



Integration of smoking cessation and lung cancer screening

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Abstract: The National Lung Screening Trial demonstrated a decrease in both lung cancer mortality and overall mortality in enrollees aged 55–74 with a 30 pack-year smoking history using low-dose computed tomography (LDCT). Lung cancer screening in high-risk groups is supported by the United States Preventive Services Task Force, the National Comprehensive Cancer Network, and multiple other organizations. Inclusion for any lung screening program requires a history of smoking, and many undergoing screening are currently smoking. Screened patients are not only at risk for developing lung cancer, but also carry the risk of developing a host of other smoking related diseases, and cessation at any point is beneficial. Counseling and pharmacotherapy are evidence-based strategies which are well known to help people quit smoking. However, as lung cancer screening is an emerging and evolving field, the integration of cessation resources in screening programs is not uniformly done, and when it is done, there is no standardized approach. The goals of this review are to discuss the rationale for integrating smoking cessation resources in lung cancer screening, review what types of resources may be effective, and discuss different strategies of how integration can be done. Ultimately, the overarching goal of any lung cancer screening program is not merely to find more nodules, or diagnose more cases of cancer, but to help screened patients live longer, better lives. Smoking cessation broadens the impact of any lung cancer screening program well beyond the endpoints of cancer diagnosis and cancer mortality to reduce risk from many other diseases, and can positively impact many more patients than the small percentage that have cancer.

Keywords: Lung cancer; screening; smoking; tobacco

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Background

Historically, screening for lung cancer with plain film radiographs, sputum cytology, or other modalities had been attempted, but was never demonstrated to detect cancer at an early stage to a degree where the screening method statistically impacted mortality of the screened group. Molecular testing of biomarkers in blood, urine, or exhaled breath are exciting possible modalities to improve the detection of lung cancer at an early stage or the definition

of “high-risk” population, but logistically and economically not feasible to implement on a large scale at the present. The perspective on lung cancer screening changed with the National Lung Screening Trial (NLST) which was funded by the National Cancer Institute (NCI) (1). The landmark NLST paper released in 2011 involved over 53,000 patients with a 30 pack-year or greater smoking history enrolled in a prospective screening trial comparing plain film chest radiograph to low-dose computed tomography (LDCT). A statistically significant 20% decrease in lung cancer

mortality was shown in the LDCT arm of the trial and there was a statistically significant 6.7% decrease in all-cause mortality as well. This established that screening a high-risk group with LDCT could not only detect cancer more frequently, and at an earlier stage, but would also lead to saving lives through screening. Other LDCT screening trials with smaller enrollment had not been able to demonstrate the same benefit. However, the results of the European NELSON (2) trial have demonstrated detection of lung cancer at earlier stages (3). Decreased lung cancer mortality for men and women in the NELSON trial was shared at the 2018 World Conference on Lung Cancer (4) and further publications are anticipated. More in-depth discussion of lung cancer screening was included in other articles in this focused issue, but the understanding that lung cancer screening saves lives and is increasingly common is a necessary foundation for this discussion of integrating LDCT and tobacco cessation.

The trials which have demonstrated benefit to screening have been enormous undertakings, with tens of thousands of patients screened and tracked over many years in order to demonstrate statistically significant mortality advantage. Part of the reason such large numbers are needed is that the incidence of lung cancer—even in this high-risk group—is 1–2% or less of those screened. So even in a high-risk group, which benefits from screening, lung cancer is found in only a small fraction of participants. An often overlooked, under-appreciated, and under-treated diagnosis in patients undergoing lung cancer screening is the very same risk factor which makes them eligible for screening—tobacco smoking. Adult smoking rates typically range from 15–25% depending on the community, but baseline demographics of enrollees in the NLST indicated that 48.1% (12,862/26,722) of those undergoing LDCT were currently smoking at the time of enrollment (1). Retrospective data from the University of Arkansas (5) demonstrated that 70.2% (309/440) of those undergoing LDCT in that institution were currently smoking at the time of the screening. Patients who are motivated to participate in a screening exam may be receptive to cessation support, whereas unaided cessation typically has poor success rates. It has been demonstrated that screen-detected abnormal LDCT findings were associated with increased cessation rates (6) and importantly, normal scans were not associated with increased smoking, or relapse of those who had previously quit. This is not only a “teachable moment” but also a receptive patient population with alterable risk which may benefit from cessation resources. Overall, those enrolled

