Screening for Lung Cancer

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KEYWORDS

• Lung cancer screening • Low-dose CT lung screening • Shared decision making
• Smoking cessation

KEY POINTS

- Lung cancer screening is the latest intervention designed to mitigate morbidity and mortality from cancer.
- This article briefly summarizes the history of lung cancer screening, its acceptance by primary care clinicians, elements of the intervention that are underutilized (smoking cessation and shared decision making), and integration of lung cancer screening into practice.
- Primary care physician practices related to low-dose computerized tomography have evolved slowly, and its uptake in their clinical practice has been low.
- Barriers to implementation of lung cancer screening in primary care include unfamiliarity with indications for screening, time constraints, competing health priorities, and questions about coverage.
- Both smoking cessation and shared decision making are integral to lung cancer screening, and are necessary components in its implementation.
- Gaps persist in creating a systematic approach to lung cancer screening in primary care practice; approaches to integrate lung cancer screening protocols are discussed.

INTRODUCTION

Lung cancer screening is the latest intervention designed to mitigate morbidity and mortality from cancer. This article briefly summarizes the history of lung cancer screening, its acceptance by primary care clinicians, elements of the intervention that are underutilized (smoking cessation and shared decision making [SDM]), and integration of lung cancer screening into practice.

To begin this discussion of lung cancer screening, the characteristics of a good cancer screening program as defined by Miser[1] set the stage:

> *"The cancer sought should be an important health problem. The prevalence of the cancer should be high enough to justify screening. The natural history of the cancer, including development from latent to declared disease, should be adequately*

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understood. There should be a recognizable latent (asymptomatic) or early symptomatic stage in which detection is possible. Facilities for screening, diagnosis, and treatment should be available. There should be a suitable test or examination that is sufficiently sensitive to detect disease during the asymptomatic period but sufficiently specific to minimize false-positive results. The test should be acceptable to patients. Patients should be willing to agree to further evaluation of positive screening tests and follow through with treatment if cancer is diagnosed. There should be an accepted treatment for individuals with the newly diagnosed cancer, with outcomes improved by therapy during the asymptomatic period. There should be an agreed-on policy concerning whom to treat as patients. The cost of screening, diagnosis, and treatment should be balanced economically in relation to possible expenditure on medical care as a whole."

EVIDENCE FOR LUNG CANCER SCREENING

Lung cancer remains the leading cause of cancer death for both sexes in the United States; among men, it became the leading cause of cancer mortality in the mid-1950s, and in 1987 it overtook breast cancer to become the leading cancer killer among American women as well. Although smoking is the chief cause of lung cancer, other risk factors include exposure to secondhand smoke, occupational carcinogens, radon exposure, and family history. Despite reductions in lung cancer mortality of 51% among men since 1990 and 26% among women since 2002, the American Cancer Society (ACS) estimates that 135,720 lung cancer deaths will occur in the United States in 2020.[2] Most patients are not diagnosed until they are symptomatic and are found to have stage III or stage IV cancer, with 5-year survival rates of 16% and 4%, respectively.[3]

Because of the high mortality and difficulty in detecting lung cancer at early stages when surgery might be curative, there has long been interest in attempting early detection through screening, first with chest radiography and, beginning in the 1990s, with chest low-dose computed tomography (LDCT) scanning. Chest radiography was the subject of 3 US trials supported by the National Cancer Institute (NCI) in the 1970s, with studies at Memorial Sloan-Kettering, Johns Hopkins, and the Mayo Clinic. The Sloan-Kettering and Johns Hopkins trials added sputum cytology every 4 months to an annual chest radiograph and compared that with annual chest radiograph alone; the Mayo trial compared annual chest radiograph and sputum cytology every 3 months. The Memorial Sloan-Kettering and Johns Hopkins studies showed no difference in mortality rate by adding sputum cytology to annual chest radiograph. The Mayo Clinic study did not show a difference in mortality between groups or a shift toward detection of earlier-stage cancers and lacked sufficient power to detect a mortality advantage.[4,5]

Based on the finding from the NCI trials, in 1980 the ACS changed policy that had favored chest radiography as a tool for screening asymptomatic patients for lung cancer, recommended against any mass screening tests for early detection of lung cancer,[6] and began to emphasize prevention and tobacco cessation. They did continue to support chest radiographs for heavy smokers and asbestos workers, however. In a commentary published in *American Family Physician* later that year, the American Academy of Family Physicians (AAFP) described the changes in the ACS cancer screening recommendations as being "greeted cautiously" by the medical community and noted that the lung cancer recommendations had received the most negative reaction.[7] Physician behavior seemed hard to change—ACS surveys of cancer screening in 1984[8] and 1989[9] found 44% of primary

care physicians (PCPs) in both surveys ordering chest radiographs for screening asymptomatic patients for lung cancer, well after the ACS and others had advised against its use.

