

**NCI Monograph 23**  
**Treating Smoking in Cancer Patients:**  
**An Essential Component of Cancer Care**

**Chapter 6**  
**Monograph Conclusions and**  
**Future Research Directions**

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# Chapter 6

## Monograph Conclusions and Future Research Directions

### Introduction

This monograph provides an up-to-date review of the effects of smoking cessation on cancer outcomes; smoking cessation treatments for patients with cancer who smoke; challenges of and strategies for implementing smoking cessation in cancer care settings; and tobacco use, cancer burden, and smoking cessation among medically underserved and vulnerable populations. The first section of this chapter synthesizes the evidence reviewed in this monograph into eight major conclusions; these are followed by chapter-specific conclusions that provide a more fine-grained summary of the research reviewed for the monograph. Next, the chapter highlights areas where additional research is warranted. Finally, it describes two key National Cancer Institute (NCI) initiatives designed to meet the cessation treatment needs of individuals at high risk of lung cancer, patients with cancer, and cancer survivors who smoke.

### Major Conclusions

The eight overall conclusions that emerge from this monograph are:

1. **Smoking cessation after the diagnosis of cancer is highly likely to reduce all-cause mortality and cancer-specific mortality.** Evidence continues to mount that quitting smoking after a cancer diagnosis is causally associated with reduced all-cause mortality and cancer-specific mortality, in comparison with continued smoking. The studies reviewed in this monograph confirm and expand upon findings of the 2014 and 2020 Surgeon General’s reports regarding this topic. Laboratory studies provide insight into the mechanisms by which smoking may increase tumor aggressiveness and decrease cancer treatment effectiveness.
2. **Research from the general population indicates that patients with cancer who smoke will benefit from smoking cessation treatments, including both counseling and U.S. Food and Drug Administration (FDA)–approved medications.** Smoking cessation counseling and medication have been shown to be effective in diverse populations of people who smoke. This substantial evidence, including some studies with cancer patients, clearly supports the delivery of evidence-based smoking cessation treatment as an essential component of cancer care.
3. **Effective strategies exist to increase the delivery of smoking cessation treatment in cancer care settings.** Barriers identified by cancer care clinicians include lack of time, lack of specialized training to deliver smoking cessation treatment options, misconceptions about patients’ intentions to quit, and difficulties with health insurance reimbursement. Multiple strategies, including use of EHR-based clinical workflow tools, can be adopted to address tobacco use for every patient across the cancer care continuum, including those who are screened for or diagnosed with cancer. These strategies can improve the identification of patients who smoke, the offer of smoking cessation

treatment, and the delivery of or referral for smoking cessation treatment and can do so in a low-burden, efficient manner.

4. **Evidence-based smoking cessation treatment should be systematically provided to all patients with cancer, regardless of the type of cancer. However, patients with cancer are not consistently offered and provided such treatment.** Many national and international cancer organizations recommend addressing smoking among patients with cancer and provide guidance to cancer care clinicians for effectively delivering smoking cessation treatment. However, the implementation of these evidence-based recommendations has been inconsistent and incomplete, highlighting the need to identify and address barriers to providing smoking cessation intervention that exist for both cancer care clinicians and health care systems.
5. **Continued smoking after a cancer diagnosis is associated with higher health care utilization and greater health care costs in comparison with quitting smoking.** Direct non-health care costs, such as transportation and caregiving, may also be increased with continued smoking after a cancer diagnosis. Smoking cessation interventions in patients with cancer are highly likely to be cost-effective.
6. **Medically underserved and vulnerable populations of cancer patients who smoke are very likely to benefit from using the evidence-based smoking cessation treatments identified as effective in the general population of people who smoke.** Medically underserved and vulnerable populations are faced with multiple factors at the individual, community, institutional or health care system, and societal levels that may impede access to smoking cessation treatment and cessation success. Importantly, substantial evidence indicates that medically underserved and vulnerable populations overall (i.e., noncancer populations) benefit from evidence-based smoking cessation treatment, providing evidence that these populations with cancer will benefit as well.
7. **The tobacco product marketplace and consumer use patterns are changing for both the general population and for patients with cancer, posing challenges for researchers and cancer care clinicians.** Research is needed to monitor the use and effects of diverse tobacco products, both conventional and new, by patients with cancer, including their effects on smoking cessation and relapse and their potential deterrence of patients' using evidence-based smoking cessation treatments such as counseling and FDA-approved medications.
8. **Continued research is needed to identify effective cessation interventions for patients with cancer who smoke and to better understand the effects of smoking cessation on cancer outcomes.** Relatively few well-powered randomized controlled trials of smoking cessation treatments in patients with cancer have been conducted. Additional research is needed to identify: the effectiveness of smoking cessation interventions in increasing abstinence among patients with cancer, including which intervention strategies are most effective; the effects of smoking cessation treatment and resulting abstinence on cancer-related outcomes (e.g., all-cause and cancer-specific mortality); and health care system changes and implementation strategies that are especially effective in engaging patients with cancer in evidence-based smoking cessation treatment.