in a lung cancer screening program not only have higher smoking rates than the general public, but by nature of inclusion criteria, includes the heaviest smokers—typically, those with a 30 pack-year history or more. This degree of smoking history is associated with a greater degree of addiction, and perhaps less likely to quit smoking than the average patient who smokes less. In summary, this screened group being evaluated for lung cancer may have a relatively low incidence of lung cancer, but often a large proportion, or even a majority of participants have a treatable condition which is not optimally addressed.

Benefits of cessation

Tobacco cessation may be viewed by patients, families, physicians, nurses, and healthcare administration with a nihilistic perspective. There may be the perspective that “it’s too late, the damage has already been done” or for those that have smoked decades “quitting now won’t make any difference”. Trying to reach patients with cessation resources could be viewed as a futile effort and erroneously viewed as patients not wanting to quit. In actuality, most patients who smoke do want to quit, and quitting at any point has significant health benefits, even quitting after a cancer diagnosis (7,8). A beneficial aspect of addressing tobacco use in the context of lung cancer screening, is that getting patients to quit smoking, at any age, can have significant health benefits and decreased mortality which extend beyond cancer incidence and cancer mortality. Throughout the course of the NLST, deaths were tracked according to cause. Of those who died, 24.1% (930/3,856) died of lung cancer; interestingly, more died of cardiovascular disease (24.8%, 956/3,856) than of lung cancer. In addition, another 22.3% died of other neoplasms, and 10.4% died of respiratory illnesses. Overall, the vast majority of the deaths in the NLST were secondary to tobacco related diseases, but lung cancer only represented less than a quarter of the all deaths (1). We know that quitting smoking can decrease cardiovascular risk, cerebrovascular events, and respiratory diseases; thus, if we as physicians and researchers wish to impact mortality through LDCT programs, detecting and curing lung cancer are only part of the solution, as a treatable risk factor exists in many of those enrolled in screening programs.

Clinical practice guidelines such as the NCCN guideline for lung cancer screening (9) recommend that all current smokers be advised to quit smoking and former smokers be advised to remain abstinent. The degree to which

individual lung cancer screening programs advise patients can range widely. At minimum, patients may be provided with a verbal recommendation, handed print material, or be given a quit-line phone number. Guidelines do not typically detail the type of cessation advice, how that advice is delivered to the patient, or if it is followed with further support. A Cochrane review of physician recommendations regarding smoking cessation concluded that a physician recommendation is important and can increase cessation. Assuming an unaided cessation rate being 2–3% per year, physician recommendation alone would add additional 1–3% (10). While physician advice does boost quit rates over offering no advice, it leaves great room for improvement, and a structured cessation program with counseling support and pharmacotherapy could potentially raise this rate several fold.

Framework for cessation

While there are many different strategies to approach patients who smoke and provide cessation support, a common framework of cessation is summarized by “5 As”: ask, advise, assess, assist, and arrange (11). First, each patient should be asked about tobacco use at each visit and have it documented in the medical record. Every patient should be clearly advised of the benefits of quitting, and the risks of continued smoking. After asking and advising the patient, the health care provider should assess the patient’s willingness to quit, and if unwilling, discuss overcoming barriers to cessation. Patients eligible for LDCT screening by inclusion criteria, have a long history of smoking and most have likely tried to quit in the past. Part of the assessment should be exploring what may or may not have worked for the patient in the past. Quit attempts could include abrupt cessation (also known as “cold turkey”), or gradual tapering. Attempts may have involved medication or counseling, or other unconventional methods including acupuncture, hypnosis, chew tobacco, and/or electronic cigarettes (EC). It is important to understand what has and has not worked for that individual in the past. After a thorough assessment of the patient’s tobacco use, readiness to quit, and prior cessation history, the next step would be to assist with a cessation attempt including a timeline, which is referred to as the patient’s “quit plan”. Other forms of assistance with a cessation attempt include counseling and pharmacotherapy. A discussion of both counseling and pharmacotherapy is included later in the manuscript. Finally, after assisting the patient to formulate a plan, the last step would be to arrange a follow-up after the

anticipated quit date. The follow-up can be in person, by telephone, or some electronic health systems involve secure methods for online messaging which can be useful and convenient.