A larger trial examining chest radiograph in lung cancer screening, the Prostate, Lung, Colorectal and Ovarian randomized trial, randomized 154,901 individuals either to annual chest radiograph or usual care, with sufficient power to detect a 10% difference in lung cancer mortality between intervention and control groups. Men and women at 10 centers were seen between 1993 and 2001. There was no eligibility requirement concerning smoking. The intervention group had a baseline chest radiograph and annual radiographs for 3 more years. There was no effects on cumulative lung cancer mortality over the 13 years of observation in the trial or stage shift in lung cancer at diagnosis. A subanalysis of patients who would have been candidates for the National Lung Screening Trial (NLST), which compared chest radiograph with LDCT scan, also found no difference between groups.[10]

In the early 1990s, studies began using LDCT scan as a modality for lung cancer screening. Studies in Japan[11] and the United States began in 1993[12] and were followed with studies in Europe.[13–15] The largest of the early US studies was the Early Lung Cancer Action Project, which enrolled 1000 high-risk patients (age 60 and older with at least 10 pack-year history of smoking) and found 27 to have cancer on enrollment, with only 7 of these seen on chest radiograph. At surgery, 85% of the tumors were stage 1A.[12]

Subsequent single-arm trials in Europe, Japan, and the United States affirmed that LDCT showed superiority over chest radiograph for lung cancer screening,[16–22] finding approximately 4 times more tumors than chest radiograph but did not show that screening saved lives. Subsequently, NLST and other randomized controlled trials provided unambiguous evidence of benefit of LDCT in reducing lung cancer mortality.

The NLST, published in 2011, enrolled 53,454 participants over 5 years. Individuals were between ages 55 and 74 with a 30 pack-year history of smoking, and LDCT was compared with chest radiograph using annual examination for 3 years. Median follow-up time was 5.6 years.[23] A total of 1060 lung cancers were found in the LDCT arm, compared with 941 in the chest radiograph group. Almost twice as many early-stage cancers were diagnosed with LDCT compared with chest radiograph (40% vs 21%, respectively). There was a 20% relative reduction in lung cancer mortality in the LDCT group; the number needed to screen to prevent 1 death was 320. This was the first trial to show a reduction in lung cancer–specific mortality through LDCT screening.[23]

Despite criticism about its false-positive tests, cost, overdiagnosis, and patient anxiety, the NLST spurred the adoption of lung cancer screening guidelines, most of which mirrored its study parameters. The first of these medical society guidelines was published in 2012, when Wood and colleagues[24] wrote the Clinical Guidelines in Oncology for Lung Cancer Screening for the National Comprehensive Cancer Network (NCCN), which have been updated annually. The NCCN agrees with the NLST/US Preventive Services Task Force (USPSTF) criteria and has issued 1 recommendation for LDCT screening that has the same smoking history criteria but also points out that lung cancer risk is not confined to cigarette smoking and has issued a companion guideline that includes other factors, such as radon exposure, occupational exposure to carcinogens, family history of lung cancer, and a personal history of cancer or chronic lung disease. This alternative guideline, which has become known as NCCN-2, targets adults with the presence of at least 1 of these additional risk factors, combined with a 20 pack-year smoking history (instead of 30), and expanded age criteria ($\geq$50 years and >77 years). Adults with a less intense smoking history and none

of the other listed risk factors are classified as lower risk, and LDCT screening for lung cancer is not recommended.

