

Integration of tobacco cessation services into multidisciplinary lung cancer care: rationale, state of the art, and future directions

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Abstract: Tobacco use is the largest risk factor for lung cancer and many lung cancer patients still smoke at the time of diagnosis. Although clinical practice guidelines recommend that all patients receive evidence-based tobacco treatment, implementation of these services in oncology practices is inconsistent and inadequate. Multidisciplinary lung cancer treatment programs offer an ideal environment to optimally deliver effective smoking cessation services. This article reviews best practice recommendations and current status of tobacco treatment for oncology patients, and provides recommendations to optimize delivery of tobacco treatment in multidisciplinary practice.

Keywords: Lung cancer; multidisciplinary treatment; smoking cessation; tobacco

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Introduction

In 2015, an estimated 221,000 people in the United States (US) will be diagnosed with lung cancer, representing 13% of total cancer diagnoses (1). However, an estimated 158,000 patients will die of lung cancer, translating to almost 27% of total cancer deaths. In contrast to prostate and breast cancer, where most patients will die of non-cancer related causes, most lung cancer patients will die of lung cancer. As a result, of an estimated 17 million cancer survivors, only 3% are lung cancer patients (2).

Optimal lung cancer care requires quick, efficient, and accurate triage of patients through multiple providers. Lung cancer care typically begins with an abnormal X-ray or CT scan from a primary care or emergency physician, and proceeds through a series of diagnostic and therapeutic steps involving a variety of specialists, such as medical oncologists, pulmonologists, radiation oncologists, radiologists, pathologists, and surgeons. Care in the US

usually involves sequentially referring patients to these specialists who may be located in different practices, which may result in patients and caregivers perceiving care to be disorganized and fragmented (3,4). Sequential care may also needlessly prolong the duration of time from symptom presentation to diagnosis to treatment (5-8).

Coordinated, multidisciplinary lung cancer care has been advocated as a delivery approach to overcome limitations of sequential care (3,4,9,10). In the coordinated, multidisciplinary model, specialists in a single space concurrently evaluate patients and provide input. This input is used to develop a consensus plan of care in collaboration with patients and their home caregivers (11-13) and a nurse navigator is usually integrally involved in coordinating care. Potential benefits of coordinated, multidisciplinary care include greater patient involvement in decision-making (14-16), more timely delivery of care (17,18), more accurate staging (19), and a higher rate of stage-appropriate treatment (20,21). There is strong evidence

of patient satisfaction with the multidisciplinary care model, and it is strongly advocated by experts and clinical practice guidelines (3,22-26). Given the recent nature of this delivery model, and heterogeneity in how it is defined and implemented, there is currently limited evidence that it improves patient survival (11,27). However, ongoing work is evaluating the effectiveness of this model in the community hospital setting, where most lung cancer care in the US is delivered (13,28).

Importance of effective tobacco cessation in lung cancer care

Role of tobacco in lung cancer etiology

There are over 60 carcinogens in tobacco smoke that lead to development of cancers in the lung and at least 16 other sites (29,30). Chronic cigarette smoke exposure causes accumulation of carcinogens that lead to DNA damage, loss of growth regulation, and the eventual development of cancer (30,31). Smoking is the predominant risk factor for the development of both small cell and non-small cell lung cancer (NSCLC) and contributes to 80% and 90% of lung cancer deaths in women and men, respectively. Compared to non-smokers, men and women who smoke are 23 and 13 times more likely, respectively, to develop lung cancer (29). Exposure to cigarette smoke also continues to promote the development of other non-cancer related health effects such as cardiovascular disease, stroke, and pulmonary disease in lung cancer patients (31,32). Continued exposure to cigarette smoke and constituents of smoke, such as nicotinic acetylcholine receptor (nAChR) and beta-adrenergic receptor (β -AdR) agonists, has been shown to increase cancer cell proliferation, angiogenesis, migration, and invasion (33,34).

