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Pairing Smoking-Cessation Services With Lung Cancer Screening: A Clinical Guideline From the Association for the Treatment of Tobacco Use and Dependence and the Society for Research on Nicotine and Tobacco

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CONFLICT OF INTEREST DISCLOSURES

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AUTHOR CONTRIBUTIONS

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Abstract

Smoking cessation is crucial for reducing cancer risk and premature mortality. The US Preventive Services Task Force (USPSTF) has recommended annual lung cancer screening with low-dose computed tomography (LDCT), and the Center for Medicare and Medicaid Services recently approved lung screening as a benefit for patients ages 55 to 77 years who have a 30 pack-year history. The Society for Research on Nicotine and Tobacco (SRNT) and the Association for the Treatment of Tobacco Use and Dependence (ATTUD) developed the guideline described in this commentary based on an illustrative literature review to present the evidence for smoking-cessation health benefits in this high-risk group and to provide clinical recommendations for integrating evidence-based smoking-cessation treatment with lung cancer screening.

Unfortunately, extant data on lung cancer screening participants were scarce at the time this guideline was written. However, in this review, the authors summarize the sufficient evidence on the benefits of smoking cessation and the efficacy of smoking-cessation interventions for smokers ages 55 to 77 years to provide smoking-cessation interventions for smokers who seek lung cancer screening. It is concluded that smokers who present for lung cancer screening should be encouraged to quit smoking at each visit. Access to evidence-based smoking-cessation interventions should be provided to all smokers regardless of scan results, and motivation to quit should not be a necessary precondition for treatment. Follow-up contacts to support smoking-cessation efforts should be arranged for smokers. Evidence-based behavioral strategies should be used at each visit to motivate smokers who are unwilling to try quitting/reducing smoking or to try evidence-based treatments that may lead to eventual cessation.

Keywords

cigarette smoking; lung cancer screening prevention; smoking cessation; tobacco

RATIONALE

This article was written under the auspices of the Association for the Treatment of Tobacco Use and Dependence (ATTUD)/Society for Research on Nicotine and Tobacco Dependence (SRNT) Synergy Committee, which was convened and approved by both the SRNT and ATTUD Boards with the following goals: 1) advance the science and treatment of tobacco dependence and 2) promote greater collaboration between our organizations. It was undertaken as an official product from the committee to review the extant research and provide guidance regarding the implementation of evidence-based smoking-cessation treatment to lung cancer screening patients.

Major medical and professional organizations, including the American Society of Clinical Oncology,¹ the American College of Chest Physicians,^{1,2} the American Thoracic Society,³ the American Association for Thoracic Surgery,³ the American Cancer Society,^{1,4} the National Comprehensive Cancer Network,^{1,5} and the International Association for the Study of Lung Cancer,⁶ have endorsed lung cancer screening and have devised screening guidelines/recommendations. All of these organizations support the inclusion of smoking-cessation advice and recommend making smoking-cessation interventions available to patients in their lung cancer screening guidelines. Nevertheless, none of these guidelines,

including the US Preventive Services Task Force (USPSTF) recommendation, provide specific details for how smoking-cessation treatment should be offered in conjunction with lung cancer screening. ATTUD and SRNT represent the leading treatment and scientific organizations for tobacco use and dependence in the United States, respectively. The primary objective of this report is to provide evidence regarding why evidence-based smoking cessation treatment should be prioritized for smokers seeking lung cancer screening and recommendations for how to integrate smoking-cessation services into screening programs.

