer at an early, more treatable stage in high-risk populations. This detailed protocol provides a comprehensive approach to eligibility criteria, risk assessment, and follow-up procedures.

2. Eligibility Criteria for Lung Cancer Screening

A. Patient Criteria

Screening is recommended for patients meeting **all** the criteria below:

- **Age Range:** 50 to 80 years
- **Smoking History:** At least **20 pack-years** (number of packs per day x years of smoking), e.g., smoking one pack/day for 20 years or two packs/day for 10 years)
- **Current or Former Smokers:**
 - Current smokers
 - Former smokers who quit within the last **15 years**

B. Exclusion Criteria

Do not screen individuals with:

- **Life Expectancy <10 Years** due to severe comorbid conditions
- **Inability to tolerate diagnostic evaluation** or treatment if cancer is detected; Severe medical conditions that prevent curative treatment

- **Previous diagnosis of lung cancer**

3. Screening Methodology

A. Low-Dose Computed Tomography (LDCT)

- **Imaging Protocol:**
 - Non-contrast, spiral CT scan with reduced radiation
 - Scan from lung apices to lung bases
- **Frequency:**
 - **Annual screening** until criteria are no longer met

B. Radiation Safety

- Minimize exposure while maintaining diagnostic accuracy
- Educate patients about the low risk associated with LDCT

4. Risk Assessment and Shared Decision-Making

Shared Decision-Making Components

- Discuss **benefits**: Early detection, reduced mortality
- Discuss **risks**: False positives leading to unnecessary procedures, overdiagnosis of indolent cancers, and radiation exposure risks
- Use **decision aids** to explain outcomes and statistics visually
- Ensure informed consent before proceeding

5. Lung-RADS Scoring System

A. Detailed Management Based on Lung-RADS

Category	Findings	Recommended Action
1 (Negative)	No nodules or benign findings	Resume annual LDCT

Category	Findings	Recommended Action
2 (Benign Appearance/Behavior)	Nodules <6 mm or benign calcification	Continue annual screening
3 (Probably Benign)	Nodules 6-8 mm, <1% malignancy	Repeat LDCT in 6 months
4A (Suspicious)	Nodules >8 mm, 5-15% risk	LDCT or PET-CT in 3 months
4B/4X (Highly Suspicious)	Nodules >15 mm or growing nodules	Biopsy or surgical consultation

6. Follow-Up Care

A. Multidisciplinary Approach

- Collaboration with pulmonologists, radiologists, thoracic surgeons, and oncologists
- Develop individualized management plans based on risk and preferences

B. Smoking Cessation Programs

- Integrate smoking cessation as a critical component of the screening program
- Offer pharmacologic aids (nicotine replacement, varenicline) and behavioral support

C. Patient Education and Support

- Educate about the importance of adherence to follow-up screenings
- Provide resources for mental health support if anxiety about screening results arises

7. Quality Assurance and Program Evaluation

A. Quality Metrics

- **Adherence Rates:** Percentage of eligible patients participating in annual screening
- **Stage Distribution:** Proportion of cancers detected at early (I-II) versus late stages (III-IV)
- **False Positive Rate:** Percentage of abnormal results not leading to cancer diagnosis

B. Continuous Quality Improvement

- Regularly review screening outcomes and protocols
- Update practices based on new evidence or guideline changes

8. Conclusion

Lung cancer screening with LDCT for high-risk individuals is a vital preventive measure that can significantly impact mortality rates. Adherence to clinical guidelines, combined with a multidisciplinary approach and patient education, is essential for maximizing the benefits of screening while minimizing harm. Providers should remain updated with the latest evidence and proactively integrate new advancements into clinical practice. This protocol should be updated regularly based on evolving clinical guidelines from organizations such as the U.S. Preventive Services Task Force (USPSTF) and the American Cancer Society (ACS).

Lung Cancer Screening Decision Tree

