


COMMENTARY

The American Cancer Society National Lung Cancer Roundtable strategic plan: Implementation of high-quality lung cancer screening

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Abstract

More than a decade has passed since researchers in the Early Lung Cancer Action Project and the National Lung Screening Trial demonstrated the ability to save lives of high-risk individuals from lung cancer through regular screening by low dose

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Funding information

American Cancer Society National Lung Cancer Roundtable

computed tomography scan. The emergence of the most recent findings in the Dutch–Belgian lung-cancer screening trial (Nederlands–Leuvens Longkanker Screenings Onderzoek [NELSON]) further strengthens and expands on this evidence. These studies demonstrate the benefit of integrating lung cancer screening into clinical practice, yet lung cancer continues to lead cancer mortality rates in the United States. Fewer than 20% of screen eligible individuals are enrolled in lung cancer screening, leaving millions of qualified individuals without the standard of care and benefit they deserve. This article, part of the American Cancer Society National Lung Cancer Roundtable (ACS NLCRT) strategic plan, examines the impediments to successful adoption, dissemination, and implementation of lung cancer screening. Proposed solutions identified by the ACS NLCRT Implementation Strategies Task Group and work currently underway to address these challenges to improve uptake of lung cancer screening are discussed.

Plain language summary

The evidence supporting the benefit of lung cancer screening in adults who previously or currently smoke has led to widespread endorsement and coverage by health plans. Lung cancer screening programs should be designed to promote high uptake rates of screening among eligible adults, and to deliver high-quality screening and follow-up care.

KEYWORDS

early detection of cancer, lung cancer screening, lung neoplasms, mass screening, standard of care

INTRODUCTION

Lung cancer has been the leading cause of cancer death in the United States for decades¹ without a reliable method to detect lung cancer at an early, curable stage until the advent of low-dose computed tomography (LDCT) of the chest. A pivotal cohort study conducted by the Early Lung Cancer Action Project group demonstrated the ability of LDCT to detect early-stage lung cancer and improve survival.^{2,3} The ability of LDCT lung cancer screening (LCS) to reduce lung cancer mortality was subsequently confirmed in two large randomized controlled trials. The National Lung Screening Trial (NLST) reported a 20% relative reduction in lung cancer mortality in a group invited to receive LDCT screening compared with a control group that underwent a single-view chest x-ray,⁴ and the Dutch–Belgian randomized lung cancer screening trial (NELSON), demonstrated a 24% lung cancer mortality reduction in a younger cohort with lower tobacco exposure than NLST.⁵ The NLST followed with cost-effectiveness analysis placing LCS in the same range of other screening tests performed in the United States.⁶

The NLST results spurred landmark attention and led to update of LCS guidelines from numerous professional organizations, including a favorable Grade B recommendation from the United States Preventive Services Task Force (USPSTF) at the end of 2013.⁷ Initially, the USPSTF eligibility criteria targeted adults who were 55–

80 years old who currently or formerly smoked and had at least a 30-pack-year history of smoking.⁷ Adults who formerly smoked had to have quit smoking within 15 years, and once 15 years had elapsed (YSQ15), they would no longer be eligible for LCS. In 2021, the USPSTF updated their 2013 recommendation by lowering the age to begin LCS from age 55 to age 50, and lowering the minimum pack-year history to 20 pack-years.⁸ In 2021, the American Academy of Family Physicians also updated their earlier recommendation, which had concluded there was insufficient evidence to recommend for or against LCS, and adopted the USPSTF 2021 recommendation update.^{9,10} In 2023 the American Cancer Society (ACS) updated their guideline, which was similar to the USPSTF 2021 recommendation, but without the YSQ15 criterion¹¹. Although screening recommendations for individuals at high-risk of developing lung cancer have garnered support from most professional organizations and lung cancer patient advocacy groups, uptake has been slow, with only approximately 20% of eligible individuals reporting LCS in the past year,¹² with highly variable rates across states. As part of the ACS National Lung Cancer Roundtable's (NLCRT) strategic plan, the Implementation Strategies Task Group (ISTG) was charged with addressing the current challenges in LCS implementation, with perspectives and recommendations to accelerate uptake (Table 1) and to enable many more individuals to be cured of their lung cancer through the implementation of high-quality LCS.

TABLE 1 Challenges and recommendations for implementation of high-quality lung cancer screening.