Early in 2013, the ACS updated its lung cancer screening guideline and recommended the NLST eligibility criteria, similar to the NCCN,[24] emphasizing that clinicians with access to high-volume, high-quality lung cancer screening and treatment centers should initiate a discussion about annual LDCT screening for lung cancer with apparently healthy patients aged 55 years to 74 years who have at least a 30-pack-year smoking history and who currently smoke or have quit within the past 15 years.[25] Later in 2013, the USPSTF reviewed the NLST data and in 2013 issued a grade B recommendation supporting annual lung cancer screening with LDCT for asymptomatic individuals 55 years to 80 years of age with a 30 pack-year history of smoking who currently smoke or have quit within the past 15 years. The USPSTF further stressed that patients should be healthy enough to undergo lung surgery and be willing to undergo potentially curative treatment.[26] Since the USPSTF gave LDCT screening for lung cancer a B rating, provisions in the Patient Protection and Affordable Coverage Act require private insurance carriers to provide coverage for lung cancer screening without deductible or copay when patients meet the USPSTF criteria for screening.[27]

After publication of the NLST and the USPSTF recommendations, several other medical societies and health groups issued guidelines regarding lung cancer screening, most of which adhere closely to the USPSTF recommendations. **Table 1** summarizes the major medical society recommendations.

The AAFP reviewed the USPSTF recommendation in 2013 and issued a grade I recommendation (insufficient evidence to recommend either for or against

Table 1
Eligibility criteria for lung cancer screening with low-dose computed tomography

Organization	Age (y)	Smoking History (Pack-Years)	Years Since Quitting Smoking	Other
CMS	55–77	≥30	<15	—
USPSTF	55–80	≥30	<15	—
American Association for Thoracic Surgery				
Tier 1	55–79	≥30	—	Additional risk factor[a]
Tier 2	≥50	≥20	—	Lung cancer survivor >5 y
ACCP	55–77	≥30	<15	—
ACS	55–74	≥30	<15	—
NCCN				
Group 1	55–77	≥30	<15	—
Group 2	≥50	≥20	—	At least 1 additional risk factor[b]

Definition: 1 pack-year, having smoked an average of 1 pack of cigarettes per day for 1 y.

[a] Additional risk factors for lung cancer defined by the American Association for Thoracic Surgery include chronic obstructive pulmonary disease, environmental and occupational exposures, any prior cancer or thoracic radiation, and genetic or family history.

[b] Additional risk factors for lung cancer defined by NCCN include cancer history, lung disease history, family history of lung cancer, radon exposure, and occupational exposure.

Adapted from Fintelmann FJ, Gottmukkala RV, McDermott S, et al. Lung Cancer Screening: Why, When and How? Radiology Clinics of North America. 2017;55(6): p.1165; with permission.

screening).[28] This was based on concerns that the USPSTF decision was made chiefly from the findings of a single study, the NLST, which was not replicated in community settings and had only 3 annual computed tomography (CT) scans in the study. Cost, the need for SDM (USPSTF had not specified this intervention), the potential for radiation exposure, and the problems of potential harms from diagnostic follow-up of positive findings also were of concern to AAFP.

The Centers for Medicare and Medicaid Services (CMS) announced in 2015[29] that it would cover lung cancer screening services for patients ages 55 to 77 who met the other USPSTF metrics, with several provisions. The provider must engage the patient in an SDM encounter, discussing the risks and benefits of lung cancer screening, using decision aids that help the patient understand issues, such as radiation exposure, false-positive findings, the potential for follow-up diagnostic procedures, and the need for annual screening examinations. CMS also mandated that clinicians must offer smoking cessation services for patients who smoke.

In early 2020, the long-awaited results of the Dutch-Belgian Nederlands-Luvens Longkanker Screenings Onderzoek (NELSON) trial was published.[30] This trial recruited study subjects from 2000 to 2004, and enrolled 13,195 men and 2594 women randomized to undergo low-dose, volumetric LDCT scanning with baseline and 1-year, 3-year, and 5.5-year repeat scans versus no scanning. There was a shift toward earlier-stage diagnosis in the LDCT arm, and, at 10 years' follow-up, lung cancer mortality was 24% lower in men and 33% lower in women than the control group, thus confirming the major findings of the NLST. Use of node volume measurement and the doubling time of node volume likely resulted in higher sensitivity (93.5% vs 92.5%, respectively) and specificity (98.3% vs 73.4%, respectively) than the NLST.[30] Editorials accompanying publication of the NELSON trial stated emphatically that the efficacy of LDCT screening for lung cancer has clearly been affirmed.[31,32]