BACKGROUND

Lung cancer is the leading cause of cancer death among men and women.⁷ It is typically diagnosed at later stages, and the long-term prognosis is poor.⁸ Cigarette smoking is the primary causal factor in lung cancer, accounting for 90% of all lung cancer diagnoses.^{8–10} Although smoking rates have declined, an estimated 18% of American adults smoke cigarettes.¹¹ Current smokers as well as former smokers who quit within the past 15 years (ie, the patients eligible for lung cancer screening) remain at heightened risk for lung cancer.¹²

In an effort to prevent cancer-related deaths by detecting lung cancer at earlier, treatable stages, the USPSTF issued a recent announcement recommending annual screening for lung cancer with low-dose computed tomography (LDCT), a technology capable of detecting early stage lung cancer, for individuals at high risk for the disease.^{13,14} This recommendation is based on results from multiple randomized controlled trials of LDCT compared with either no LDCT or chest x-ray and studies comparing chest x-ray with usual care.¹⁴ The cumulative evidence across these studies is that LDCT significantly reduced lung cancer mortality. For example, the National Lung Screening Trial (N = 53,454) demonstrated that LDCT screening significantly reduced lung cancer mortality by 20% compared with chest x-ray.¹⁵

In line with the USPSTF recommendation, the Center for Medicare and Medicaid Services (CMS) recently approved coverage and reimbursement for lung cancer screening for individuals with the following characteristics: 1) ages 55 to 77 years, 2) asymptomatic (no signs of lung cancer illness), 3) a tobacco smoking history of at least 30 pack-years (defined as 1 pack-year = smoking 1 pack per day for 1 year; 1 pack = 20 cigarettes), and 4) report current smoking or quit smoking within the past 15 years. Nearly 9 million Americans meet these eligibility criteria for lung cancer screening.^{16,17} For lung cancer screening, the CMS requires former smokers to receive counseling on the importance of maintaining cigarette abstinence and requires current smokers to receive counseling on the importance of smoking cessation and, if appropriate, information about smoking-cessation interventions.

There are limited data on the implementation of smoking cessation into lung cancer screening. The absence of sufficient data, however, should not preclude the implementation of evidence-based smoking-cessation support for lung cancer screening patients. The objective of this report is to provide current, evidence-based guidance regarding the methods of and access to smoking-cessation support for this important high-risk population of smokers. We review the available evidence on: 1) the effect of smoking cessation on cancer

risk and overall health in smokers ages 55 to 77 years, 2) the smoking-cessation motivation of smokers who present for lung cancer screening, 3) the effect of lung cancer screening on smoking, 4) the efficacy of smoking-cessation services paired with lung cancer screening, and 5) the efficacy of smoking-cessation interventions for smokers ages 55 to 77 years. The literature search included select references, prior reviews, and meta-analyses of smoking-cessation effects on health outcomes among older smokers and lung cancer screening and smoking. References were identified through MEDLINE, the “related citations” feature in MEDLINE, and additional relevant citations identified by the Writing Work Group and peer reviewers. Treatment recommendations are based on the evidence review sponsored by ATTUD and SRNT and the Public Health Service (PHS)-sponsored *Treating Tobacco Use and Dependence: 2008 Update*.¹⁸

EVIDENCE REVIEW

Effect of Smoking Cessation on Overall Health and Lung Cancer Risk Among Smokers Ages 55 to 77 Years

Several lines of evidence support the conclusion that smoking cessation has substantial general health benefits. A full review of the benefits of smoking cessation among older smokers is beyond the scope of this article, but the purpose of this discussion is to introduce evidence elucidating several observed effects of smoking cessation among older smokers. Smoking cessation reduces all-cause mortality among individuals aged 60 years, and the relative risk for death decreases with longer smoking-cessation duration even among individuals aged 80 years.¹⁹ It is estimated, for example, that smokers between ages 55 and 64 years may gain 4 years of life by quitting smoking.²⁰ Smoking cessation is also important for reducing chronic disease risk and increasing *active* life expectancy among older smokers.^{21,22} Among individuals aged 60 years, smoking cessation decreases the risk of acute coronary events and stroke within a few years of quitting.²³ Likewise, smoking cessation among older individuals is associated with improvement in activities of daily living.^{22,24}