Benefits of quitting smoking for lung cancer patients

Quitting smoking has several positive benefits in cancer patients, including lung cancer patients. The 2014 Surgeon General's Report (SGR) analyzed the effects of smoking on cancer treatment outcomes with the following conclusions (29):

- (I) In cancer patients and survivors, the evidence is sufficient to infer a causal relationship between cigarette smoking and adverse health outcomes. Quitting smoking improves the prognosis of cancer patients;
- (II) In cancer patients and survivors, the evidence is sufficient to infer a causal relationship between cigarette smoking and increased all-cause mortality and cancer-specific mortality;
- (III) In cancer patients and survivors, the evidence is sufficient to infer a causal relationship between cigarette smoking and increased risk for second primary cancers known to be caused by cigarette smoking, such as lung cancer;
- (IV) In cancer patients and survivors, the evidence is suggestive but not sufficient to infer a causal relationship between cigarette smoking and the risk of recurrence, poorer response to treatment, and increased treatment-related toxicity.

As estimated by the SGR, patients who continue to smoke after a cancer diagnosis have an estimated 50% increased risk of all-cause mortality and a 60% increased risk of cancer specific mortality (29). Continued smoking by early stage lung cancer patients is associated with an 86% increased risk of recurrence (35). Although current evidence is not conclusive, lung cancer patients who do not smoke appear to achieve a better response to chemotherapy, radiotherapy, and surgery (33,34,36). The SGR (29) reviewed 82 cohort studies of cancer patients that examined associations of smoking and cancer treatment-related toxicity. Of these, 94% (77/82) showed a positive association between ever smoking and increased toxicity, with 80% (66/82) statistically significant. Of the 49 studies that examined current smoking, 88% (43/49) showed a statistically significant positive association between current smoking and toxicity. Among lung cancer patients, smoking is associated with greater risk of post-surgical pulmonary complications such as infection and bronchopleural fistula (37), resistance to systemic therapy (such as chemotherapy and biologic therapy), and alterations in chemotherapy concentrations (38). Additionally, lung cancer patients who smoke report worse health-related quality of life (39) and pain, even after adjusting for age, perceived health status, and other lung cancer symptoms such as dyspnea, fatigue and trouble eating (40).

Knowledge deficits in treating lung cancer patients who smoke

A significant deficit in the treatment of lung cancer patients who smoke is the lack of a clear biologic or targeted strategy to improve clinical outcomes. Since 85% of lung cancer patients are diagnosed at an advanced stage (41), most will require treatment with

systemic chemotherapy or biologic therapy. Significant advances have been made for agents that target the epidermal growth factor receptor (EGFR) and anaplastic lymphoma kinase (ALK) in patients with NSCLC (42). Whereas treatment with EGFR or ALK inhibitors can produce significant survival benefits, these agents are useful in only about 10-15% of patients (approximately 10% for EGFR inhibitors and 5% for ALK inhibitors), who are generally represented by patients with minimal or no smoking history (43,44). There are currently no evidence-based alternative targeted treatment strategies for patients who smoke at the time of diagnosis. Because more than 80% of lung cancer patients have a smoking history (current or former smoking), some will argue that traditional systemic therapy trials have indirectly targeted lung cancer patients who smoke. The 2014 SGR confirms that current smoking by cancer patients causes poor therapeutic outcomes and that the effects of former smoking are better than current smoking (29); however, there are currently no existing systemic treatments that appear to work better in patients who smoke at the time of diagnosis.

Unfortunately, smoking has not been well characterized in clinical trials (45). A recent survey of active cooperative group clinical trials demonstrated that 71% did not collect any tobacco use information and less than 5% collected follow-up tobacco use information (46). As a result, the relationship between biomarkers, biologic or clinical response, and smoking cessation after cancer treatment is unclear and likely will not be significantly improved upon completion of existing clinical trials. Furthermore, to the authors' knowledge, longitudinal smoking assessments have not been collected in existing large-scale genomic profiling studies that have been linked to clinical outcomes. These are significant deficits in the ability to identify prognostic and therapeutic targets that could be used to improve clinical outcomes in lung cancer patients who smoke at the time of diagnosis.

There is a small glimmer of hope. New advances in immunotherapy targeting programmed death-1 and its ligand (PD1 and PD-L1) have resulted in significant tumor responses in a spectrum of cancer patients and are now being investigated for lung cancer (47). Though more robust responses appear to correlate with PD-L1 expression, the necessity for PD-L1 expression to elicit a therapeutic response is still in question (47). Recent data (presented as an abstract) suggests that PD1/PDL1 based therapies may have superior response profiles in lung cancer patients with a former or current smoking history (48). However, a recent

meta-analysis demonstrated no significant correlation between smoking history and PD-L1 expression (49). Several trials are now underway to evaluate the effects of these targeted strategies in lung cancer patients. Time will tell if these strategies will provide meaningful differences in lung cancer patients with a former or current smoking history.