## Chapter Summaries and Conclusions

The following section summarizes each chapter within this monograph and presents the chapters' conclusions.

### Chapter 1: Introduction and Overview

Chapter 1 introduces the monograph, describes its framework, and explains how it was prepared and organized. The chapter also presents the evidence base regarding smoking and cancer outcomes from the 2014 and 2020 Surgeon General's reports as well as studies conducted since then that have examined the association between quitting smoking and all-cause mortality.

### Chapter 2: Smoking in Patients With Cancer: Biological Factors

A strong body of research documents the biological rationales for addressing tobacco use in cancer care. Chapter 2 provides a brief overview of the relationship of smoking to the biological aspects of cancer, including the relationship between cigarette smoke and tumorigenesis, biological characteristics of lung cancers in smokers and never-smokers, and the effects of cigarette smoke exposure on cancer cells.

#### *Conclusions*

1. Tobacco smoke contains more than 7,000 chemical compounds including approximately 70 that are carcinogenic. Continued exposure to tobacco smoke after a cancer diagnosis may promote the continued growth and transformation of tumor cells through a variety of mechanisms.
2. Tumors in smokers are often biologically distinct from tumors in nonsmokers. In the case of lung cancer, these differences have important implications for cancer treatment and prognosis.
3. Laboratory studies of cancer cells exposed to tobacco smoke or tobacco smoke constituents provide experimental evidence that continued smoking by patients with cancer increases tumor aggressiveness and reduces therapeutic response.

### Chapter 3: Treating Tobacco Use and Dependence in Cancer Populations

This chapter extracts evidence from cancer populations and from the general smoking population literature to identify elements of effective smoking cessation treatments that can be applied to patients across the cancer care continuum who smoke.

#### *Conclusions*

1. Despite the heightened risks for adverse cancer-related outcomes due to continued smoking after a cancer diagnosis, too few patients with cancer who smoke are offered evidence-based smoking cessation treatment and too few engage in such treatment.
2. Patients with cancer who smoke generally have strong motivation to quit, and a high percentage make one or more quit attempts during their cancer treatment.

3. Research with the general population of individuals who smoke has identified effective smoking cessation intervention strategies, including counseling, medications, and web-based and short message service (SMS) (text) digital interventions.
4. Although more research on the effectiveness of smoking cessation treatments in cancer populations is needed, the consistent effects of these treatments across diverse populations who smoke suggests that they are likely effective in cancer populations as well. Smoking cessation treatments may benefit from adaptation (e.g., addressing fatalism and depression) to best meet the needs of cancer populations and provide optimal benefit.
5. The combination of cognitive behavioral therapy (CBT) counseling with either nicotine replacement therapy (NRT) or varenicline is an especially effective smoking cessation treatment among the general population of people who smoke. CBT counseling has been shown to be effective in the general population when delivered via several different routes, such as in-person, in groups, and by phone. These treatments are recommended for use with patients who smoke in the Public Health Service (PHS) Clinical Practice Guideline, *Treating Tobacco Use and Dependence: 2008 Update*, and for patients with cancer who smoke in the National Comprehensive Cancer Network (NCCN) Clinical Practice Guidelines in Oncology.
6. Patients who have been diagnosed with cancer face significant patient-level barriers to smoking cessation that include competing demands due to their cancer treatment, complications and side effects of cancer treatment, pain, psychological distress, and guilt regarding tobacco use. These barriers should be assessed and addressed in strategies used to offer and deliver smoking cessation treatment to patients with cancer.
7. Clinician-level barriers to providing smoking cessation treatment to patients with cancer include limited time per encounter, clinicians' beliefs that FDA-approved cessation medications are ineffective, and lack of confidence or training in providing smoking cessation treatment.
8. The efficacy of electronic nicotine delivery systems (ENDS) as an aid for smoking cessation for patients with cancer is not established. Additionally, the short- and long-term health effects of ENDS use (alone or in combination with cigarettes) by patients with cancer remain to be determined.
9. Many patients with cancer who try to quit smoking will relapse. Data from the general population suggest that periodic, repeated offers of additional smoking cessation treatment to patients with cancer diagnoses who have relapsed will lead to increased quit attempts and quitting success.