Although progress has been made in establishing lung cancer screening with LDCT through clinical trials and publication of professional society guidelines, uptake of lung cancer screening in clinical practice has been sluggish at best, and implementation of screening guidelines is inconsistent. Richards and colleagues[33] at the Centers for Disease Control and Prevention (CDC) analyzed the 2010 and 2015 National Health Interview Survey data, finding that in 2015 only 4.4% of patients eligible for lung cancer screening reported receiving an LDCT scans. Surprisingly, 8.5% of adults eligible for LDCT screening received a chest radiograph instead, and an estimated 1.8 million people not meeting USPSTF criteria inappropriately received an LDCT.[33] If lung cancer screening is to become as well integrated into practice as are more accepted programs, such as screening for breast or colorectal cancer, a variety of steps need to be undertaken through education and changes in practice patterns. Surveys of PCP attitudes and implementation of lung cancer screening reveals that lack of knowledge about screening guidelines and their implementation is a key barrier.[34] In addition, physicians identify several challenges with screening that include lack of time, patients with competing clinical priorities and health concerns, prior authorization and other insurance barriers, reimbursement, and uncertainty about referral protocols.

PRIMARY CARE PHYSICIAN ATTITUDES TOWARD LOW-DOSE COMPUTED TOMOGRAPHY SCREENING

PCP knowledge, attitudes, and practices related to LDCT screening for lung cancer have evolved slowly, but 9 years after publication of the NLST findings and 7 years since endorsement of LDCT screening by guideline-issuing organizations, surveys

of PCPs still do not reveal a predominate readiness to implement LDCT screening for early lung cancer detection.

Lung cancer screening practices among PCPs were examined in a national survey published in 2012 before guidelines were issued by national authorities[35]; 25% of surveyed PCP believed that LDCT screening guidelines had been issued. More PCPs believed that LDCT was effective at screening than chest radiograph; few believed sputum cytology was useful. More believed screening was useful in current smokers, contrasted with former smokers. A substantial 34% thought LDCT would be useful in never-smokers. In the past year, 38% had ordered no lung cancer screening tests, 55% had ordered chest radiograph, 22% had ordered LDCT, and fewer than 5% had ordered sputum cytology. PCP were more likely to have ordered lung cancer screening tests if they (1) believed that expert groups recommend lung cancer screening or that lung cancer screening was effective; (2) if they would recommend screening for asymptomatic patients, including patients without substantial smoking exposure; and (3) if their patients had asked them about screening. The investigators were concerned about inappropriate screening by PCPs and overuse of technology that at the time was still unproved.[35]

Hoffman and colleagues[36] reported results of semistructured interviews with 10 PCPs in New Mexico in 2014, and found that both chest radiograph and LDCT scanning were being used for lung cancer screening. Several of those interviewed were not aware of the NLST results or other national recommendations. Respondents were skeptical about the false-positive rate, the number needed to screen to prevent 1 death, and the small proportion of minority participants in NLST. There was doubt about whether infrastructure was sufficient for screening and concerns about access and cost. The perceived complexity of conducting SDM discussions was perceived as another barrier. The investigators concluded that provider/patient education about lung cancer screening was needed and recommended support for informed decision making and initiatives to ensure that high-quality screening could be delivered in community practice, given the rural nature of the state.

Ersek and colleagues[37] conducted a 2015 survey of family physicians in South Carolina. Most had incorrect knowledge about which organizations recommended lung cancer screening—only 40% knew the USPSTF recommended LDCT screening. Many PCP continued to recommend chest radiograph for lung cancer screening. Most felt that LDCT screening increased the odds of detecting disease at earlier stages (98%) and that the benefits outweighed the harms (75%); however, paradoxically, only 40% thought screening reduced mortality. Concerns included unnecessary procedures (88%), patient stress/anxiety (52%), and radiation exposure (50%). Only 31% knew that Medicare covered LDCT screening. Most PCP reported that they discussed the risks/benefits of screening with their patients in some capacity (76%); however, more than 50% reported making 1 or no screening recommendations in the past year.