Conclusions

Collectively, these biologic and clinical consequences warrant incorporating structured smoking cessation efforts into lung cancer care (50-54). The need for such services is considerable given that at the time of diagnosis, approximately 40-50% of patients report current smoking (55,56), and 23.5% of lung cancer survivors report continuing to smoke (57). However, these estimates are based on self-report and likely to be artificially low due to cancer patients' reluctance to report smoking (58-62). Further, many lung cancer patients quit smoking only after being diagnosed and the recentness of the attempt places them at high risk of relapse (63,64).

Addressing tobacco use in lung cancer care

Patient perspectives

Several lines of evidence demonstrate that cancer patients have made multiple attempts to quit smoking and want to quit after a cancer diagnosis. In one recent study of survivors of smoking-related cancers (65), more than 22% had ever used behavioral cessation resources, 67% had used pharmacotherapy, and 63% and 75%, respectively, were interested in using behavioral or pharmacotherapy in the future. Many of these cancer survivors used various harm reduction strategies after being diagnosed to reduce their tobacco exposure, including switching cigarette brands (20%), decreasing cigarette consumption (54%), limiting how much they smoke (55%), or not smoking every day (15%). In another survey study of patients with lung or head/neck cancer, 51% of smokers and 20% of recent quitters expressed interest in a smoking cessation program, with "individual" treatment (one-on-one with a tobacco treatment specialist) being the preferred cessation approach (66). In a qualitative study that interviewed 20 lung or head/neck cancer patients, patients reported being motivated to quit, but were resistant to ask doctors for help and embarrassed to admit relapse due to feelings of guilt and stigma (67).

When offered smoking cessation support, most cancer patients are very receptive. A physician-led intervention in head/neck cancer patients demonstrated that 80% of patients referred to a cessation program were receptive to cessation support (68). In a large cohort of cancer patients who were screened for tobacco use and automatically referred to a phone-based cessation program, only 3% of patients contacted by the cessation program refused participation in the cessation program (69). A recent survey study of 108 lung cancer patients in a community hospital-based multidisciplinary lung cancer program found that nearly half (46%) were current cigarette smokers or had quit within the past year. Among current smokers, 71% (n=27) were “very interested” in quitting in the next month and of these, 74% reported that they would be willing to participate in a smoking cessation program in the clinic (Ward *et al.*, unpublished data). Thus, data suggest that most cancer patients are highly receptive to receiving assistance with smoking cessation. Fundamentally, this suggests that access to evidence-based cessation support is a significant barrier that must be overcome to improve smoking cessation rates in cancer patients.

In contrast to patient receptiveness, many cancer patients do not receive evidence-based smoking cessation support. In one study of lung and head/neck cancer patients at a large NCI-designated comprehensive cancer center, most patients (87%) reported that their physician had asked about their smoking, 72% had been advised to quit, but only 39% were assessed for interest in quitting, fewer than one quarter received any specific suggestion about behavioral or pharmacotherapy, and only 10% received a prescription for pharmacotherapy (70). Among lung cancer patients undergoing surgery, only 46% of those who were smoking at diagnosis reported receiving cessation assistance, with pharmacotherapy being the most common form (63).

Provider perspectives

Surveys of physicians about their tobacco treatment practices are somewhat more positive than reports from patients, but still indicate marginal adherence to clinical practice guidelines. Two large independent surveys demonstrate that most oncologists report that they ask about tobacco use, but do not regularly provide cessation support. In an International Association for the Study of Lung Cancer (IASLC) survey of over 1,500 thoracic oncology providers, 90% of respondents reported regularly asking about tobacco use, 80% reported asking patients if

they would quit using tobacco, and 80% advised patients to stop using tobacco; however, only 40% reported discussing medications and 39% reported actively treating patients or referring for cessation support (71). Very similar patterns were observed in a separate survey of nearly 1,200 American Society of Clinical Oncology (ASCO) members (72). Similar 30-40% rates of assistance with quitting have been reported in other studies (73,74). These estimates are likely to be upper limits since there is discrepancy between physician and patient reports of smoking cessation assistance (67,75). Remarkably, approximately 85-90% of respondents in both the IASLC and ASCO surveys reported believing that tobacco adversely affected cancer outcomes and that cessation should be a standard part of cancer care (71,72). These findings suggest that even motivated oncologists may not provide cessation support to cancer patients.