#### **Chapter 4: Implementing Smoking Cessation Treatment Programs in Cancer Care Settings: Challenges, Strategies, Innovations, and Models of Care**

Chapter 4 evaluates evidence on health care system strategies that can be used to implement smoking cessation treatment programs in cancer care settings. Strategies are reviewed regarding the reach and effectiveness of treatment, ease of implementation, and maintenance over time. The chapter presents an organizational framework for planning, implementing, and evaluating smoking cessation treatments within oncology health care delivery systems and describes

effective models of care, highlighting findings from the NCI Cancer Moonshot<sup>SM</sup>-supported Cancer Center Cessation Initiative (C3I).

### *Conclusions*

1. Challenges to implementing smoking cessation treatment in cancer care settings persist at the patient, clinician, and health care system levels. It is important that these multilevel barriers be understood and addressed so that health care systems can provide cessation treatment equitably and effectively to all patients with cancer who smoke.
2. Successful implementation of smoking cessation treatment in cancer care settings requires health care system changes designed to increase the reach, effectiveness, adoption, implementation, and maintenance (i.e., the RE-AIM framework) of smoking cessation treatment interventions.
3. Effective strategies to improve smoking cessation treatment reach and engagement in oncology care start with the consistent and accurate assessment of tobacco use status for all patients across the cancer care continuum. Assessment of tobacco use for all patients with cancer needs to be empathic and nonjudgmental to reduce patient anxiety, embarrassment, or guilt, and to encourage accurate disclosure of tobacco use status.
4. Clinic-wide opt-out (as opposed to opt-in) smoking cessation treatment engagement strategies show promise as a means of enhancing the reach and delivery of smoking cessation treatments to patients with cancer who smoke.
5. Clinical decision supports, prompts, and order sets embedded in electronic health records (EHRs) can improve the rate of both screening for tobacco use and delivering smoking cessation treatments. Such EHR tools can aid in the delivery of smoking cessation treatment, either as part of the cancer care or via a referral to an internal health care system tobacco treatment specialist or to an external option, such as a state tobacco quitline, state quitline-provided texting program, or the National Cancer Institute's (NCI) SmokefreeTXT.
6. Health care system accreditation guidelines, publicly reported quality metrics, and pay-for-performance programs can encourage health care systems to improve the frequency of tobacco use screening and treatment for all patients who smoke, including those with cancer.
7. Research has identified multiple smoking cessation treatment program models (e.g., smoking cessation treatment delivered during cancer care or via referral to internal or external smoking cessation treatment services) that can be effectively implemented in a variety of cancer clinical settings.
8. Continued smoking after a cancer diagnosis is associated with increased health care costs relative to not smoking. Smoking cessation interventions provided to patients with cancer are highly likely to be cost-effective.
9. The NCI Cancer Center Cessation Initiative (C3I) has developed a variety of implementation strategies to enhance the reach and effectiveness of smoking cessation treatment delivery in NCI-Designated Cancer Centers. These approaches exemplify how smoking cessation treatment strategies can be implemented broadly in cancer care settings.

10. Strategies to reduce system-level barriers to cessation among patients with cancer who smoke include ensuring that evidence-based cessation treatments are provided as a covered benefit by health insurers and other payers, without barriers to access and/or use.

### Chapter 5: Addressing Smoking in Medically Underserved and Vulnerable Cancer Populations

Chapter 5 describes the cancer burden, smoking prevalence, and difficulties medically underserved and vulnerable populations face when making a quit attempt. The chapter specifically focuses on racial and ethnic minority populations, socioeconomically disadvantaged populations, sexual and gender minority (SGM) populations, rural populations, individuals with serious mental illness (SMI), and people who use alcohol or other substances.

#### *Conclusions*

1. Medically underserved and vulnerable populations face challenges at the individual, community, health care system, and societal levels that affect the likelihood that individuals will smoke, that they will develop cancer, and/or that they will receive effective smoking cessation treatment.
2. Challenges shared by many medically underserved and vulnerable individuals who smoke, including those with cancer, include poverty, high levels of stress, discrimination, lack of health insurance coverage, competing priorities, inadequate access to health care and smoking cessation treatment, and frequent exposure to smoking in their social networks and to tobacco industry marketing.
3. Patients with cancer who are also members of medically underserved and vulnerable populations are motivated to quit smoking but some of these groups tend to be less likely to be successful in their attempts to quit smoking than are cancer patients from the general population. More research is needed regarding the effectiveness of smoking cessation treatment among medically underserved and vulnerable groups of cancer patients who smoke and regarding strategies for increasing the reach and cost-effectiveness of such treatment.

#### **Future Research Directions**

This monograph has emphasized the importance of clinicians and oncology health care systems delivering smoking cessation treatment to all patients with cancer who smoke. However, key research questions remain regarding identifying, implementing, and maintaining effective smoking cessation treatments across cancer care settings; and prompting oncologists and other cancer care clinic staff to use these treatments. While not exhaustive, the research questions identified in this monograph are presented thematically below and summarized in Table 6.1.