Challenges	Recommendations
Improving uptake of LCS including in vulnerable populations and those in under-resourced localities	<ul style="list-style-type: none"> • Expand reach of LCS to eligible individuals through revision of regulatory mandates and policies • Expand insurance coverage for LCS in eligible individuals • Expand geographic access for LCS in eligible individuals • Advance dissemination and coverage of LCS services by telehealth • Grow public awareness of LCS through public service announcements, marketing, and outreach • Ensure feasibility of accurate and complete data collection in the EHR to identify individuals eligible for LCS using the eligibility criteria (age and smoking history)
Reaching individuals who live in rurality, who are at higher risk for lung cancer and worse health outcomes when diagnosed with lung cancer	<ul style="list-style-type: none"> • Expand and improve LCS and treatment services in rural areas • Promote the delivery of high-quality LCS services by telehealth when necessary
Addressing stigma and self-stigmatization of people who smoke or formerly smoked, which leads to poor uptake of LCS and worse health outcomes	<ul style="list-style-type: none"> • Collaborate with stakeholders to educate the public, providers, and individuals at risk for lung cancer about the presence and deleterious effects of stigma on lung cancer outcomes
Addressing institutional hesitancy in establishing or resourcing LCS programs	<ul style="list-style-type: none"> • Develop and disseminate an implementation guide and interactive online business plan adaptable to unique local environments for both LCS and incidental pulmonary nodule programs
Defining how to more effectively address tobacco use disorder and smoking cessation in the context of LCS	<ul style="list-style-type: none"> • Promote broad awareness and implementation of quality cessation practices in lung cancer screening.
Provider knowledge gaps and low referral volumes for LCS	<p>Collaborate with key stakeholders to develop and disseminate the following:</p> <ul style="list-style-type: none"> • Clarity about screening guidelines, benefits-to-harms ratios and coverage • Patient decision aids and implementation toolkits • Shared decision-making tools • Clinic staff training • Information about qualified local LCS sites
Absence of a population health (HEDIS, ^a CMS Medicare Stars, HRSA, UDS, etc.) metrics for LCS and identification of disparities in the provision of LCS	<ul style="list-style-type: none"> • Develop reportable HEDIS metric that upholds accountability for the percentage of eligible individuals screened and transparency in who is being screened
Absence of LCS quality indicators and health metrics and routine program evaluation	<ul style="list-style-type: none"> • Disseminate and promote current quality indicators and metrics for LCS, and further develop, update, and promote the use of quality indicator metrics
Detection of other significant or potentially significant findings, including smoking-related diseases at the time of LCS	<ul style="list-style-type: none"> • Standardize reporting and streamline management of other significant findings • Research and quantify the benefit of OSF detection and associated costs of workup

Abbreviations: CMS, Centers for Medicare and Medicaid Services; EHR, electronic health record; HEDIS, Health Effectiveness Data and Information Set; HRSA, Health Resources and Services Administration; LCS, lung cancer screening; LCSPs, lung cancer screening programs; OSF, other significant findings; UDS, Uniform Data System.

^aThe National Committee for Quality Assurance (NCQA) is presently developing a HEDIS measure.

IMPEDIMENTS TO LUNG CANCER SCREENING

Professional endorsements and administrative hurdles

Directives in the Affordable Care Act for coverage by private payers resulting from the assignment of a Grade B screening recommendation by the USPSTF⁸ and a subsequent national coverage determination (NCD) by the Centers for Medicare and Medicaid Services (CMS) for eligible beneficiaries have laid a foundation for the

implementation of LCS.¹³ However, despite this national preventive health recommendation associated with coverage and recommendations by other reputable professional organizations and societies, screening rates have remained disappointingly low.¹² In addition to common barriers facing patients (low awareness, low access, cost, etc.), there is an important concern that administrative and clinical requisites tied to coverage impede screening uptake, especially in underserved and at-risk populations.^{14,15} Obstacles in these groups include the complexity of determining eligibility for LCS, obligations for shared decision-making (SDM), smoking cessation counseling,

management of abnormal screening findings, etc. all of which require time, infrastructure, and resources within clinical settings to support.¹⁶ Cancer screening for other cancer types has achieved success by having gone through initiation growing pains, followed by increasing uptake over decades leading to overall screening rates that exceed 50%.¹⁷ Moreover, uptake has benefited from many years of focused, coordinated action through national campaigns and cancer roundtables, which promoted effective implementation and uptake.¹⁸⁻²³ Yet, increasingly, it is clear that prior experience with other cancer screening tests will not ensure quick uptake of LCS despite the similar integration and implementation challenges LCS shares with other screening tests, due to the unique target population and the greater regulatory requirements tied to LCS coverage. The intersection of cancer risk and concurrent eligibility for more than one cancer screening may yield an opportunity for combined cancer screening discussions and bundled cancer screening referrals. This approach could enhance lung cancer screening and other cancer screening uptake (e.g., colon, breast) and streamline utilization of the primary care provider's time. To this end, the ACS NLCRT Implementation Strategies and Women in Lung Cancer Task Groups have joined forces in a joint project to assess operational structures to identify and offer dual screening for women in breast cancer programs.^{24,25}