With respect to lung cancer specifically, it is well documented that smoking is the primary causal factor.¹⁰ Smoking cessation, however, clearly and unequivocally reduces risk of lung cancer.^{10,25} Data from case-control studies demonstrate that former smokers have a 20% to 90% reduction in lung cancer risk compared with current smokers.¹⁰ The reduction in risk is evident within 5 years of smoking cessation and increases with longer smoking abstinence.¹⁰ Smoking cessation also improves lung cancer prognosis and survival. Patients with early stage lung cancer who continue to smoke after diagnosis have an 86% increased risk of recurrence.²⁶ The 5-year survival rate for patients aged 65 years with early stage nonsmall cell lung cancer who quit smoking is 70% compared with 33% among those who continue smoking; among those aged 65 years who have limited stage small cell lung cancer, the 5-year survival rates for quitters versus smokers are 63% versus 29%, respectively.²⁶ In the National Lung Cancer Screening Trial, smoking abstinence for 7 years yielded a lung cancer-specific mortality reduction comparable to that produced by annual LDCT screening.²⁷ The reduction was greater when smoking abstinence was combined with lung screening.²⁷ There is also suggestive evidence that smoking cessation among lung cancer

patients is associated with a better response to chemotherapy, radiotherapy, and surgery.^{26,28,29}

Are Lung Cancer Screening Patients Motivated to Change Their Smoking?

Research on smoking-cessation motivation among older smokers in general is mixed. Some studies report no difference in motivation between smokers older than 50 years and younger smokers.³⁰ Conversely, other research suggests that older smokers, particularly those aged >65 years, may be less motivated to quit smoking and/or may perceive that smoking cessation has limited health benefit at their age.^{31,32} Although health care use is high among older people,³³ most providers do not offer smoking-cessation services, especially to older smokers.^{34,35} A study of Medicare beneficiaries aged >64 years (N = 346,674) demonstrated that only 50% of these smokers reported that they usually or always received smoking-cessation advice from their health care provider.³³ Approximately 50% of lung cancer screening patients are smokers.^{15,36–39}

Motivation for smoking cessation varies somewhat among this subsample of smokers undergoing lung screening. Among current smokers in the Dutch-Belgian NELSON Lung Cancer Screening Trial, 41% reported no intention to quit smoking.⁴⁰ In the United States, however, the subset of lung cancer screening participants who report low motivation to quit smoking is lower. For example, only 13% of smokers reported no motivation to quit smoking in the US National Lung Screening Trial.⁴¹ In smaller US studies of lung cancer screening patients, many smokers were interested in quitting smoking and in receiving smoking-cessation services⁴² and reported increased motivation to quit after screening.³² Two lung cancer screening trials (N = 313) demonstrated that approximately $\frac{2}{3}$ of smokers were ready to quit smoking; 25% within the next month and 40% within the next 6 months.⁴³ Furthermore, 60% of lung cancer screening participants who smoked expressed strong interest in receiving smoking-cessation counseling and nicotine replacement therapy (NRT), and 50% were interested in using the smoking-cessation medication bupropion.⁴³ In a pilot lung cancer screening study with 55 female smokers, 35% were ready to make changes within the next month; and between $\frac{1}{3}$ and $\frac{1}{2}$ of all smokers expressed interest in receiving NRT and other smoking-cessation pharmacotherapies.⁴⁴

It is noteworthy that there is some concern that lung cancer screening results might undermine motivation to quit smoking in smokers. For example, smokers may perceive negative screening results as evidence that they are not at risk for lung cancer.^{45,46} There are limited data to support this concern; the relation between screening results and smoking behavior is not well understood. Some findings suggest that motivation to quit smoking does not vary by screening results. In 1 trial (N = 169), 30% of smokers reported an increase in their readiness to quit smoking 1 month after screening, regardless of the scan outcome.⁴³ Likewise, 74% of smokers who were surveyed 6 months after screening in another trial (N = 134) reported an increase in their motivation to quit with no differential effect of screening results.⁴⁷ Conversely, a qualitative study of 37 smokers in a Veterans Affairs lung cancer screening program indicated that 49% of participants described mechanisms by which screening lowered their motivation to quit, including perceptions that screening yielded the

same health benefits as smoking cessation and that a negative screening result (ie, no findings in the lung study) indicated that they had avoided the harms of smoking.⁴⁸

In summary, although a subset of lung cancer screening participants may have low motivation to quit smoking, the existing evidence nevertheless suggests that, by and large, this population is motivated to cease smoking. Considering that lung cancer screening provides an opportunity to intervene with smoking in a high-risk population that might otherwise not seek or receive smoking-cessation services, potentially reduced motivation to quit smoking among some lung cancer screening participants should not be viewed as a rationale to forgo smoking-cessation services.