**Table 6.1 Summary of Research Needs**

Topic	Specific Needs for Further Study	Monograph Chapter(s) With Related Content
<b>Clarifying the effects of continued smoking and smoking cessation treatment on cancer outcomes</b>	<ul style="list-style-type: none"> <li>• Effects of smoking cessation on cancer site-specific and treatment-specific health outcomes</li> <li>• Data collection on smoking status after a cancer diagnosis and tracking smoking status longitudinally through survivorship</li> <li>• Effects of smoking cessation on outcomes other than all-cause mortality</li> <li>• Biological differences between smoking-related tumors based on how exposure to cigarette smoke is received</li> </ul>	Chapter 2
<b>Assessing the economic effects of continued smoking and cessation after a cancer diagnosis</b>	<ul style="list-style-type: none"> <li>• Cost-effectiveness studies specific to cancer populations</li> <li>• Studies of smoking-attributable mortality in patients with cancer to improve the validity of parameters used in economic models</li> <li>• Economic studies to better understand the value of evidence-based smoking cessation programs in cancer care settings</li> <li>• The impact of continued smoking on the economic burden of cancer from the patient perspective</li> </ul>	Chapter 4
<b>Achieving better tobacco use assessment in cancer care</b>	<ul style="list-style-type: none"> <li>• Methods that achieve consistent assessment of tobacco use in clinical practice and in cancer treatment clinical trials</li> <li>• Objective measures of tobacco exposure and promotion of standard definitions of current smoking status for cancer patients and survivors to improve tobacco use assessment</li> </ul>	Chapter 4
<b>Addressing barriers to the implementation of effective treatment of tobacco use in cancer care</b>	<ul style="list-style-type: none"> <li>• Well-powered randomized controlled trials that provide additional experimental evidence on the effectiveness of smoking cessation treatments in patients with cancer</li> <li>• Barriers that discourage patient involvement in smoking cessation treatment in cancer care</li> <li>• Identification and tests of acceptable, effective, and scalable strategies to improve implementation of smoking cessation treatment in cancer care settings</li> <li>• Strategies that improve adherence to smoking cessation pharmacotherapy among patients with cancer</li> <li>• System-wide barriers, including payer barriers, that reduce clinician involvement in smoking cessation treatment in cancer settings</li> </ul>	Chapters 3 and 4
<b>Understanding the effects of new tobacco products and other drug use in patients with cancer</b>	<ul style="list-style-type: none"> <li>• Whether use of electronic nicotine delivery systems (ENDS) or other new tobacco products poses unique risks to patients with cancer and affects the success of their cancer treatment</li> <li>• Whether the use of ENDS has an impact on the motivation of patients with cancer to use U.S. Food and Drug Administration (FDA)-approved smoking cessation medications and/or cessation counseling</li> <li>• Expansion of current assessment measures to include other tobacco products</li> <li>• Evaluation of the effectiveness of evidence-based smoking cessation treatments for cancer patients and survivors who engage in dual and co-occurring substance use</li> <li>• Characterization of patterns of cannabis use among patients with cancer and the health effects of such use, and studies to guide the clinical management of patients with cancer who smoke and also use cannabis products</li> </ul>	Chapter 3

Table 6.1 (continued)

Topic	Specific Needs for Further Study	Monograph Chapter(s) With Related Content
<b>Optimizing smoking cessation treatment for medically underserved and vulnerable populations with cancer</b>	<ul style="list-style-type: none"> <li>• Methods to enhance the reach and engagement of smoking cessation treatment for such populations in cancer care settings</li> <li>• Effects of training cancer care clinicians in social and cultural competencies on the reach and effectiveness of smoking cessation treatment</li> <li>• Factors that discourage smoking cessation treatment participation in these populations and evaluation of strategies that address such barriers</li> <li>• Facilitators of quitting success among patients with cancer with different types of psychiatric disorders</li> </ul>	Chapter 5

### Clarifying the Effects of Continued Smoking and Smoking Cessation Treatment on Cancer Outcomes

Studies included in this monograph advance the understanding of the effects of smoking on cancer patient outcomes. Evidence suggests that smoking increases tumor aggressiveness and decreases cancer treatment effectiveness for therapies such as radiotherapy and chemotherapy. The monograph also adds to evidence that smoking cessation after a diagnosis of cancer is highly likely to improve overall mortality. However, additional research is needed on the effects of smoking cessation on cancer site-specific and treatment-specific health outcomes. Relatively few studies on outcomes of cancer treatment have collected data on smoking status after a cancer diagnosis or tracked smoking status longitudinally, and there is a dearth of research on the effects of smoking cessation on outcomes other than all-cause mortality. Similarly, more research is needed to understand whether there are biological differences between smoking-related tumors based on whether they receive exposure to cigarette smoke directly, through the circulatory system, or a combination of both. Much of the research to date has also focused on earlier stages of cancer, and it is important to understand how cessation versus continued smoking affect advanced stages of cancer. Such research would yield more informative data on the relationship between smoking cessation and improved outcomes among patients with cancer.