The electronic health record-friend and foe in identifying eligible individuals

Using the 2021 USPSTF screening criteria, an estimated 14.5 million at-risk individuals are eligible for LCS. This number is nearly twice as high as the size of the previous eligible population.²⁶ Identification and screening of high-risk individuals is essential to significantly influence the trajectory of LCS in reducing lung cancer mortality. In 2011, CMS introduced the Medicare and Medicaid EHR Incentive Programs to prompt providers and health systems to use the electronic health record (EHR) meaningfully.²⁷ This includes population health core performance measures with EHR fields that designate smoking status for patients 13 years old and older.²⁸

There is no substitute for taking an accurate tobacco history at each in-person encounter to determine if a person is eligible for LCS. When the EHR contains accurate and complete LCS related data (detailed and accurate smoking history calculation and age), it can be leveraged using best practice alerts as clinician decision support tools in clinical encounters. Identification of eligible individuals may be missed if they do not have a clinical encounter. In this case, with accurate tobacco history documented, the EHR may be used as a population health management tool to identify, with more certainty, individuals eligible for LCS using age and smoking history as the eligibility criteria. The design of the most highly used EHRs in the US health systems supports the capture of basic smoking history information, satisfying the CMS and meaningful use requirement. However, the accuracy of the smoking history is critical in determining

risk for lung cancer and identification of people who are eligible for LCS. Each patient has a unique smoking history, and this history must be accounted for to determine if they are eligible for LCS. This history must include:

1. In total, for how many years did you smoke cigarettes in your lifetime?
2. On average, when you smoked, how many cigarettes did you smoke per day?
3. Do you currently smoke cigarettes?
4. (For those who formerly smoked) How many years ago did you permanently quit smoking?

The potential for variation in individual smoking patterns necessitates EHRs capable of capturing and retaining accurate cumulative pack-year calculations that include fields with hard stops that cannot be easily altered in the day-to-day intake processes (i.e., not modifying historical smoking history with data from current smoking status) and a field that captures current smoking status.²⁹ An example of this challenge is outlined in a recent cross-sectional study, where imprecise smoking history data in the EHR resulted in identifying only 30% of potentially LCS eligible study respondents when searching for screen-eligible beneficiaries for LCS.³⁰ In a patchwork system like the one in the United States, where screening is not centrally organized and depends on encounters with health services for referrals, the need to rely on EHRs is greater and compounded by the underuse of health care services and cancer screening among people who smoke.^{31,32} A recent white paper from the ACS NLCRT addressing the needs from EHR vendors to support LCS provides more detail on this and other opportunities for the implementation of quality LCS.²⁹

Disparities in lung cancer screening

The poor uptake of LCS represents a constellation of complex factors, including the legacy of the relationship between tobacco use and marginalized populations. Although the antecedents of the greater challenge to implement LCS extend far beyond the scope of this article, they include crucial factors pertinent to LCS that must be addressed to reach the population most vulnerable to lung cancer and other smoking-related diseases. Tobacco-related diseases, including those from cigarette smoking, account for nearly 50% of the top 10 national and global causes of morbidity and mortality, led by coronary artery disease (CAD) and chronic obstructive pulmonary disease (COPD), with lung cancer mortality leading all cancer types.³³ Moreover, these tobacco-related diseases disproportionately afflict the most disadvantaged and at-risk populations, including minorities, those who are less educated, low-income individuals, and those living in rural areas.³⁴ Low socioeconomic status and race serve as significant mortality predictors.³⁵⁻³⁷ This is especially true for the least educated men who in 2011 were shown to have a 5-fold mortality risk from lung cancer compared to the most educated, and among

Black men compared with White men, lung cancer death rates were higher in the lowest to the highest educational groups.³⁶ Individuals with low socioeconomic status face financial, social, and geographic barriers to accessing LCS and essential follow-up.³⁸ Rural residents eligible for LCS are more likely to be at higher risk for lung cancer and often reside a significant distance from qualified LCS sites.^{39,40} As a result, they are reported to experience more late-stage lung cancer diagnoses and related mortality than their urban counterparts.^{41,42} The impact of these disparities on health outcomes are not new, but the challenge is to define new and sustainable clinical care delivery plans that could effectively disseminate LCS service to improve the health of those most in need. Emerging evidence shows that risk prediction modeling using key variables associated with lung cancer risk is more accurate in identifying at-risk individuals for developing lung cancer compared with age and cigarette smoking history (USPSTF criteria) alone.^{43,45-47} Utilization of validated risk assessment tools has been proposed by the American College of Chest Physicians to augment current age and tobacco history-based recommendations for individuals who do not meet smoking and age-based eligibility criteria but are estimated to have a high net benefit from screening.⁴⁵