What Is the Effect of Lung Cancer Screening on Smoking Behavior?

Research on the relation between lung cancer screening and smoking behavior is limited. Current data on the effect of screening on smoking behavior are equivocal. A review of 2 large European LDCT RCTs and 3 large US LDCT cohort studies indicated that lung cancer screening had no overall effect on smoking, but patients who had positive results had higher smoking abstinence rates.⁴⁹ For instance, in the Danish Lung Cancer Trial (N = 4104), there was no effect of lung cancer screening on smoking.⁵⁰ In that trial, participants were randomly assigned to either screening or no intervention. Over a 5-year period, there was no statistical difference in smoking status between the 2 groups. Quit rates, however, differed significantly between smokers with and without initial positive results (18% vs 11%). Another investigation of screening and quit rates over a 3-year period (N = 926) demonstrated a 1.37-fold increase in the odds of quitting because of positive scan results compared with negative scan results.³⁸ Specifically, 42% of smokers who had 3 positive results quit smoking compared with 28% of those who had only 2 positive scans, 24% of those who had only 1 positive scan, and 20% of those who had no positive results. Styn and colleagues⁵¹ also observed that 1-year quit rates were significantly higher among smokers (N = 2094) who received positive scan results (18% vs 7%).

Conversely, data from smaller studies suggest that lung cancer screening alone may have small effects on smoking. A review of 9 trials investigating the impact of lung cancer screening on cigarette use demonstrated that screening yielded abstinence rates that exceeded the annual expected abstinence rate among older smokers (expected rate, 5%).³¹ Across all 9 studies, the overall quit rate was 11%. One study had a low quit rate (ie, 7%) but only followed smokers for 1 month after screening. Quit rates for the other studies ranged from 12% to 42%. Moreover, smokers attributed increased abstinence-related motivation to lung cancer screening.^{36,47}

Long-term follow-up studies of lung cancer screening participants also contradict other evidence that smoking rates are lower among individuals who have negative screening results. In a sample of 901 smokers, 14% reported quitting smoking 1 year after screening, and screening findings were not associated with changes in smoking behavior.⁵² Likewise, among male smokers who were followed for 2 years after screening (N = 440), the prolonged smoking abstinence rates were comparable between those who received negative results (9%) and those who received 1 or more indeterminate results (12%).³⁷ A study of 2078 individuals during long-term participation in lung cancer screening demonstrated that

consistently negative screening results over a 6-year-period were not associated with reduced smoking-abstinence rates.⁵³

Across these studies, it is especially important to note that smoking quit rates occurred presumably in the absence of formal smoking-cessation treatment. Therefore, pairing evidence-based smoking-cessation interventions with screening is likely to maximize the potential for reductions in smoking after these events. A recent study of smoking-cessation interventions provided to lung cancer screening participants in the US National Lung Screening Trial 1 year after screening supports this hypothesis. Patients who received more intensive smoking-cessation interventions (ie, assistance with quitting and arranging follow-up) from their primary care provider had higher smoking quit rates than patients who received less intensive interventions (ie, asked about smoking, advised to quit).⁵⁴

Several others factors predict smoking cessation at 1-year postscreening. These include older age, poorer lung function, lower cigarette dependence and pack years, higher motivation to quit, fewer lung cancer symptoms, higher self-efficacy regarding abstinence, and greater perceived advantages of quitting smoking.^{36,52,55} These findings suggest that smoking-cessation interventions provided to lung cancer screening participants may need to be tailored to smokers' characteristics to increase quit rates.