### Assessing the Economic Effects of Continued Smoking and Cessation After a Cancer Diagnosis

Similarly, as detailed in chapter 4, further research on the economic effects of continued smoking and cessation after a cancer diagnosis would be useful. As part of such analyses, additional information is needed on smoking-attributable mortality in patients with cancer to improve the validity of the parameters used in economic models. Although a few modeling studies provide estimates of the impact of continued smoking by patients with cancer, more studies are needed to assess the economic effects of smoking cessation among patients with cancer. Further, it is vital to conduct economic evaluations to better understand the value of evidence-based smoking cessation programs. Cost-effectiveness studies in the general smoking population may not provide accurate cost-effectiveness and cost-benefit data for cancer populations. Patients with cancer, for instance, may differ from the general population on factors such as higher quit rates in the absence of smoking cessation treatment, greater stress and affective distress, greater relapse rates over time, costs associated with cancer treatment, and the burden of imminent and

taxing medical treatment. Any of these factors might affect smoking cessation treatment success or the costs and cost-effectiveness associated with it.

More studies are also needed to evaluate the effects of different types and intensities of smoking cessation interventions on outcomes in patients with cancer, including the use of less costly intervention modalities (e.g., technology-based interventions). Additionally, future research should investigate the impact of continued smoking on the economic burden of cancer from the patient perspective.

### **Achieving Better Tobacco Use Assessment in Cancer Care**

Additional research is needed to identify methods that achieve consistent assessment of tobacco use in clinical practice and in cancer treatment clinical trials. Research should also focus on identifying methods to measure smoking, how to implement those methods in clinical settings, and how the accuracy of smoking status assessment in cancer care settings affects the reach of smoking cessation treatment. Assessment should include objective measures of tobacco exposure and standard definitions of current smoking status. A detailed assessment of smoking behavior after a cancer diagnosis should include assessment of recent quitting status, short-term abstinence (e.g., during hospitalization, chemotherapy treatment), relapse, amount smoked, type of tobacco product(s) used, and current smoking status of others within the patient's household. Further, assessing short- and long-term health outcomes is particularly important given the persistent elevation in risk of illnesses caused by smoking (both cancer and noncancer), underscoring the need for continued monitoring of patients once they successfully quit smoking. Researchers may make use of the Cancer Patient Tobacco Use Questionnaire (C-TUQ), developed jointly by NCI and the American Association for Cancer Research.<sup>1</sup>

### **Addressing Barriers to the Implementation of Effective Treatment of Tobacco Use in Cancer Care**

Most research evaluating smoking cessation treatments in patients with cancer has involved small samples or nonrandomized trials. Despite some evidence that indicates that smoking cessation treatment can be effective in patients with cancer, there is a need for well-powered randomized controlled trials that provide additional experimental evidence on the effectiveness of smoking cessation treatments in patients with cancer. Studies that examine the effectiveness of different types of smoking cessation treatments will help clarify those that are especially effective and cost-effective with cancer populations. Studies are also needed to ensure that such cessation treatment strategies are effective with medically underserved and vulnerable populations who constitute a large percentage of the cancer patient population and typically have high smoking rates. Also, while many patients with cancer are motivated to quit using tobacco, many are reluctant to engage in formal treatment. Further exploration of the barriers that discourage patient involvement in smoking cessation treatment in cancer care are warranted.

Further research is needed to identify and test acceptable, effective, and scalable strategies to improve implementation of smoking cessation treatment in cancer care settings. One approach would be to use highly efficient and pragmatic research designs and methods to explore different approaches to smoking cessation treatment delivery in cancer care settings. Also, telehealth and digital strategies may be particularly helpful approaches when travel or time constraints are barriers to patients receiving in-clinic treatment. The ability of digital interventions to enhance

the effects of other treatment approaches (i.e., serve as adjuvants or treatment extenders) should also be explored. Similarly, additional research is needed to optimize implementation of eReferral to programs such as NCI's SmokefreeTXT to determine their effects on smoking cessation among patients with cancer. Finally, it is important that researchers explore the role of the entire cancer care clinical team in delivering smoking cessation treatment. For instance, involving the patient's cancer care team can often increase the reach and effectiveness of smoking cessation treatment.