General guidelines and principles of tobacco cessation in healthcare settings

Clinical practice guidelines from the US Public Health Service (PHS) (76) recommend that all healthcare providers provide tobacco cessation treatment, and leading national cancer organizations, including ASCO (53), the American Association for Cancer Research (AACR) (52), IASLC (77), Oncology Nursing Society (ONS) (78), and the National Comprehensive Cancer Network (NCCN) (79) are increasingly advocating for smoking cessation support in all cancer patients. The benefits of smoking cessation will apply to both cancer and non-cancer related health effects (29). Recently released NCCN Guidelines for Smoking Cessation provide guidance for clinicians to use, tailored to the cancer patient (79).

In general, all patients who report using tobacco within the preceding 30 days should receive smoking cessation and relapse prevention assistance. NCCN guidelines discuss the use of behavioral counseling and pharmacotherapy, using a strong evidence-base from the well-established PHS Guidelines (76). Principles of follow-up and relapse prevention are also discussed, which is highly applicable to cancer patients who are at risk for restarting tobacco use after a cancer diagnosis and treatment (33,50,80). More will be discussed later on addressing tobacco use in cancer patients emphasizing integration into multidisciplinary care.

The 2008 PHS Guidelines (76), and recently released NCCN Smoking Cessation Guidelines (79), provide a strong evidence base that can be used to increase cessation rates in cancer patients. However, changes are needed in

the standard approach to cancer care to facilitate access to evidence-based cessation support. To make an effective change in a clinical setting, considerations should be given to several aspects of developing and implementing an evidence-based cessation support initiative (33). Patients should be screened for tobacco use with structured questions, which can be delivered using paper instruments or electronic assessments. These assessments could be administered by a variety of clinical staff including physicians, mid-level practitioners, nurses, clinical assistants, or other intake staff. Patients who would benefit from cessation support (patients who report tobacco use within the past 30 days), would need to be identified based upon completed assessments (79).

Trained clinical staff members could perform patient identification, but automated electronic methods have also been shown to be highly effective to identify at-risk patients and generate automatic referrals to dedicated smoking cessation programs (69). As noted above, cancer patients often misreport their smoking. Approximately 30% of cancer patients who smoke do not accurately report tobacco use when asked in person (58-60). Recent data further suggest that self-reported tobacco assessments collected by phone are inaccurate in 48-80% of cancer survivors who are current smokers (61,62). Biochemical confirmation is another method that can be used to significantly enhance the accuracy of tobacco assessments (81,82), and is further useful to track tobacco use in patients enrolled in a cessation program.

Once a patient has been identified for smoking cessation support, there are practical considerations on who should provide cessation support to cancer patients (33). Physicians and nurses have often been advocated as interventionists to assist patients with quitting smoking (33,50,53,78). Dedicated cessation resources, such as institutional smoking cessation programs or state quitlines, have also been effective in promoting smoking cessation (33,53,69,81). Each institution and clinic must decide what clinical resources are available to assist patients with cessation support. However, providing cessation support by physicians in a busy oncology clinic can slow clinic flow, potentially resulting in decreased clinical revenues and increased strain by other clinical staff (33). Moreover, many oncologists may not feel adequately trained to provide evidence-based smoking cessation support (71,72). The advocacy for screening all patients, and providing support or referring to a dedicated cessation support program, has been broadly supported across organizations and guidelines (50-54,69,76-79,82,83).

Consideration should be given to requiring that clinicians assess tobacco use, advise patients to quit, and refer patients to dedicated trained cessation specialists who can provide individualized smoking cessation support using evidence-based guidelines (33,69,82). Though untested in a randomized setting, this approach intuitively supports effective delivery of evidence-based cessation support while maximizing existing clinical infrastructure.