Abbreviated framework for cessation

While most would agree that cessation is important, and many undergoing LDCT could benefit, implementation of cessation resources in the context of LDCT screening is variable, and not standardized. Reviewing the 5As approach to tobacco cessation in the context of a lung cancer screening program brings to light many barriers which may exist preventing those undergoing LDCT from receiving a comprehensive structured plan. Screening programs may lack the personnel with time to go through a structured assessment or expertise to provide counseling or pharmacotherapy. Programs may lack the infrastructure to track patients quit attempts and provide follow-up. An abbreviated, efficient strategy of Ask-Advise-Refer has been used in many clinical settings, where the patients are asked about tobacco and advised of the benefits of cessation, but the assess, assist, arrange components of a structured quit plan are outsourced to a reliable tobacco cessation resource with a patient referral. The Cancer Care Ontario group streamlined the 5As model and summarized their strategy as Ask-Advise-Act, following the same strategy of providing all patients with brief advice and then providing a referral to a cessation service (12).

Counseling

Counseling patients regarding tobacco cessation is an incredibly important part of any cessation program, and there are multiple different modalities of delivering counseling. For the purposes of this article, three forms of counseling will be discussed as examples: Telephone counseling in the form of a quit-line, group counseling in a structured tobacco cessation specific program, and individual counseling.

An efficient method to provide follow-up cessation resources for some LDCT programs is to include the quit-line number on their scheduling papers or hand the patients a card or pamphlet. While providing them a contact number does fulfill the requirement of providing further cessation resources, there may be low likelihood that the patient will follow through with actively seeking help from an outside resource. We know quit-lines are effective at increasing

cessation as well as cost-effective (13), but patients need to participate, in order for it to have any effect. Throughout the world, quit-lines exist in most countries, and while their resources may vary to some degree, quit-lines are typically toll-free telephone numbers which link patients to centers offering free telephone counseling, and often provide free or reduced cost nicotine replacement therapy (NRT). Of course, patients can call the quit-line themselves to enroll, but many states or countries have the option of either telephone, online, or fax referral forms where a patient can be enrolled by a physician's office or other third party. An active referral process in a LDCT screening program could include an automated referral to a regional quit-line. This could be done as part of the enrollment in the LDCT program, or at the time of providing the results. By including quit-line referral as a mandatory part of the LDCT program, patients may opt out of participation in the referral if they wish. Not only are quit-lines cost-effective overall, they are of no cost to the patient or referring physician, and an appealing resource to include in any program which is constrained by budget, limited on time, and may lack in-house tobacco cessation expertise. By integrating a preexisting, evidence-based, free of charge resource such as a quit-line, patients can have much better access to cessation resources at minimal to no cost for the LDCT program.

The American Lung Association's (ALA) Freedom From Smoking[®] (14) Group Clinic program is a structured, evidence based group counseling program available throughout the United States. Small groups (8–16 participants) meet weekly with certified facilitators. The program can be flexible, but typically it meets weekly for 6 weeks, where the facilitator follows a structured weekly curriculum to guide small group discussions. Typically, participants plan for a quit date during the program. Cost for participation is typically a nominal fee to cover booklets and other materials. This program and others like it already exist in most communities which are large enough to have LDCT screening programs. If this type of program does not exist at a local cancer center or hospital, the ALA has resources to train facilitators and start new programs. Not all patients are personally comfortable with group counseling sessions. Variations of the Freedom From Smoking[®] program exist as an online interface that can be used on a smartphone, tablet, or computer, with links to an online community (14). This may be appealing to certain patients who are uncomfortable joining a small group, or do not have access to group counseling due time,

transportation, or other logistical issues. LDCT programs forming partnerships and referral paths with ALA or other organizations which run tobacco cessation group counseling can be mutually beneficial for both programs. The cessation programs can not only provide that valuable resource to the LDCT program participants, but can also serve as a referral source to the screening program, feeding back referrals of patients for screening, for many patients may enroll in the classes who are unaware of availability or benefit of LDCT screening.