Adherence to smoking cessation pharmacotherapy is a frequent problem among people in the general population who smoke. It may be especially problematic for patients with cancer who smoke given their additional challenges (e.g., cancer treatment side effects, time pressures, distraction by cancer treatment needs). Research on strategies that improve adherence to smoking cessation pharmacotherapy among patients with cancer would address an important impediment to greater smoking cessation success in this population. Additionally, research on effective strategies to prompt clinicians to prescribe evidence-based smoking cessation pharmacotherapy for all patients with cancer who smoke, including an opt-out provision of cessation medications, is needed. These strategies could build on the foundation of evidence-based referral approaches such as "Ask, Advise, Connect" that can be implemented via EHR enhancements such as eReferral.

While the evidence base is still developing for cancer patient-specific approaches to smoking cessation treatment, a robust evidence base exists for the general population of people who smoke that can guide intervention. While basic cognitive behavioral or skills-based training approaches have been demonstrated to be effective with multiple populations of individuals who smoke, other approaches might be even more effective in the cancer care setting. Patients with cancer may be especially likely to experience feelings of guilt over their smoking, as well as fear and depression resulting from their cancer diagnosis. Interventions such as mindfulness training or cognitive behavioral interventions for negative affect might be helpful adjuvants to smoking cessation treatment.

The considerable research reviewed in chapter 4 has identified health care system changes that can significantly enhance smoking assessment, as well as patient engagement and cessation treatment success in cancer care settings. Further research is needed to explore how such approaches can be used to improve implementation of smoking cessation treatment in the cancer care context. Specific issues pertaining to cancer populations include: 1) how to best use the EHR to enhance tobacco use assessment, treatment engagement, and treatment success; 2) what implementation strategies result in high and sustained levels of tobacco intervention engagement and cessation success; and 3) how different intervention models such as point-of-service clinician approaches can be integrated with models that refer patients with cancer who smoke to an internal or external treatment program, with the goal of enhancing treatment engagement and cessation success.

Understanding the system-wide barriers that reduce clinician involvement in smoking cessation treatment in cancer care settings is an important first step toward addressing such barriers. For example, additional implementation studies on sustainable funding approaches for smoking cessation treatment under various reimbursement models may shed light on the most feasible options.

## Understanding the Effects of New Tobacco Products and Other Drug Use in Patients With Cancer

The tobacco product landscape is expected to continue to change over time, and it is anticipated that new products will enter the marketplace. Researchers and clinicians alike need to be vigilant and nimble regarding the impact of changing tobacco product use patterns in cancer populations. For example, most patients with cancer and those with a cancer history who use ENDS report doing so to help them quit smoking and because they perceive them to be safer than cigarettes (similar to people without a cancer diagnosis). The short- and long-term health effects of ENDS and other new tobacco products (such as heated tobacco products) for patients with cancer is an important understudied topic. More research is warranted to determine whether use of ENDS or other new tobacco products poses unique risks to patients with cancer and affects the success of their cancer treatment. Research findings on the risks and potential benefits of ENDS and other new tobacco product use can inform communication between clinicians and patients.

It is also important to determine whether the use of ENDS has an impact on the motivation of patients with cancer to use FDA-approved smoking cessation medications and/or cessation counseling. This research could help shed light as to whether ENDS or ENDS marketing strategies negatively influence the uptake and successful use of safe and effective evidence-based smoking cessation treatments.

Although cigarette smoking remains the predominant form of tobacco use among cancer patients and survivors, cigarettes may be used in conjunction with other tobacco products, as well as with alcohol and other drugs. Poly tobacco use, defined as the use of multiple tobacco products, is common,<sup>2</sup> highlighting the need to evaluate such use among cancer patients and survivors. Specifically, two areas for future research include the following: 1) expanding current assessment measures to include other tobacco products (e.g., ENDS, heated tobacco products, cigars, little cigars and cigarillos, smokeless tobacco, dissolvable tobacco, waterpipes) as well as alcohol and other drug use; and 2) evaluating the effectiveness of evidence-based smoking cessation treatments for cancer patients and survivors who engage in dual and co-occurring substance use.

As briefly discussed in chapter 5, the use of cannabis may affect smoking cessation among patients with cancer who smoke. There is limited research evidence regarding cannabis use among patients with cancer who smoke. Research is urgently needed that characterizes patterns of cannabis use among patients with cancer and the health effects of use, including the potential to interfere with smoking cessation treatment. Research is also needed to guide the clinical management of patients with cancer who smoke cigarettes and use cannabis products, including counseling patients on the efficacy and harms of cannabis for symptom management.