A national survey in 2016 to 2017 examined PCPs' knowledge, attitudes, referral practices, and associated barriers regarding LDCT screening.[38] More than half of the respondents correctly reported that the USPSTF recommends LDCT screening for high-risk patients. Although 75% agreed that the benefits of LDCT screening outweighed the risks, fewer agreed that there was substantial evidence that screening reduces mortality (50%). The most commonly reported barriers to ordering screening included prior authorization requirements (57%), lack of insurance coverage (53%), and coverage denials (31%). The most frequently cited barrier to conducting SDM was patients' competing health priorities (42%). Clinical practice and policy changes were suggested by the investigators as ways to engage more patients in screening discussions.

A 2017 survey found PCPs less confident than subspecialists in identifying patients who were candidates for lung cancer screening.[39] They were less comfortable than subspecialists in counseling patients about screening and reported inadequate time for counseling/screening activities. Despite these barriers, PCPs were equally likely to order lung cancer screening in their practice as subspecialists, likely because they were aware of USPSTF guidelines and were inclined to follow them. This study suggested the need for improving education for physicians, especially PCPs, related to lung cancer screening and the counseling that is involved.

Lewis and colleagues[34] found in a 2019 survey of academic and Veterans Affairs physicians in Nashville that 62% had low knowledge of lung cancer screening guidelines and 59% reported ordering LDCT screening. Referring provider screening was proportional to their knowledge of the guidelines; both physician education and system-level changes to support screening were suggested.

Although the uptake of lung cancer screening has been quite low, a 2020 CDC report[40] on a 10-state survey conducted in 2017 found that 12.5% of patients meeting the USPSTF screening criteria reported having received a screening LDCT scan, representing a sizable increase compared with earlier reports.[40–42] As in the Lewis and colleagues[34] survey, the CDC investigators recommended provider education and decision support tools to help increase screening. More educational opportunities for PCPs related to lung cancer screening recently have emerged, notably, the LuCa National Training Network online course, available without cost at https://www.lucatraining.org/.

IMPLEMENTATION OF LUNG CANCER SCREENING IN PRIMARY CARE PRACTICE

Despite the broad support for lung cancer screening by multiple organizations, LDCT screening continues to be underutilized in primary care. A recent survey confirmed that PCP are unfamiliar with the indications for lung cancer screening and have problems identifying eligible patients, a problem complicated by electronic medical record (EMR) deficiencies.[43] Other gaps include time constraints, competing health priorities, issues with insurance coverage, and patient comorbidities.[43,44] In addition, both smoking cessation and an SDM conversation with patients are required by CMS for reimbursement of lung cancer screening interventions. A brief overview of these aspects of lung cancer screening implementation may be useful.

SMOKING CESSATION

Because half of persons presenting for lung cancer screening still smoke cigarettes, the CMS mandate for smoking cessation interventions during the screening process presents an opportunity to deliver another life-saving clinical service. All of the professional societies that have developed lung cancer screening guidelines agree that lung cancer screening is not a substitute for smoking cessation interventions; thus, the CMS mandate is a reminder that tobacco treatment should be a standard of care for any current smoker, regardless of whether they quality for lung cancer screening or are age 65 and older. In the 2020 US Surgeon General report, “Smoking Cessation,” lung cancer screening is listed among 2 “life events” that can trigger smoking cessation attempts, uptake of smoking cessation services, and smoking cessation.[45] The report further suggests that integration of smoking cessation services into lung cancer screening programs may increase smoking cessation.

A recent study of physician perceptions of lung cancer screening as a teachable moment for cessation found mixed views.[46] Some thought that the lung cancer screening discussion was a good opportunity to motivate patients to attempt

cessation, whereas others did not think that lung cancer screening would motivate patients. Most physicians did believe that receiving screening results could affect patients' motivation to stop smoking; however, some physicians thought that a negative report would lead to a laissez-faire attitude and perpetuation of current smoking patterns.

Physicians often saw the smoking cessation intervention as being a different event than the SDM discussion and failed to integrate cessation into lung cancer screening. Lack of time, limited resources, and knowledge gaps contributed to missed opportunities in integrating smoking cessation into the lung cancer screening visit.

In the same study, many patients reported that the lung cancer screening experience triggered a strong emotional response, leading them to rethink their health priorities, and motivated them to consider smoking cessation. Some patients, however, reported that other life stressors prevailed and that they would continue to smoke.