Another important issue for consideration is that the majority (>75%) of lung cancer screening participants will receive negative scan results.¹⁵ Current evidence on the effect of negative screening results on smoking behavior is inconclusive, as reviewed above. Nevertheless, patients may benefit from a greater focus on the overall advantages of smoking cessation for older smokers (eg, cardiovascular benefits, benefits for mobility and function) and encouragement to quit now to preserve their current lung health status. More research is needed on effective interventions for motivating lung cancer screening participants who have negative results to quit smoking. Altogether, these findings suggest that many smokers who undergo lung cancer screening are interested in quitting smoking and in receiving smoking-cessation treatment.⁴² Although screening alone appears to have little or no effect on smoking behavior, those who receive positive results may be especially likely to quit.

What Are the Effects of Providing Smoking-Cessation Services in Conjunction With Lung Cancer Screening on Smoking Behavior?

Research on smoking-cessation interventions for lung cancer screening participants is scarce. Moreover, the available research has limitations, including no smoking-cessation treatment control groups,⁵⁶ small sample size,⁵⁷ and a focus on model simulation as opposed to actual patient data.⁵⁸ One randomized pilot study tested the effects of telephone counseling and pharmacotherapy either before or after CT scans, but the small sample size (N = 18) limits the ability to draw conclusions from those data.⁵⁷

Providing self-help materials (written or internet-based resources)⁵⁹ or brief tailored or standard smoking-cessation advice to lung cancer screening participants has small effects on smoking (ie, quit rates of 5%–10%).⁵⁶ A pilot study of a 12-week smoking-cessation program for lung cancer screening participants (N = 18) yielded more promising results.⁵⁷ In

that trial, half of smokers received treatment before the scan, and the other half received treatment after the scan. Treatment included nurse-delivered telephone counseling plus either NRT or the smoking-cessation medication varenicline. Quit rates at 4 months were 33% in those who received treatment before the scan and 22% in those who received treatment after the scan, and all but 1 smoker had made a 24-hour quit attempt. At 6 months, those figures dropped to 22% and 11%, respectively, but they were still higher than the annual expected abstinence rate among older smokers.³¹ Furthermore, abstinence rates did not vary by scan results. Another study examined the cost effectiveness and overall health impact of adding various smoking-cessation interventions to screening using simulated data.⁵⁸ Models compared no cessation treatment with a single counseling session and 3 intensive interventions with different pharmacotherapies. The results demonstrated that lung cancer screening was more cost effective when linked with smoking-cessation treatment across all intervention types.

The preliminary findings for lung cancer screening participants who receive smoking-cessation interventions are promising; however, this clearly is a nascent area in much need of additional research. It will be very important for future studies to conduct investigations into effective smoking-cessation interventions for this understudied high-risk groups of smokers. In the meantime, insufficient research in this area should not limit the provision of evidence-based smoking-cessation interventions for these patients.

What Are Evidence-Based Smoking Cessation Treatments for Smokers Ages 55 to 77 Years?

According to the PHS *Treating Tobacco Use and Dependence Clinical Practice Guideline*, counseling interventions and medications are effective for increasing smoking quit rates across a broad range of patient populations, *including smokers ages 55 to 77 years*.¹⁸ The benefits of counseling increase with greater intensity.¹⁸ Likewise, the combination of counseling plus medication is more effective than either intervention alone.¹⁸ Brief smoking-cessation treatments that are amenable to primary health care settings are effective in general¹⁸ and for older smokers, particularly when they are tailored for that age group (eg, information about the health benefits of smoking cessation for older, long-term smokers).⁶⁰