## Optimizing Smoking Cessation Treatment for Medically Underserved and Vulnerable Populations With Cancer

Chapter 5 concludes that certain sociodemographic groups suffer disproportionately from smoking-related cancers, are especially unlikely to receive evidence-based smoking cessation treatment, and experience high levels of stress and other challenges that can reduce smoking cessation success. Research is needed to explore methods to enhance the reach and engagement of smoking cessation treatment for such populations in the cancer care context and to increase their success in quitting. Innovative methods are needed to inform these populations about the

effects of continued tobacco use on their cancer and to increase their knowledge of the effectiveness and importance of smoking cessation treatment as part of their cancer care. Similarly, randomized controlled trials evaluating evidence-based smoking cessation treatments in rural patients with cancer could identify opportunities to improve cessation treatment reach and effectiveness among this population. Research efforts with medically underserved and vulnerable populations may need to consider the following subgroups.

**Racial and Ethnic Populations.** Far too little is known about the smoking patterns of specific racial and ethnic groups following a cancer diagnosis, or their responses to smoking cessation treatment. It is important to note that researchers' categorization of racial and ethnic groups can vary, sometimes making it difficult to compare smoking prevalence across studies. More research is needed on the use and effects of different smoking cessation treatment approaches with such groups in cancer populations and how such treatment affects cancer recovery and outcomes. Future research should develop multilevel ecological and system-wide models that can help researchers and clinicians understand and intervene to address tobacco-related health disparities, including those among cancer patients and survivors. Appropriate and standardized tobacco product use assessment, such as use of EHR-enabled prompts and surveillance strategies, could be used to enhance the accurate assessment of smoking among cancer patients and survivors from diverse racial and ethnic populations and to monitor their inclusion in smoking cessation treatment programs and clinical trials. Exploration of the effects of training cancer care clinicians in social and cultural competencies on the reach and effectiveness of smoking cessation treatment is also warranted.

**Sexual and Gender Minority (SGM) Populations.** SGM populations experience poorer health outcomes, including cancer-related outcomes, compared with the general population. At present, there is limited research focused on tobacco use among patients with cancer who identify as SGM. In particular, very little is known about how tobacco use affects cancer and its treatment among transgender people, representing a major gap in the literature. Improved and expanded measures, including EHR tools, to better assess and document sexual orientation and gender identity should be explored as a means of alerting clinicians to SGM status and to help promote the equitable inclusion of all SGM groups in smoking cessation programs. There is a need for increased attention to the smoking cessation treatment needs of SGM patients with cancer, and more robust empirical findings to support health system initiatives aimed at health equity for this population. Additionally, it is important to determine the acceptability and effectiveness of evidence-based smoking cessation treatments in SGM groups.

**Childhood and Adolescent and Young Adult (AYA) Cancer Survivors.** There is limited research on evidence-based cessation interventions for adult survivors of childhood and AYA cancer. These populations are at substantial risk for delayed effects from their cancer treatment, many of which are exacerbated by tobacco use. Despite the serious risks, smoking is not uncommon among survivors of childhood and AYA cancer, indicating a need to further examine the personal factors as well as the interpersonal, community, and organizational factors that influence their smoking.

**Serious Mental Illness (SMI) and Cancer-Related Psychological Distress.** Research is needed to better define the prevalence of psychiatric disorders in cancer patients and survivors and the smoking prevalence among cancer populations with psychiatric disorders. It is also vital to

determine the reach of smoking cessation treatments in this population and whether such individuals are equitably offered such treatment in cancer care settings. This research need is especially great for those with SMI. Research is also needed to identify the factors that discourage smoking cessation treatment participation in this population and to evaluate strategies that address such barriers. In addition, research to evaluate the facilitators of quitting success in those with different types of psychiatric disorders in the cancer patient population is needed. Psychological distress is very common among patients who have cancer. As noted in chapter 5, the evidence base in this area is dated and could benefit from additional studies.

## NCI Initiatives to Support Implementation of Smoking Cessation Treatment in Cancer Care and Screening Settings

As described above, several topics require further research and consideration to improve the identification and delivery of smoking cessation treatment to those at high risk of cancer, patients with cancer, and cancer survivors. To address some of these challenges, NCI established two initiatives to further the implementation of tobacco use assessment and interventions for smoking cessation treatment.

### Cancer Center Cessation Initiative (C3I)

As discussed in detail in chapter 4, as part of the Cancer Moonshot<sup>SM</sup>, NCI launched an effort to promote smoking cessation treatment at NCI-Designated Cancer Centers. The goal of C3I is to ensure that every patient with cancer is asked about their tobacco use status during cancer care and that all patients with cancer who smoke are provided with smoking cessation treatment. Since 2017, 52 NCI-Designated Cancer Centers have received C3I funding. An additional goal of the initiative is to identify and summarize best practices to enhance smoking cessation treatment interventions in cancer care settings that can be shared with cancer treatment facilities across the United States.

Key features of C3I include:

- Funded centers must take a population-based approach; that is, the aim is that every patient with cancer who smokes and presents to the cancer center will be identified, urged to quit, offered evidence-based tobacco treatment, and tracked in terms of treatment outcomes.
- Centers must take a systems-based approach, integrating evidence-based tobacco treatment into cancer care workflows and utilizing EHR technology to facilitate that integration.
- Centers are required to address program sustainability; that is, have a plan that sustains the program after NCI funding ends.