The Association for Treatment of Tobacco Use and Dependence (ATTUD) and the Society for Research on Nicotine and Tobacco published a guideline for pairing lung cancer screening services and smoking cessation in 2016.[47] The guideline points out that the population being screened is, by and large, motivated to stop smoking and that pairing evidence-based smoking cessation methods with lung cancer screening is likely to have the potential to increase smoking cessation attempts, although data are limited (but promising) about the response of patients to these interventions.

The guideline summarizes the evidence for smoking cessation treatment in patients 55 to 77 years of age, including the 5 As approach to cessation (ask patients about whether they smoke; advise smokers to quit; assess willingness to quit at that time; assist them in quitting with practical counseling, a supportive clinical environment, links to supplemental support, and medication; and arrange for follow-up contact with smokers making a quit plan). The guideline discussed the use of motivational interviewing for patients who resist cessation interventions and the potential for smoking reduction as an interim step.

Specific resources for this population of older smokers were reviewed. Recommendations include

1. Encourage smokers who present for lung cancer screening to stop at each visit in the screening process, regardless of the screening result. Reinforcement of the message by different providers during the screening process may strengthen the intervention.
2. Provide patients with access to evidence-based behavioral counseling and pharmacotherapy for smoking cessation. These services could be provided by referring physicians, cessation clinics at the screening center, referral to tobacco treatment services, and/or the national tobacco cessation quitline (1–800-QUIT NOW).
3. Arrange follow-up through the referring provider or screening service to support cessation attempts.
4. For patients unwilling to make a quit attempt or reduce tobacco use, provide motivation with the 5 relevance, risks, rewards, roadblocks, and repetition (Rs) behavioral intervention.

The ATTUD guideline calls for further research into the optimal intensity and timing of cessation interventions in the context of lung cancer screening, the optimal delivery mode, the potential adverse effects of screening on tobacco cessation motivation, barriers to clinician implementation of cessation services within the context of lung cancer screening, and the educational needs of clinicians who could provide cessation services.

SHARED DECISION MAKING

As discussed previously, SDM has been mandated by CMS as a necessary component of the lung cancer screening encounter, and lung cancer screening is the only imaging or cancer screening intervention with this requirement. SDM is a patient-centered activity that ideally empowers individuals to take part in their care, assuming that when provided with good information, patients will be able to ask questions and provide their input into decisions about their care that align with their values and circumstances. Having taken part in SDM, clinicians should be more informed as well, providing services that are based on patient preferences and goals. If patients understand the benefits and risks of a procedure, SDM allows patients to actively assist in decisions regarding their care.[48] As with offering tobacco cessation services, this component of lung cancer screening often is not performed in a systematic, integrated way.[49,50]

Lowenstein and colleagues'[50] review of SDM in lung cancer screening points out that multiple components exist in SDM encounters:

- Discussion of the benefits of lung cancer screening, including the potential for early detection of disease, reduction in treatment morbidity comparing early-stage versus late-stage therapy, and possible reduction in mortality
- Discussion of the risks involved in screening, including the false-positive rate; risk of follow-up testing and procedures, although low; the possibility of overdiagnosis; and the risk of radiation
- The need to undergo annual LDCT until the patient no longer meets screening criteria
- Discussion of patient comorbidities
- Discussion of the patient's ability and willingness to undergo treatment
- Discussion of smoking cessation, if applicable

CMS requires the use of decision aids in the SDM discussion. These tools are meant to improve clinician-patient discussions and enhance patient knowledge. Decision aids provide information about lung cancer, the screening process, the benefits and risks of screening, and smoking cessation. Several decision aids have been developed and are discussed in detail by Lowenstein and colleagues.[50]

Implementation of SDM has been difficult to integrate into lung cancer screening visits. As an example, a report in 2020 from an academic medical center revealed that in interviews approximately 6 months after a lung cancer screening encounter, 85% of patients (n = 39) who completed screening and 89% of patients (n = 30) who declined screening could not recall having used a decision aid during the SDM conversation with the provider. Although 62% of patients who completed screening recalled that an SDM conversation had taken place, only 39% of patients who declined undergoing screening thought so. In reviewing the charts of all the patients in the survey, none had any documentation of the SDM conversation in the record. As with other screening measures, physicians cite several familiar reasons why they do not perform SDM, including lack of time, training, inadequate support, and lack of decision aids.[48]

Where and when should the SDM encounter occur? CMS reimburses clinicians for a separate SDM visit apart from the screening encounter itself, allowing for PCP to integrate SDM for lung cancer screening into routine clinical care before the referral. Another option is having the SDM encounter at the screening center. The provider may bill for the lung cancer screening SDM visit with the screening code G0296, defined as a counseling visit to discuss need for lung cancer screening using LDCT

scanning (the service is for eligibility determination and SDM). The SDM conversation is not limited to physicians but can be carried out by other members of the health care team. The nurse navigator or another dedicated clinician could take on this role at the screening center, freeing up the physician for other responsibilities and giving more time for the SDM encounter.