Institutional support is a critical detail of developing, implementing, and maintaining a smoking cessation initiative (8). Obtaining provider "buy-in" can be a critical determinant of developing a successful cessation program (33,84). Though smoking cessation can produce significant health benefits, reimbursement for cessation services has traditionally been relatively low with potential improvements through new healthcare reforms (85). However, since smoking causes adverse outcomes in cancer patients (29), smoking cessation has the potential to substantially reduce the cost of cancer care through reductions in toxicity and progression to second line therapy. Indeed, smoking cessation intervention at the time of surgery for lung cancer has been shown to be cost effective at both 1 and 5 years post-surgery (86). When presenting the financial aspects of smoking cessation support to institutional leadership, potential cost savings associated with smoking cessation should be conveyed rather than focus solely on increasing front-end clinical revenues.

Embedding tobacco control within clinical oncology programs

There are several excellent recent reviews that have discussed pharmacotherapy and evidence-based methods for cessation support (33,50,53,76,82,84,87), and we will defer much of this discussion to these reviews and guidelines. However, there are relatively few discussions on how to implement cessation into an oncology clinic (33,87). Fundamentally, there are four general methods to deliver evidence based cessation support for cancer patients. For all proposed scenarios, all patients should be screened for tobacco use and all patients who report tobacco use within the past 30 days should receive cessation support. Useful questions to screen for tobacco use are shown in *Table 1* (87) using three steps. From this base, patients can receive smoking cessation support from one or more of the following options:

Physician based cessation support

As stated earlier, physicians should ask all patients about tobacco use, advise all patients to quit tobacco use, and either

Table 1 Screening questions to assess tobacco use**Step 1: Baseline tobacco assessment asked of all patients**

1. Have you smoked at least 100 cigarettes in your lifetime?
 - (A) Yes
 - (B) No
2. Do you now smoke every day, some days, or not at all?
 - (A) Every day
 - (B) Some days
 - (C) Not at all
3. Do you use other forms of tobacco every day, some days, or not at all?
 - (A) Every day
 - (B) Some days
 - (C) Not at all

Step 2: Determine if patients are current, former, or never tobacco users

Current = Answers 2A, 2B, 3A or 3B

Former = Answers 1A and 2C and 3C

Never = Answers 1B and 2C and 3C

Step 3: Ask additional questions for current or former tobacco users**For current tobacco use**

4. On average, how many cigarettes per day did you smoke in the past 7 days?
5. How soon after waking do you smoke your first cigarette?
 - (A) <30 min (higher nicotine dependence)
 - (B) >30 min (lower nicotine dependence)

For former and current tobacco use

6. At what age did you start smoking regularly?
7. At what age did you stop smoking regularly?
8. When you smoke regularly, how many cigarettes per day did you smoke on average?
9. How long has it been since you smoked even a single puff?
 - (A) <1 day
 - (B) 1-7 days
 - (C) 8-30 days
 - (D) 1-3 months
 - (E) 4-6 months
 - (F) 6-12 months
 - (G) More than 1 year

******, patients who report smoking within the past 30 days (responses A-C) should receive cessation support as many will misrepresent tobacco use and many will require assistance to prevent relapse.

provide cessation support or refer patients to an evidence-based cessation program (31,33,50-54,68,76-79,82,83,87). Physicians may choose to provide cessation support to patients directly. Detailed guidelines are available to assist in educating physicians about methods and medications to

enhance smoking cessation efficacy (82,87). ASCO further provides specific guidelines that can be used to deliver cessation support to cancer patients (79). Several online and institutional training programs are available for physicians to receive additional training (79,87).

However, whereas this option is certainly supported, data clearly demonstrate that most physicians to date provide limited cessation support (71,72). There are advantages to physician based cessation support in that physicians are acutely aware of other health comorbidities, can tailor messaging to the patient, can prescribe and monitor medications, and can coordinate care with planned follow-up appointments for other aspects of cancer care, which can ease the medical management burden for patients. On the other hand, physicians in busy oncology clinics may have tight time constraints, may not feel adequately trained, and may feel financial pressure to maintain or grow clinical revenues. Whether physicians provide direct assistance with cessation or refer patients to other dedicated resources, all physicians should inquire about tobacco use and advise patients to quit smoking at repeated intervals. Physicians should also congratulate patients on progress towards cessation and not be overly critical of continued tobacco use, as cessation is often a chronic relapsing condition that requires repeated quit attempts (33,50,53,82,87).