The PHS *Treating Tobacco Use and Dependence Clinical Practice Guideline* outlines an effective, brief intervention model called the *5As*, which should be the standard of care for health care facilities. At each visit, health care providers should *ask* patients about smoking, *advise* smokers to quit, *assess* smokers' willingness to quit at that time, *assist* smokers in quitting (ie, provide practical counseling, a supportive clinical environment, links to supplemental support, and recommend/prescribe medication), and *arrange* for a follow-up contact with smokers by telephone or in person soon after the scheduled quit date. One clinician can conduct the initial steps and then refer the patient to a smoking-cessation resource like a quitline or tobacco treatment specialist, which would provide additional treatment.¹⁸ This model, comprising *ask*, *advise*, and *refer*, may be viewed as an alternative standard of care. The initial provider, however, would still remain responsible for ensuring that the patient receives appropriate treatment and subsequent follow-up.¹⁸ This *5As* model is endorsed by major oncology and pulmonary/thoracic organizations, including the

American Society of Clinical Oncology,⁶¹ the National Comprehensive Cancer Network,⁶² and the American College of Chest Physicians.⁶³ Treatment models in which 1 provider/service addresses all 5 steps versus only the first 3 may be more effective for increasing smoking quit rates⁶⁴ generally and specifically among lung cancer screening participants.⁵⁴ A recent matched case-control study of 3336 patients in the US National Lung Screening Trial evaluated rates of delivery of the 5As after a lung screen and smoking cessation.⁵⁴ Participants who received step 4 (*assist*) or step 5 (*arrange*) from their primary care provider had increased odds of quitting smoking compared with patients who only received steps 1 through 3.

Step 3 of this model has received criticism. At any given point, only 12% to 20% of smokers report willingness to quit smoking in the next month.⁶⁵ Moreover, motivation to quit fluctuates often. Consequently, patient motivation as a requirement for treatment (ie, an *opt-in* model) means that most smokers will not receive smoking-cessation assistance. In contrast, treatment approaches for other chronic diseases (eg, hypertension, asthma) use an *opt-out* model in which treatment is offered upon detection with the option to decline. Opt-out models have demonstrated promise with cancer patients. Among cancer patients (N = 473) who received a surgeon-led, brief smoking-cessation intervention concurrent with their cancer care visit, 78% accepted a referral to stop-smoking services; among this subsample, 36% stopped smoking at least temporarily, and another 10% either reduced smoking or set a future smoking quit date.⁶⁶ Similarly, an automated tobacco-use assessment and telephone-based smoking-cessation support program for patients who had cancer identified at diagnosis/follow-up was highly effective for engaging patients in smoking-cessation treatment.⁶⁷

For smokers who are unwilling to quit, the PHS *Treating Tobacco Use and Dependence Clinical Practice Guideline* recommends the specific use of evidence-based motivation techniques to increase smoking-cessation motivation, ie, the 5Rs. The health care provider should engage the patient in a discussion of the personal *relevance* of smoking cessation, the *risks* of smoking, the potential *rewards* of smoking cessation, and the potential *roadblocks* to quitting (and treatment to address these, if relevant). The fifth step is to *repeat* these steps at subsequent visits. The 5Rs model increases the likelihood of a future quit attempt compared with no motivational advice.^{68,69}

An alternative approach to the 5Rs for unmotivated smokers, consistent with other chronic disease treatment models, is to offer treatment and advise that patients use treatment at a minimum to see whether it can help reduce their smoking.⁶⁵ For example, a patient who is unwilling to quit smoking at this time can be given nicotine transdermal patches and advised to wear the patch while he or she is still smoking to help cut back. The patient would be advised that this practice is safe, approved by the US Food and Drug Administration (FDA), and efficacious in helping smokers reduce their smoking.⁷⁰ Research evidence indicates that providing medications to smokers who are not ready to quit increases smoking quit rates.^{71–73} In 1 clinical trial, unmotivated smokers were provided with a 2-week starter pack of NRT and a referral to a quitline or a quitline only referral.⁷² Compared with unmotivated smokers who received the quitline referral, a greater proportion of unmotivated smokers who received NRT plus a quitline referral quit smoking or reduced their smoking by at least 50%.