Provider knowledge gaps

Primary care providers (PCP) are increasingly aware of LCS, but misconceptions, referral hesitancy, and knowledge gaps exist.⁴⁸⁻⁵² Such provider knowledge gaps regarding LCS eligibility are significant barriers to uptake, with only 50% of PCPs familiar with the USPSTF LCS guidelines. Priority areas for improved implementation of LCS have been identified by PCPs, including a need for greater clarity in current screening guidelines from professional organizations, the harms, quality of evidence, and coverage. Information about local LCS centers, access to patient education and decision aids and implementation tools for SDM, and integration of LCS processes in the EHR and staff training are also needed.⁵³

Stigma undermines lung cancer screening recruitment

The implementation mechanics of any other cancer screening revolve around identifying the target group, typically by age and sex, and applying evidence-based recruitment and referral interventions. With LCS, a superimposed challenge is to address the far-reaching and negative impact of stigma and self-stigmatization related to smoking and lung cancer in people who currently smoke or who previously smoked in recruiting LCS eligible individuals.⁵⁴ The ISTG is collaborating with the ACS NLCRT Survivorship, Stigma, and Nihilism Task Group to address these challenges in the context of LCS and across the entire lung cancer continuum through proactive engagement and education of providers, the public, and patients.

Complexities of marketing, communication, and outreach

Efforts to increase public awareness of LCS are far more complex than other population-level screening awareness strategies. There are distinct difficulties in identifying who is at high-risk and targeting a message to them about the benefits and risks associated with LCS that are clear and easily understood and that will induce them to take action in a responsible, patient-centered manner.

Although most lung cancer screening programs (LCSPs) report a lack of patient awareness to be a significant barrier to LCS, less than a third report lack of patient interest as a barrier.^{52,55,56} Effective patient and provider communication promotes improved screening uptake^{48,56}; however, key considerations are the lower health literacy levels of this high-risk population in combination with the common use of LCS education materials better suited for adults with higher health literacy.⁵⁷ Combining other modalities, such as video resources with appropriate written materials, can improve comprehension while reducing decisional conflict around LCS.⁵⁸

In the history of cancer screening, it has consistently been observed that patients place a great deal of trust in their health care provider for referral to screening and for providing important information about the value of the test, what to expect, and outcomes, including some that could be harmful. Thus, it is desirable to expand the responsibility for initiating discussions about lung cancer screening beyond the referring physician to include advanced practice professionals, or other nonphysician practitioners as was recently allowed by Medicare.⁵⁹⁻⁶¹ Referring provider outreach strategies that identify and reduce process challenges and systemic barriers to screening referral, and address low awareness, preparedness, and use of efficient decision aids to support time-efficient SDM delivery, may reduce their referral hesitancy to refer eligible individuals.⁶²

Policy and implementation of lung cancer screening

Local, state, and national policies, both written and unwritten, play an integral role in shaping communities and their access to health care resources. The implementation of LCS has been particularly challenged by the inconsistency in eligibility criteria among various governing bodies. At the beginning of coverage, CMS required criteria to be met for Medicare reimbursement (e.g., SDM smoking cessation counseling, order from a physician or qualified nonphysician provider, eligible radiologist and imaging facility, detailed data submission to the national registry), which have been interpreted by some to be a barrier to uptake.⁶³ Additionally, individual state-based decision-making rules and rejection of Medicaid expansion in some states have limited access to LCS, and in some cases, continues to leave eligible LCS candidates without a route to screening.⁶⁴ After a decade of slow uptake of LCS, approximately 16%–18% of eligible individuals reported having undergone LCS in 2022.^{65,66}

Need for population health lung cancer screening metrics

Factors limiting LCS referrals are the absence of nationally recognized population health metrics for LCS by organizations such as the National Committee for Quality Assurance's (NCQA), Health Effectiveness Data and Information Set (HEDIS), and the Medicare Stars programs of CMS. Standardizing measurement and reporting of the percentage of eligible individuals screened would strongly incentivize Medicare, Medicaid, and private payers to promote LCS.⁵⁹ Similar metrics exist for breast, cervical, and colorectal cancer screening. Development and inclusion of LCS quality metrics is an ACS NLCRT and ISTG strategic priority to measure access to screening, identify disparities in the provision of these services, and contribute data that informs practice and facilitates policy development to close gaps in care delivery. To that end, NCQA and the ACS and ALA have entered into an agreement to develop a LCS HEDIS measure.⁶⁷