Support from other clinicians in the oncology clinic

Advocacy for cessation support from other clinical staff is well supported (78). Common providers for cessation support include physician assistants, nurses and nurse practitioners, psychiatrists, psychologists, pharmacists, and clinical staff trained in behavioral counseling such as social workers. Regarding pharmacotherapy, several agents require prescriptions and monitoring (82), which require close communication and support from physicians or other providers with prescribing privileges. Importantly, clinical staff who provide smoking cessation should be well-supported by supervisory staff to prevent overload due to other clinical responsibilities. For example, clinical staff in a busy oncology clinic is commonly called upon to provide ad hoc services, such as collecting vital signs, blood or urine specimens, providing supportive care (medication and intravenous hydration), counseling on other clinical interventions, etc. As a result, providers may feel pressure to accomplish other clinical tasks in competition with providing evidence-based smoking cessation support. Physicians and clinical managers should closely consider how cessation can be integrated into the clinical flow of existing oncology clinics.

Referral to a quitline

In the US, state and national quitlines are available by calling 1-800-QUIT-NOW, where patients will receive

phone based behavioral counseling and guidance on over the counter medications such as nicotine replacement therapy. Quitlines use evidence-based cessation methods and are effective at boosting long-term quit rates (76,88). Unfortunately, there is considerably variability among quitlines in services offered (89) and state budgetary challenges have led to cuts in quitline funding levels. Another caution is that recent data on the use of quitlines in cancer survivors suggest that many patients continue to use tobacco and misrepresent tobacco use with low biochemically confirmed quit rates (62,81). There are also difficulties in communicating smoking cessation efforts and individualized patient data between quitlines and oncology clinics. However, a program developed by the Michigan Oncology Quality Consortium demonstrates the feasibility and efficacy of delivering a quitline based cessation program for community oncology practices (90). The success of this program is closely linked with effective communication between the quitline and oncology practices.

Referral to a dedicated institutional cessation support program

Consolidation of cessation expertise into a dedicated institutional program facilitates efficient delivery of evidence-based cessation support. This option is an ideal mechanism to provide cessation support for institutions that can develop and maintain such a program (33,50,82,87). Development of a dedicated cessation program reduces clinical burden in a busy oncology clinic, decreases educational burden for physicians, and allows cessation providers to focus on the importance of cessation without distraction on other clinical factors, such as the details of cancer treatment (33). Dedicated cessation programs often capitalize on the utilization of biochemical confirmation and more intensive cessation interventions, which can translate to higher quit rates in patients (33,76,82).

Cessation programs also allow for concentration of expertise among a more focused group, rather than requiring education and dissemination of evidence-based cessation methods across a broad spectrum of clinical providers. Cessation support can be provided in person, by phone, or using a combination of techniques (33,69,87). For example, a few cessation specialists are able to provide evidence-based cessation support for patients across multiple oncology clinics in a moderate sized comprehensive cancer center. However, providing the same level of support in individual clinics would require education, implementation, and monitoring of possibly hundreds of physicians, nurses,

and other clinical staff. Though dedicated cessation support programs can be highly effective, it is still critical to provide screening, referral, and advocacy in the oncology clinic.

Conclusions

Each of these general options can be used to increase access to cessation support for cancer patients. Each relies upon a firm commitment by clinicians to address tobacco use in all cancer patients, by identifying patients who would benefit from smoking cessation support, advising all appropriate patients to quit smoking, and providing smoking cessation support either directly or through referral to evidence-based cessation programs. Each option has challenges as well as benefits. As we review below, multidisciplinary lung cancer care provides an ideal environment to overcome barriers to successful implementation of smoking cessation services.

Role of multidisciplinary lung cancer care in improving delivery of smoking cessation services

The need for multidisciplinary care for the cancer patient seems obvious, requiring input from surgeons, medical oncologists, radiation oncologists, pathologists, radiologists, nurses, financial counselors, social workers, and genetic counselors. Addressing tobacco use is another facet of multidisciplinary care that requires integration into the oncology care paradigm. Much like other aspects of cancer care, smoking is associated with a spectrum of social, demographic, and clinical variables in cancer patients (33,87). Smoking is associated with a lower level of education and lower socioeconomic status (91,92), higher rates of mental health disorders (93,94), higher rates of substance and alcohol abuse (95), and stigmatization associated with smoking or a lung cancer diagnosis (96).