The Agency for Healthcare Research and Quality (AHRQ) has developed tools to assist clinicians in assisting with improved SDM encounters. "Lung Cancer Screening Tools for Patients and Clinicians" contains a decision aid for patients to be reviewed before the SDM visit, a decision tool for patients and clinicians to be used for SDM, a lung cancer screening summary guide for primary care clinicians, and a checklist for clinicians that summarizes all the necessary components of lung cancer screening and decision making that allow the encounters to be covered as a preventive service visit under Medicare. The AHRQ tools can be found at https://effectivehealthcare.ahrq.gov/decision-aids/lung-cancer-screening/home.html.

Another summary resource on lung cancer screening and SDM has been developed by the American Thoracic Society, the American Lung Association, and Lung Force, and is available at https://www.lungcancerscreeningguide.org/shared-decision-making/shared-decision-making-resources/.

IMPLEMENTING LUNG CANCER SCREENING PROGRAMS

Particularly in nonacademic health centers, there is a need to create an integrated, systematic approach to lung cancer screening. The American College of Chest Physicians (ACCP) and the American Thoracic Society have developed a policy statement about implementation of lung cancer screening programs.[51] Bernstein and colleagues[52] described the creation of a lung cancer screening program in a nonacademic hospital system and point out several issues to be considered. First, the need for key physician leadership (in their experience, from pulmonary, radiology, and thoracic surgery physicians) who coordinate patient flow, management of findings, and communication with the referring provider; a nurse navigator is a highly desirable part of the team, providing a central role in coordination and communications. Programs need to adhere to the CMS standards for the radiology infrastructure involved in LDCT screening, including equipment, interpretation, and reporting data to national registries such as the American College of Radiology (ACR) Lung Cancer Screening registry. ACR accredited imaging facilities for lung cancer screening may be found at https://www.acraccreditation.org/accredited-facility-search.

Bernstein and colleagues[52] and other investigators[42,43] point out that integration of data regarding lung cancer screening into the EMR continues to be problematic, because information that helps identify patients who are appropriate candidates for screening is not easy to enter. The pack-year smoking history, for example, often is recorded in a free text box. Referring physicians should be able to use EMRs as a tool to prompt screening discussions with eligible patients, find tools for SDM discussions, and refer patients to screening centers. Referring clinicians may have EMR systems that differ from those at screening centers, complicating referral as well as efforts at the nodule management clinic of identification, screening/results management, communication, and follow-up for repeat annual LDCT. EMRs also need to be structured in such a way that both referring providers and screening centers are not hampered by the required documentation for screening to justify the procedure and obtain reimbursement. Fathi and colleagues[53] discuss the benefits and challenges of using the EMR to support lung cancer screening, including the key elements of EMR software systems needed for this task. They point out that EMRs should support

the referral process, patient data, tracking and navigation, and communication within the screening/nodule management center and with referring clinicians.

A standardized report for communication with referring providers, nodule management, and data reporting should be used, as discussed by the ACCP[51] or the ACR Lung Imaging Reporting and Data System (Lung-RADS) system.[54] Use of standardized reporting protocols with coordination by the nurse navigator allows for better nodule management and follow-up, including incidental findings.

SUMMARY

Lung cancer screening with LDCT provides an opportunity to save lives by early detection of the deadliest cancer in the United States. Uptake of lung cancer screening has been quite low, but anecdotal reports and a survey of 10 states suggest improvement. Clinician and patient education, integration of lung cancer screening protocols into EMR, support for SDM and tobacco cessation, and improved communication between referral centers and providing clinicians are all important areas for improvement for lung cancer screening to reach its potential in reducing morbidity and mortality from lung cancer.

DISCLOSURE

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