A review of 10 trials that investigated smoking reduction/cessation treatment in smokers who were not ready to quit⁷⁴ indicated that smoking-cessation treatments doubled the odds of long-term smoking abstinence even in a population of smokers who were unwilling to quit in the immediate short-term but were willing to work with their provider on smoking reduction. This treatment approach may promote quitting by increasing unmotivated smokers' motivation to quit and abstinence self-efficacy.⁷¹

There are additional smoking-cessation treatment considerations for older smokers—the population eligible for lung cancer screening. This population has a longstanding tobacco use history of at least 30 pack-years.¹⁶ Research on older smokers demonstrates that they are likely to have high nicotine dependence and may perceive that quitting smoking will have limited benefit at an advanced age (ie, 70 years).⁷⁵ Moreover, they may benefit from more intensive smoking-cessation interventions. A review of 13 smoking-cessation trials of adult smokers aged 50 years⁷⁶ demonstrated that more intensive interventions and combined pharmacotherapy plus counseling yielded higher quit rates than brief advice, minimal counseling, or self-help materials. This finding, along with research on the limited efficacy of the first 3 steps of the 5As model (ie, *ask, advise, assess*) for lung cancer screening participants⁵⁴ highlights the need for models of care that provide access to actual evidence-based treatment and follow-up (ie, *assist* and *arrange*). Although the motivation of lung cancer screening participants to quit can be assessed (ie, step 3), it should not be considered a necessary precondition to receiving treatment. There is not sufficient evidence to draw conclusions about the use of electronic nicotine-delivery systems (ENDS) by lung cancer screening participants. However, consistent with the joint statement by the American Association for Cancer Research and the American Society of Clinical Oncology and the statement by the International Association for the Study of Lung Cancer, all smokers should be encouraged to use an FDA-approved medication in conjunction with counseling in lieu of using ENDS.^{77,78}

In summary, multimodal, comprehensive, and evidence-based treatments, consistent with recommendations of the PHS *Tobacco Clinical Practice Guidelines*, yield better clinical outcomes for smokers than usual care (eg, general advice to quit, provision of self-help materials). Moreover, because the motivation to quit smoking varies in this population, an *opt-out* tobacco-treatment approach may be preferred in which all smokers seeking lung cancer screening receive access to smoking-cessation treatment regardless of their motivation. To our knowledge, no studies have investigated universal cessation support or automatic referral to cessation support services for lung cancer screening services, but this is an important area that warrants further investigation.

CONCLUSIONS AND IMPLEMENTATION ISSUES

Smoking is the primary causal factor in lung cancer,⁸ and smoking cessation is crucial for reducing lung cancer risk and premature mortality.²⁶ LDCT can detect early stage lung cancers; and, as recommended by the USPSTF and recently approved for reimbursement by the CMS, individuals at high risk for lung cancer (ie, current and former [quit for 15 years] smokers with a 30 pack-year history ages 55–77 years) should be screened annually. As part of this benefit, the CMS requires that counseling be provided on the importance of

maintaining cigarette abstinence for former smokers; the importance of smoking cessation for current smokers; and, if appropriate, the furnishing of information about smoking-cessation interventions. Unfortunately, this requirement is neither specific nor comprehensive, and it does not provide health care providers or administrators with any direction regarding how to implement tobacco treatment in the context of a lung cancer screening program. These findings necessitate the need for the present clinical guideline to provide specific guidance regarding what lung cancer screening physicians and programs need to do regarding the high-risk smokers who ethically need assistance with smoking cessation. Indeed, this is the first time the US health care system has specifically targeted smokers. It is a watershed moment for clinical medicine and 1 that should be embraced with high-quality tobacco-treatment interventions, which will lead to not only reduced lung cancer risk but also to an improvement in overall health for patients engaged in lung cancer screening.

Lung cancer screening alone may have little to no effect on smoking behavior. Moreover, minimal care models focused on brief advice and the provision of self-help materials have limited effects on smoking among older smokers—the population eligible for lung cancer screening. Therefore, it is important that health care practitioners in the field use this part of the CMS benefit effectively to maximize health benefits for their patients. Integrating smoking-cessation treatments with lung cancer screening may increase smoking quit rates and the overall cost-effectiveness of screening, although more research is needed to confirm this hypothesis. Moreover, efficacious smoking-cessation interventions (medications and counseling) are well established, but the mechanism of cessation support (ie, access to tobacco treatment) needs to be established further.