QUALITY IMPROVEMENT AND HIGH-QUALITY OUTCOMES IN LUNG CANCER SCREENING

Too often, health care institutions fail to identify disparities in access, service, and outcomes because they do not collect or have not scrutinized their performance data.^{59,68} Lung cancer screening programs must possess programmatic elements high in fidelity and integrity, including continuous quality monitoring, emphasizing complication rates with rapid process improvement to achieve safe and responsible screening with optimal population health benefits. As such, routine assessment of the LCSP should consist of regular evaluation of program and outcomes data. The ISTG formed a multi-stakeholder team to establish consensus on proposed quality metrics for LCS programs: (1) appropriateness of screening, (2) documentation of smoking cessation intervention, (3) rate of short interval surveillance CT performed when indicated for LungRADS category 3 and 4, (4) compliance with follow-up recommendations, and (5) timeliness of evaluation of concerning findings). Updating and identifying new quality metrics will be an ongoing focus of the ISTG.⁶⁸

Performance reporting would be achieved through structured data collection and maintenance of the program and patient information in a local or institutional registry, including those recently published by the ISTG,⁶⁸ and also could be augmented with local cancer registry data available directly, or from the North American Association of Central Cancer Registries, and data reported to the National Cancer Institute, Surveillance, Epidemiology, and End Results (SEER) registry. Quality performance indicators also critical in evaluating a LCSP are lung nodule and cancer detection rates, interventions and invasive procedures performed for cancer and benign disease, related complications, 30-day admissions and readmissions, and deaths. Programmatic assessment may also include quality assurance measures. These measures may consist of radiation exposure, adherence to evidence-based management recommendations and clinical algorithms, return to regular screening, attrition

rates, disparity indicators (age, sex, race/ethnicity, education, and health insurance status), and other related harms and complications.

Finally, advanced implementation may include public dissemination of LCSP performance outcomes outlined earlier and include the performance of health care providers, health systems, payers, and goal setting. Such reporting is necessary for high-quality LCS and helps guide programmatic care delivery processes. These quality improvement efforts ultimately aim to improve clinical care delivery outcomes and motivate the allocation of resources to encourage higher uptake of LCS.

SECURING RESOURCES FOR PROGRAM AND BUSINESS DEVELOPMENT

Successful implementation of LCS and thoracic oncology care requires engagement and partnership with organizational leadership early in the process. Aligning goals and quantifying the support and infrastructure required to implement a high-quality and coordinated LCSP is essential. This is necessary for ensuring adequate resource allocation of staff, including clinical and administrative space, navigation, outreach and marketing, and essential software systems required for regulatory mandates, registry reporting, and tracking of key programmatic and quality metrics. Leadership buy-in will depend on accurate and detailed projections of LCSP performance in the form of a proforma or similar business modeling. Such projections should include both a fee-for-service calculation and institution-specific, risk-based contract considerations, with careful attention to the impact of implementation of LCS on stage shift and the cost of diagnostic and therapeutic care.⁶⁹⁻⁷¹ An ACS NLCRT priority and an important aspect of the work of the ISTG has been the development of an interactive online business modeling program adaptable to unique local environments for both LCS and incidental pulmonary nodule management. This modeling tool, known as LungPLAN, may help LCSPs secure resources for LCS, both for existing programs seeking to improve their infrastructure and for new programs in development.⁷²

DEVELOPMENT AND IMPLEMENTATION OF LUNG CANCER SCREENING PROGRAMS

The structure of each LCSP depends on available resources, the type of institution and practice, and the skills and interests of the individual staff stakeholders. Often new LCSPs arise from preexisting multidisciplinary lung cancer clinics. Most programs fit within one of three general categories—centralized, decentralized, or hybrid structures with each dependent on whether various program management activities are performed centrally by the LCSP staff or in a decentralized manner by the referring providers.^{71,73}

Program responsibilities may include recruitment of eligible patients, provider outreach and education, provision or clarification of the SDM process, smoking cessation counseling and treatment, performance and interpretation of all screening studies using a standardized reporting system, sending patient-centered reports to

individuals undergoing LCS, and tracking of necessary data elements for regulatory requirements and purposes of program quality.^{74,75}

Establishment of a high-quality, well-resourced LCSP can be daunting. To execute LCSP activities, team members must engage institutional leadership and develop a plan to procure program navigation support and a dedicated LCS tracking system. Many LCSPs form a governance structure comprised of multidisciplinary advisory and clinical teams and radiology working groups to oversee scanning infrastructure, technologist training, and radiologist credentialing and training. The governance group establishes and monitors radiology and program quality metrics to determine the optimal integration of smoking cessation protocols, facilitates insurance and reporting requirements, provides outreach and provider education, and markets screening services to the health care community and at-risk individuals.