By the time of a lung cancer diagnosis, most patients have smoked for several decades, are highly nicotine dependent, have tried unsuccessfully to quit several times, are embarrassed about their smoking, and while interested in quitting, are skeptical, if not downright demoralized, about their ability to quit (56,63,84,97). This challenging clinical and psychosocial situation requires an informed, comprehensive approach to cessation to be optimally effective. While the above recommendations for implementing cessation services are relevant for most oncology practices, the unique aspects of coordinated, multidisciplinary care—including provision of multiple services under one roof, formalized coordination of

care through the use of a navigator, and the ease of communicating among providers—makes this environment particularly suitable for providing high quality, best practice-based cessation services. Here, we offer several additional recommendations for integrating cessation services into multidisciplinary lung cancer care.

Make tobacco cessation a priority clinical goal

As noted above, tobacco treatment usually is inconsistently and weakly delivered in oncology practice, despite its known benefits and cost-effectiveness in the general population. The multidisciplinary clinic offers an ideal environment to systematically assess smoking status on a repeated basis, communicate this information efficiently to all providers via electronic health record or paper chart notes, obtain input from multiple providers, and use these providers to reinforce the cessation message and encourage patients to quit and remain abstinent. Further, integrating cessation services into multidisciplinary care can minimize the burden for cancer patients (33,87). We recommend that tobacco treatment be the default option; that is, that patients are given the opportunity to “opt out” of treatment rather than to “opt in”, as in usually the case now (98). It is important to educate patients about the benefits of quitting smoking, especially the potential to improve response to treatment and extend life. This message is particularly important for smokers who are resistant to quit, which often is due to lack of confidence. A recent cessation intervention in a thoracic oncology program found that patients with low confidence in their ability to quit smoking could be enrolled, and that confidence increased over time (84).

Integrate Certified Tobacco Treatment Specialists into multidisciplinary care

Physicians may be very effective at delivering brief cessation treatment, but physicians in a multidisciplinary clinic are unlikely to have the time to deliver more intensive intervention, which is beneficial for the typical highly dependent smoker with lung cancer (55,71,72,99). For smaller multidisciplinary practices, it often is not practical to have a full time, in-house tobacco professional and such a position may need to be shared institutionally. There is a benefit, however, in having a committed tobacco treatment specialist embedded within the multidisciplinary practice that knows and understands patient needs and can easily communicate with other providers. A fairly recent

development in tobacco treatment is a formalized training and certification process for Tobacco Treatment Specialists who specialize in the delivery of evidence-based cessation methods. It is possible to train a staff member, such as a nurse or patient navigator, to fulfill this role. In the US, training and certification as a Tobacco Treatment Specialist is offered at several institutions through the Council for Tobacco Treatment Training Programs of the Association for the Treatment of Tobacco Use and Dependence (<http://attudaccred.org/programs>). One challenge is to ensure adequate reimbursement for these services (85). Medicare covers tobacco cessation treatment, including individual counseling and pharmacotherapy, but reimbursement rates are not optimal. The Affordable Care Act (ACA) has considerably expanded tobacco cessation coverage, for example, by requiring coverage of tobacco cessation medications for Medicaid recipients in all states in 2014. State Health Insurance exchanges through the ACA also are providing tobacco cessation benefits, although coverage varies and details are not yet fully worked out.

Tailor cessation intervention to the patient's cancer treatment plan

Patients with lung cancer who receive multidisciplinary care typically are followed for an extended period, from diagnosis to treatment to follow-up care. This extended contact provides an opportunity to tailor motivational interventions to the individual patient's treatment needs. For instance, patients who are receiving surgery as a part of their cancer care can be counseled in preparation for surgery and emphasis can be placed on reducing complications associated with pulmonary complications, infections, difficulty with wound healing, and the potential benefits of decreased recurrence, overall mortality, and risk of developing a second primary cancer. Patients who are facing a new metastatic cancer can discuss that smoking increases the risk of treatment complications and hospitalization. Although patients with metastatic lung cancer typically do not have a chance for cure, the discussion of the benefits of smoking cessation can be tailored to improving quality of life. These discussions and coordination of care require close communication among treating clinicians, which is the *sine qua non* of multidisciplinary treatment.