Lung cancer screening programs are now available in a range of facilities that vary in terms of resources. Likewise, the referral pathway for screening will vary among patients (ie, self-referred vs physician referred), and these differences have implications for smoking-cessation follow-up care.⁴⁵ Each treatment program will need to determine which model of smoking-cessation care is feasible for its setting. For some settings, it may be best for the referring physician to provide smoking-cessation treatment and follow-up. For some physicians, this will require brief training on smoking-cessation treatment. For physicians who are motivated to receive training, they may do so online (eg, <http://tobaccodependence.chestnet.org/>, Accessed January 11, 2016) or by going to a formal training program (available at <http://www.attud.org/findprog.php>, Accessed January 11, 2016). Alternatively, a dedicated service in the LDCT facility or a dedicated clinician with tobacco treatment experience could be integrated into the lung cancer screening treatment team to provide tobacco treatment services. This model, however, may not be possible in some settings. Therefore, a brief intervention should be offered with a referral to an adjacent specialized facility for smoking cessation and/or a telephone cessation quitline available in all 50 states through a common, toll-free telephone number (800-QUIT-NOW). If the patient is referred to an external resource, then the referring physician/lung cancer treatment team provider should follow-up on the patient's tobacco treatment.

Research on smoking-cessation interventions for lung cancer screening patients is limited. Evidence-based methods of cessation support (counseling, medications) are well established,

but the mechanism of cessation support (access to care) for lung cancer screening participants needs to be established further. A 1-size-fits-all approach is not likely given the variability of LDCT screening settings and clinical pathways. Patients may be referred to LDCT by a physician or self-referred. Follow-up care may involve the LDCT clinic, primary care provider, or other clinicians.

Recommendations

Recommendation 1—For smokers who present for lung cancer screening, it is recommended that they be encouraged to quit smoking at each visit regardless of lung cancer screening results. The physician furnishing the LDCT script at the shared decision-making visit is in a pivotal position to emphasize the importance of quitting smoking. Other clinicians (for example, nurse navigators, radiologists, pulmonologists, etc) may be in a similar position to offer a brief intervention and solidify the same message.

Recommendation 2—For smokers who present for lung cancer screening, it is recommended that they be assisted with access to evidence-based, comprehensive behavioral and pharmacologic treatments as outlined in the PHS *Tobacco Clinical Practice Guidelines* to facilitate quitting or smoking reduction, which may lead to eventual cessation. Assistance should be provided by the physician who refers them for lung cancer screening, by a lung cancer screening treatment team provider (eg, nurse navigators, radiologists, pulmonologists, etc), or by referral to an external smoking-cessation intervention resource (eg, quitline, provider/service with expertise in treating tobacco dependence). If the patient is referred to an external smoking-cessation intervention resource, then the referring physician or lung cancer treatment team provider should arrange for follow-up contact with the patient about his or her smoking as delineated in the PHS *Tobacco Clinical Practice Guidelines*.

Recommendation 3—For smokers who present for lung cancer screening, it is recommended that follow-up contacts to support the patient's smoking-cessation efforts should be arranged. This follow-up contact can be with the treating lung cancer screening provider or the initial referring provider.

Recommendation 4—For smokers who are unwilling to use evidence-based treatments to work on quitting or smoking reduction in the immediate future, it is recommended that behavioral strategies like the 5R's model be implemented at each visit to motivate them to change their smoking.

Recommendation 5—More research is needed on the optimal intensity (ie, the number of/and duration of interventions), timing relative to screening, and delivery mode (eg, physician-directed treatment vs dedicated tobacco-treatment service) of smoking-cessation interventions for this population and important moderators of these effects.

Recommendation 6—More research is needed on the potential adverse effects of screening on smoking-cessation motivation, the barriers to implementing smoking-cessation interventions within LDCT clinics, and the education and training needs of LDCT clinical staff to support smoking cessation.

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