Individual counseling can be provided by a physician, but most physicians lack the time, and background to deliver in-depth counseling on an individual level. Strategies of counseling are beyond the scope of this article but a brief discussion into some aspects of communication and an example of individual counseling will allow some insight into how counseling can benefit those patients who are smoking in a lung screening program. Oftentimes, a supportive message from a physician and referral to a tobacco treatment specialist can link the patient with someone with more time and expertise in the area. Brief encouraging messages highlighting the clear benefits of cessation, and a direct referral to an individual counselor can be meaningful and effective. From a physician perspective, typically, positive messages such as “When you quit smoking, you will be able to breathe better and enjoy activities with the grandchildren” are better received than negative messages such as “If you are not going to quit, you will end up needing an oxygen tank”. A physician who solely focuses on negative aspects of smoking can set up an adversarial feel to the physician-patient relationship. Counselors may use many different strategies to guide patients and support them. One such strategy used by some in tobacco treatment is motivational interviewing. This goal-oriented method guides patients toward resolving ambivalence or decreased confidence with questioning which can help them to gain confidence, identify barriers, and set goals. A series of questions may include: “What do you think about your tobacco use? How do you think it plays into your health right now? What are some other negative things about tobacco? What would you like to see in your future regarding tobacco? How do you think you could successfully quit? What may help you to quit? How could I help you? What might be some problems or risky situations where you could slip or relapse? How could you avoid that?” Getting patients to articulate their own goals requires motivation and engagement on the part of the patient, and time on the part of the counselor. The

logistics of providing individualized counseling in a LDCT program may be a challenge, and most LDCT programs would not have the budget to hire a dedicated counselor. Local resources to which patients can be referred may be quite helpful, but could present challenges for the patient regarding scheduling, and require motivation to go to another appointment. A straightforward, efficient, and cost-effective method to deliver individualized counseling within our (MAS) LDCT program was to provide the program coordinator, an advanced practice nurse, with additional training as a tobacco treatment specialist (15). The scheduling phone call includes the initial discussion, and she meets with the patient at the time of the LDCT to discuss the test, and provide face-to-face counseling. Overall acceptance of this counseling is quite good with 100% of screened patients receiving the brief intervention (as it is integrated into the discussion), and nearly all patients agree to a more in-depth face-to-face discussion about cessation at the time of the LDCT visit as it is framed as an opt out standard part of care.

Pharmacotherapy

Approved pharmacotherapy is another mainstay of support for patients who are smoking and unable to quit. The following is not a comprehensive review of the drugs, and side effects, but an overview of examples often used. The most frequently used pharmacotherapy for tobacco cessation is NRT. A transdermal patch is the only long-acting form of NRT available and it is available in different patch strengths that can be tapered down. Short-acting forms of NRT include gum, lozenges, nasal spray, and an inhaler. For clarification, the pharmacologic NRT inhaler holds a cartridge containing nicotine which is inhaled, with mostly pharyngeal and buccal absorption, but it is not heated into an aerosol like an electronic cigarette. The nasal spray and inhaler are available by prescription only in the US, whereas patches, lozenges, and gum are available over the counter. It is common practice in some tobacco cessation programs to use a strategy of combination NRT which would involve a long acting patch, and to use a short acting agent such as gum or lozenge for addressing breakthrough cravings. Two other non-nicotine drugs are approved for use in tobacco cessation, bupropion and varenicline. Bupropion is often used as an antidepressant and could be a good choice for a patient with a depressed mood seeking help with smoking cessation. Varenicline is a partial agonist for the alpha-4 beta-2 nicotinic acetylcholine receptor. A