Ensure optimal use of pharmacotherapy

Although there are several FDA-approved medications

that are effective for smoking cessation, including nicotine replacement (gum, patch, lozenges, inhaler, and nasal spray), Bupropion and Varenicline (76), most oncologists do not prescribe or adequately monitor their use (70-74). Multidisciplinary care provides an excellent environment to ensure that pharmacotherapy is prescribed, dosed properly, monitored for adherence and side effects, and adjusted as needed. Combination treatment, such as short- and long-acting nicotine replacement (e.g., gum and patch, respectively), or nicotine replacement and Bupropion, boost quit rates over mono-treatment (76,100) and are likely to be useful in heavily dependent lung cancer patients. Patients often discontinue cessation pharmacotherapy prematurely, which can be effectively monitored and corrected in a multidisciplinary environment.

There is growing interest among smokers in the use of electronic cigarettes ("e-cigarettes") to aid smoking cessation. However, there currently is not adequate evidence about their safety or effectiveness to recommend their use. Leading cancer organizations including IASLC, ASCO, and AACR advise oncologists to tell patients that the safety and effectiveness of e-cigarettes are not fully understood and there is no current clear evidence to suggest that e-cigarettes are safer or more effective than existing government-approved smoking-cessation medications (77,83).

Use effective behavioral cessation approaches

Several behavioral intervention approaches, including motivational enhancement, provision of social support, and problem solving assistance substantially boost quit rates in a dose-dependent fashion (76). Given the compelling need for lung cancer patients to quit smoking, and the typically high levels of dependence in this population, Tobacco Treatment Specialists have a vital role in providing state-of-the-art cessation approaches. It is recommended that all smokers be comprehensively assessed, provided a motivational intervention to reduce the self-blame that is common in this group and enhance their readiness to quit, and given the most intensive treatment that is acceptable to the patient and likely to be efficacious. Combining behavioral treatment with pharmacotherapy improves quit rates over pharmacotherapy alone (76) and should be offered as standard treatment.

In addition to the behavioral strategies noted above, a few additional approaches that are new or less widely used, but effective and potentially feasible in a multidisciplinary clinic, should be considered. These include helping patients

to reduce smoking prior to the quit attempt, using either a scheduled reduced smoking schedule for patients who are ready to quit (101,102) or providing nicotine replacement as a smoking reduction strategy to promote future smoking abstinence in patients who are not yet ready to quit (103). Although not yet evaluated specifically for lung cancer populations, mobile technology, such as text messaging services and smoking cessation “apps” show considerable promise for smoking cessation (104,105). These tools provide a cost-effective and convenient way to extend provider-delivered treatment and to target interventions to specific patient populations, including those with lung cancer. Such tools may be especially helpful to maximize treatment delivery in community-based multidisciplinary oncology programs, which often draw patients from large areas. Importantly, clinicians at all levels should repeatedly emphasize the need to quit smoking, empathize with patients on the difficulty in quitting, and congratulate patients for progress and achieving success in quitting smoking.

Conclusions

Tobacco use is the predominant risk factor for lung cancer, and many lung cancer patients still smoke at the time of diagnosis. These smokers often want to quit but are highly dependent on tobacco and often feel blame for their illness and demoralized about the possibility of quitting. Quitting smoking improves the prognosis of lung cancer patients, however, and effective methods are available to assist them, including several FDA-approved pharmacologic agents and well-tested behavioral strategies. Several national cancer treatment organizations, including ASCO, AACR, IASLC, ONS, and NCCN have advocated for smoking cessation support for all cancer patients, but most cancer treatment practices do not consistently or adequately deliver such services. Multidisciplinary lung cancer treatment programs offer an ideal environment to optimally deliver effective smoking cessation services. Several recommendations are offered to optimize delivery of tobacco treatment in multidisciplinary practice, including making cessation a priority clinical goal, utilizing the services of dedicated smoking cessation programs and trained specialists, tailoring cessation interventions to the patient’s cancer treatment plan, ensuring adequate use of pharmacotherapy, using state-of-the-art behavioral cessation strategies, and ensuring effective communication among all providers to integrate evidence-based cessation support into the standard clinical care for all cancer patients who smoke at diagnosis.

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Footnote

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