Several professional societies and organizations have recognized the challenges of the operational implementation of LCS. In response to this need, these entities have developed policy statements and various resources, including toolkits, to support the effective and high-quality implementation of LCS across the continuum (Table 2).

The NLCRT's State-Based Task Group initiatives to support establishment of local LCS and implementation efforts are underway, including a toolkit of implementation strategies to support programs at various stages of development and process improvement.

ROLE OF RADIOLOGY AND LDCT IN LUNG CANCER SCREENING

As the standard of care technique for early detection of lung cancer, the LDCT takes only seconds to perform yet can reveal various findings, requiring expert oversight and results management. The

radiologist is an integral member of the multidisciplinary care team in LCS in overseeing quality control and reporting of the LDCT imaging process. For Medicare reimbursement, CMS requires the use of a standardized lung nodule identification, classification, and structured reporting (e.g., American College of Radiology, Lung-RADS[®] v2022), wherein the radiologist is responsible for the selection of the appropriate category based on the imaging findings.¹³

Low dose CT in detection of other significant findings including smoking-related diseases

Beyond classifying the LDCT from the perspective of nodule identification and characterization, radiologists frequently observe incidental, or other significant findings (OSF) in this heavily tobacco-exposed population. Given the prevalence of cigarette smoking and the risk of smoking-related diseases in the LCS-eligible population, such findings on LDCT are of distinct interest. The literature consistently reports that OSFs are common in the setting of LCS by LDCT,⁷⁶ including COPD and CAD as shared consequences of cigarette smoking and significant causes of premature deaths.^{77,78} These OSFs highlight the important message from the Surgeon General regarding the range of disease consequences from tobacco smoke exposure.⁷⁹

From the perspective of benefit to the individual undergoing LCS, a broader screening focus as described expands the benefits of LCS so that a great number of participants who undergo a LDCT will receive objective information from their scan about the risk for significant chronic disease. Such disease may include coronary arterial calcifications or emphysema and may be discovered when many preventive options are available. SDM in the context of LCS should include discussion of the potential for detection of such findings at the time of LCS, including those that are smoking-related and

TABLE 2 Lung cancer screening implementation toolkits.

Organization	Resource title	URL
American Cancer Society NLCRT	LungPLAN–Projecting Lung Cancer Assessment Needs	https://nlcrt.org/wp-content/uploads/LungPLAN-Overview-Brochure.pdf
American Cancer Society NLCRT	STEPS for Increasing Lung Cancer Screening Rates: A Manual for Primary Care Practices (available Fall 2024)	https://nlcrt.org
American Cancer Society NLCRT	Best Practice Guide for Building Lung Cancer Early Detection Programs (available Fall 2024)	https://nlcrt.org
American College of Radiology	Lung Cancer Screening–Resources	https://www.acr.org/Clinical-Resources/Lung-Cancer-Screening-Resources
American Lung Association and American Thoracic Society	Lung Cancer Screening Implementation Guide	https://www.lungcancerscreeningguide.org/
American Thoracic Society and American College of Chest Physicians	Policy statement: implementation of low-dose computed tomography lung cancer screening programs in clinical practice	https://pubmed.ncbi.nlm.nih.gov/26426785/
GO ₂ Foundation for Lung Cancer	Screening	https://go2foundation.org/for-professionals/
National Lung Cancer Roundtable	Resource Center	https://nlcrt.org/resource-center/
Veterans Health Administration	Lung Cancer Screening	https://lungdecisionprecision.com/

principal contributors to premature death, and include the benefit of tobacco cessation.

Although the ISTG is working to provide solutions to commonly encountered implementation barriers in partnership with other member organizations and key stakeholders, including the standardization of reporting and streamlining the management of OSFs,⁸⁰ further research is needed to quantify the benefit and harms of identifying OSFs and the associated costs of their evaluation and treatment.

EVIDENCE FOR INTEGRATION OF SMOKING CESSATION IN LUNG CANCER SCREENING

The integration of the combination of cessation medication treatment and behavioral therapy at LCS is critical to long-term cessation. For people who currently smoke, combination therapy yields a 70% to 100% greater chance of quitting successfully than a single intervention (e.g., 10% chance of quitting on a single intervention compared to a 17%–20% chance of quitting with combination therapy).⁸¹ LCSPs report providing cessation counseling or referral to a Quitline (57% and 60.2%, respectively), but only 36.8% routinely recommend cessation medications.⁸² It requires an average of 30 quit attempts to succeed,⁸³ and relapse risk is high. LCSP program staff should be aware that the smoking cessation path requires a long-term strategy and continued offers of services and ongoing smoking cessation counseling and treatment as needed are the key to success.