Cochrane review found varenicline to be the most effective single drug for smoking cessation and equivalent to combination NRT (16). There has been previous concern about increased neuropsychiatric side effects of varenicline for cessation, particularly concerns for violence or suicide risk. This was thoroughly evaluated in the EAGLES trial where varenicline, bupropion, and NRT were compared to placebo in over 8000 people. There was no increased risk of neuropsychiatric side effects in any of the groups compared to placebo (17). Overall, pharmacotherapy can boost quit rates over counseling alone. While there is no one medication that a LDCT program should use exclusively to aid cessation, those involved with lung cancer screening should familiarize themselves with the common medications which can improve cessation success.

Electronic cigarettes

There is wide variability throughout different countries regarding the availability, uses, and perspectives on EC. The EC delivers heated nicotine to the user, and while they may not contain the same level of carcinogens as cigarettes (18), do contain nicotine, flavorings, and carrier agents such as propylene glycol or glycerol that may have adverse effects on the patient. The topic of EC is covered much more thoroughly in a different article within this focused issue, but in the context of lung screening, we typically steer patients toward approved pharmacotherapy to aid cessation. If the patient has quit, but is still using the EC, a discussion is guided toward tapering the EC and/or switching to pharmacologic NRT which could be tapered off. If the patient is using both the EC and combustible conventional cigarettes (dual-use), the patient is encouraged to eliminate the combustible cigarettes altogether first, then taper the EC.

Opt out versus opt in

Whether a LDCT screening program uses quit-line enrollment, referral to a group counseling session, individual counseling, or a combination of these resources is dependent on what may be locally available and logistically possible for the patient. Regardless of the methods used, the delivery of the cessation resource requires acceptance of the patient in order to have a chance at efficacy. Early experience in our (MAS) center (15) with integrating tobacco cessation resources in a clinical workflow involved offering each patient the opportunity to visit with a tobacco treatment counselor at the time of their physician visit.

By framing the visit with the counselor as a choice, many patients would decline and indicate that they would not wish to visit with the counselor at that time. Even when the cessation counseling visit was offered at a convenient time, free of charge, and in the same location as their physician visit, patients would choose not to opt-in to receive the counseling. Changing the framing of the cessation to an opt-out strategy led to presenting the patient with a message such as “While you are here seeing the doctor, the tobacco treatment specialist will visit with you as a standard part of our program”. Of course, if a patient states that they do not want to meet with a counselor, their wish is respected. The shift to framing cessation counseling as a standard part of their care led to most patients meeting with counselors face-to-face, and a change in the delivery of resources in our program. Cancer Care Ontario demonstrated that structuring their smoking cessation program as an opt-out model led to 88% of those being offered a baseline LDCT attending a hospital-based counseling session, and 93% of those surveyed were satisfied with the cessation services (19). Regardless of what types of resources are used to support cessation in a LDCT screening program, including them as an opt-out strategy will likely have greater acceptance to patients and then greater overall efficacy. Programs with multiple different cessation resources may choose opt-out for certain levels of support and provide further information for patients to opt-in for further care, for example, all patients could be automatically referred to a local quit-line, and also provided contact information for a cessation group counseling program should they choose.

Summary

Overall, there are many benefits to implementing a tobacco cessation program within a lung cancer screening program, and some barriers which can be overcome. Lung cancer screening programs contain a high proportion of patients with a heavy smoking history and have been unable to quit previously. Patients may be motivated and receptive while the LDCT and interaction with clinician may be a teachable moment (20). Although they have accumulated risk, these patients are typically within an age range where they have decades of potential life ahead of them which could be impacted by alterable risk factors such as smoking. Cessation at any point does add significant health benefits for all patients, and decreases risk of multiple diseases, not only lung cancer. Assuming that a LDCT program has a 50% smoking rate and unaided cessation is around 2%,

whereas cessation with intensive telephone counseling and NRT could be over 20% (13), it is reasonable to see that within a LDCT program, the number of patients helped with smoking cessation could far eclipse the number diagnosed and treated for cancer.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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