A key component of C3I is identifying strategies to effectively implement tobacco cessation treatment in cancer care settings. Each funded cancer center was provided with the flexibility to establish its own approach to tobacco treatment, thus creating an opportunity to determine how a variety of intervention models can affect smoking interventions in cancer care settings.<sup>3</sup>

### Smoking Cessation at Lung Examination (SCALE) Collaboration

Integrating smoking cessation treatment across the cancer care continuum entails integrating such interventions into lung cancer screening settings. The lung cancer screening setting differs from traditional smoking cessation treatment settings in multiple ways. For example, patients who smoke and present for lung cancer screening are typically older with a longer history of tobacco use than tobacco users in the general population. Many are not seeking or expecting smoking cessation treatment intervention efforts as part of their screening. The screening context presents the opportunity to tailor treatment based on screening results. Studies should pursue this opportunity, capitalizing on the teachable moment framework (see chapter 4), but with attention to potential unintended consequences of a negative screening test. Efforts should also focus on reducing the possibility of relapse among former smokers who receive normal screening results; proactive efforts to curtail relapse will likely enhance the individual and population health benefits of lung cancer screening.

The expanded U.S. Preventive Services Task Force (USPSTF) low-dose computed tomography (LDCT) lung cancer screening recommendations<sup>4</sup> increased the number of screening-eligible patients, which may accelerate screening and lead to earlier identification of some lung cancers and lower mortality rates. Many of the eligible patients are current or former smokers at risk of relapse and will need continuing treatment over time.

In response to these needs, NCI has funded seven trials of smoking cessation treatment for people undergoing LDCT lung cancer screening. The investigators of these trials form the SCALE Collaboration, created to support the sharing of methods and data to facilitate cross-project research on lung cancer screening and cessation outcomes. SCALE collaborators also share best practices for measuring feasibility, cost, and other implementation outcomes. Collaborators work together to disseminate the results of their findings and related resources.<sup>5</sup>

### Conclusion

Tobacco use remains prevalent among patients across the cancer care continuum. Importantly, patients with cancer who smoke can experience multiple benefits of quitting, regardless of the severity of disease or time since diagnosis. Quitting smoking improves the likelihood of survival, quality of life, and overall health of people with cancer, highlighting the importance of identifying tobacco use status and providing smoking cessation treatment to every patient with cancer who smokes. Many cancer patients and survivors, as well as their clinicians, underestimate the risks of continued smoking after a cancer diagnosis. Clinicians and cancer care teams can play an important role in assessing tobacco use and providing evidence-based smoking cessation treatment to their patients who smoke as a means of improving their health outcomes.

More research is needed to determine how to better assess and intervene with individuals who smoke across the cancer care continuum. Additional research is also needed to evaluate whether smoking cessation treatments documented as effective in the general population are also effective in patients with cancer. Addressing the research gaps described in this chapter will contribute to improving the treatment of tobacco use among cancer patients and survivors. This monograph describes multiple evidence-based smoking cessation treatment interventions that have been shown to be highly effective across a range of populations and settings. The monograph provides strategies to overcome patient-, clinician-, and systems-level challenges to

implement smoking cessation treatment efficiently, equitably, and sustainably in cancer care settings. Providing patients with cancer who smoke with smoking cessation treatment holds great promise to improve both the length and quality of their lives.

## References

1. Land SR, Toll BA, Moinpour CM, Mitchell SA, Ostroff JS, Hatsukami DK, et al. Research priorities, measures, and recommendations for assessment of tobacco use in clinical cancer research. *Clin Cancer Res* 2016; 22(8): 1907-13.
2. U.S. Department of Health and Human Services (USDHHS). Smoking cessation: a report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2020.
3. Croyle RT, Morgan GD, Fiore MC. Addressing a core gap in cancer care—the NCI Moonshot program to help oncology patients stop smoking. *N Engl J Med*. 2019;380(6):512-15. doi: 10.1056/NEJMp1813913.
4. U.S. Preventive Services Task Force, Krist AH, Davidson KW, Mangione CM, Barry MJ, Cabana M, et al. Screening for lung cancer: U.S. Preventive Services Task Force recommendation statement. *JAMA*. 2021;325(10):962-70. doi: 10.1001/jama.2021.1117.
5. National Cancer Institute [Internet]. Bethesda (MD): NCI; 2022 [cited 2022 Feb 15]. Smoking cessation at lung examination: the SCALE Collaboration; [about 5 screens]. Available from: <https://cancercontrol.cancer.gov/brp/tcrb/scale-collaboration>.