As such, large-scale, multicenter research efforts are well underway, examining the most effective integration of smoking cessation services within the context of lung cancer screening, such as the Smoking Cessation at Lung Examination collaboration and the Cancer Center Cessation Initiative.⁸⁴ The ACS NLCRT Tobacco Treatment in the Context of Lung Cancer Screening Task Group and the ISTG are also working together to promote broad awareness and implementation of quality cessation practices in LCS. This includes effective engagement of institutional and local resources to improve cessation rates in individuals at high risk for lung cancer and other smoking-related diseases.

EVIDENCE FOR MULTIDISCIPLINARY CARE ANCHORING SAFE AND RESPONSIBLE SCREENING

Multidisciplinary care is well established as a critical component of a successful LCSP and a best practice.^{75,85,86} Multidisciplinary team-based cancer care in the diagnosis and treatment of cancers (including lung cancer), along with the support of patients across the cancer continuum, has been routine for well over a decade.^{87,88}

With the complexities of LCS, including extensive administrative requirements that necessitate sound coordination, multidisciplinary care must be recognized as a pillar of quality care delivery.⁸⁹ Such care embodies a team of health care professionals with expertise in

the continuum of lung cancer with consideration of local resources and the program's structure. The multidisciplinary team typically includes one or more of the following: a pulmonologist, thoracic surgeon, radiologist, interventionalist (pulmonary and/or interventional radiology), oncologist (medical and radiation), advanced practice clinician (nurse practitioner or physician assistant), program navigator and/or coordinator, certified tobacco treatment specialist, social worker, palliative care specialist, and pathologist.^{90,91} Primary care providers are also critical members of the multidisciplinary team and integral in the continuity of care for patients engaging in LCS, including the management of OSFs and those diagnosed with and treated for lung cancer.^{75,91}

Multidisciplinary care rests on collaborative input by the entire team with a commitment to an interprofessional and structured process with consensus-driven decisions that uphold evidence-based and guideline-directed care in the management of screening findings.⁹² This includes a responsibility to coordinate care that is equitable and delivered efficiently and effectively while minimizing unintended harms caused by additional testing and invasive procedures, including surgery.^{87,93-95}

ROLE OF INTERVENTIONALISTS AND THORACIC SURGERY IN LUNG CANCER SCREENING

The cornerstone of patient safety in the diagnostic workup of concerning lung nodules is consultation and care by a qualified interventional radiologist, pulmonologist, or thoracic surgeon. It is of utmost priority for the interventionalist or surgical oncologist to be trained and experienced in minimally invasive and tissue-sparing procedures and surgery that have been shown to provide timely diagnoses and optimal clinical outcomes.^{96,97}

EMERGING EVIDENCE FOR EXTENDING THE REACH OF LUNG CANCER SCREENING AND MULTIDISCIPLINARY CARE BY TELEHEALTH AND MOBILE SCREENING

Delivery of LCS services by telehealth (audio-video conferencing, store-and-forward technology, and communication by telephone) is of great value to geographically challenged localities without access to health care resources, like low dose CT scanners or health care providers with related skills or expertise. As telehealth policy evolves, it is increasingly realistic to implement high-quality LCS in under-resourced areas (urban and rural) while reducing health inequities and lung cancer screening disparities via telehealth and mobile screening.^{98,99} The ISTG is working with the Policy Task Group on advancing LCS by telehealth through expansion of coverage for associated and mandated services (SDM, smoking cessation counseling and treatment with follow-up, screening visits with remote imaging review, and multidisciplinary consultations).

SUMMARY AND FUTURE DIRECTIONS

Tobacco-related diseases are the leading cause of morbidity and mortality in the United States, with lung cancer being the primary contributor to cancer deaths. It is indisputable that LCS saves lives in high-risk individuals. However, the full benefit of LCS through early detection will not be fully realized until substantial work is done to overcome the implementation challenges discussed within this article (Table 1). Implementation of high-quality LCSPs that are thoughtfully strategic, appropriately promoted to ensure broad awareness both within health care systems and with the public, and maintain a high level of stakeholder engagement, possess immense opportunity to maximize the benefits of screening.

In partnership with the ACS NLCRT leadership and task groups, member organizations, and other interested and relevant parties, the ISTG has provided guidance to advance the comprehensive implementation of LCS programs nationwide. This work addresses the multitude of barriers for more widespread uptake of LCS through policy change, deeper ACS NLCRT member engagement, along with national and institutional leadership involvement and commitment. New tools such as digital informatics tools have emerged that could facilitate both process improvement and greater LCS implementation. This must also include reliably identifying eligible beneficiaries while driving quality through standardized, measurable, and reportable metrics.

Enhancing provider and public education and awareness around lung cancer, effective integration of comprehensive smoking cessation services, and reduction of associated stigma are key priorities of the ISTG as part of the broader mission of the ACS NLCRT. These priorities, including dissemination and enhanced reach of LCS using telehealth and responding to the local community challenges, will continue to be collaboratively addressed through state-based action.

The ACS NLCRT is committed to actively identifying LCS implementation challenges, developing tools to address them, advocating for individuals at risk for lung cancer, effectively addressing health disparities, eliminating health inequities, and creating more lung cancer survivors.

AUTHOR CONTRIBUTIONS

Joelle T. Fathi: Conceptualization, writing–original draft, and review and editing–final draft. **Carey C. Thomson:** Conceptualization, writing–original draft, and review and editing–final draft. **Angela M. Barry:** Writing–original draft and review and editing–final draft. **Grant M. Greenberg:** Writing–original draft and review and editing–final draft. **Claudia I. Henschke:** Writing–original draft and review and editing–final draft. **Jane J. Kim:** Writing–original draft and review and editing–final draft. **Peter J. Mazzone:** Writing–original draft and review and editing–final draft. **James L. Mulshine:** Writing–original draft and review and editing–final draft. **Bruce S. Pyenson:** Writing–original draft and review and editing–final draft. **Lillie D. Shockney:** Writing–original draft and review and editing–final draft. **Robert A. Smith:** Writing–original draft and review and editing–final

draft. **Renda Soylemez Wiener:** Writing–original draft and review and editing–final draft. **Charles S. White:** Writing–original draft and review and editing–final draft. **Ella A. Kazerooni:** Review and editing–final draft. All coauthors have reviewed, discussed, and agreed to their contributions and approved this final version of the manuscript.

ACKNOWLEDGMENTS

This work was supported by the American Cancer Society National Lung Cancer Roundtable (NLCRT) and the Implementation Strategies Task Group. The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government. The American Cancer Society receives funding support for the NLCRT from AbbVie, Amgen, AstraZeneca, Boehringer Ingelheim, Bristol Myers Squibb, Daiichi-Sankyo, Foundation Medicine, Genentech, Gilead, Guardant Health, Johnson and Johnson, Merck, Novartis, Regeneron, Roche, Sanofi-Genzyme, Takeda, and in-kind support from the American Cancer Society. The sponsors had no role in the design of the study, the collection and analysis of the data, or the preparation of the manuscript. This manuscript was also supported in part by resources from the VA Boston Healthcare System.

CONFLICTS OF INTEREST

Angela M. Barry received honoraria from Neurologica and honoraria and travel expenses from Medtronic. Claudia I. Henschke reports institutional research support from grants by Bristol-Myers Squibb Foundation, Flight Attendants Medical Research Institute, LungLife AI, Genentech and Biophysics in the past 3 years and serves on the Advisory Board of LungLife AI without compensation. She is the President and serves on the board of the Early Diagnosis and Treatment Research Foundation that has received funding from Bristol-Myers Squibb Foundation for VAPALS grant during the past 3 years. She receives no compensation from the foundation. Peter J. Mazzone reports institutional research support from Exact Sciences, Grail, Oncocyte, SEER, PCORI, and Veracyte (all either active or within the past year), and honoraria from Grail and SEER 2–3 years ago, and Exact Sciences >3 years ago. Robert A. Smith reports that the American Cancer Society receives unrestricted educational funding from AbbiVie, Amgen, AstraZeneca, Boehringer Ingelheim, Bristol-Myers Squibb, Daiichi-Sankyo, Foundation Medicine, Genentech, Gilead, Guardant Health, Johnson and Johnson, Merck, Novartis, Novocure, Regeneron, Roche, Sanofi-Genzyme, and Takeda to support the National Lung Cancer Roundtable. He does not receive any salary support from these grants. Carey C. Thomson reports royalties from UpToDate (outside the field) and Decision Support Science (outside the field) and fees from American Lung Association through a grant from Genentech (outside the submitted article). The other authors made no disclosures.

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How to cite this article: Fathi JT, Barry AM, Greenberg GM. et al The American Cancer Society National Lung Cancer Roundtable strategic plan: implementation of high-quality lung cancer screening. *Cancer*. 2024;130(23):3961-3972. doi:10.1002/cncr.34621