Treating Smoking in Cancer Patients: An Essential Component of Cancer Care—The New National Cancer Institute Tobacco Control Monograph

Douglas R. Lowy, MD[1]; Michael C. Fiore, MD, MPH, MBA[2,3]; Gordon Willis, PhD[1]; Kristen N. Mangold, MSW[1]; Michele H. Bloch, MD, PhD[1]; and Timothy B. Baker, PhD[2,3]

QUESTION ASKED: Continued smoking after a cancer diagnosis imposes significant harms, such as poorer treatment efficacy and adverse health outcomes, including mortality; smoking cessation markedly decreases these harms, thereby improving cancer prognosis and other health outcomes. However, most cancer care settings do not provide consistent and effective tobacco use treatment to their patients with cancer who smoke.

SUMMARY ANSWER: Numerous effective strategies to overcome patient-, clinician-, and system-level barriers to smoking cessation treatment in cancer care settings are available, and these can increase the delivery of or referral to cessation treatment in a low-burden, efficient manner. Patients who smoke can benefit from smoking cessation treatments, including both counseling and US Food and Drug Administration–approved medications, and these should be consistently provided to all patients with cancer, regardless of cancer type.

WHAT WE DID: The National Cancer Institute (NCI) commissioned Tobacco Control Monograph 23, *Treating Tobacco Use in Cancer Patients: An Essential Component of Cancer Care*, to provide a rigorous summary of the science regarding smoking cessation treatment effectiveness and implementation models for such treatment, and to identify research needed to enhance smoking cessation treatment in cancer care settings. The Monograph editorial team reviewed and synthesized evidence on the relationship of smoking to the biology of cancer, treating tobacco use and dependence in cancer populations, implementing smoking cessation treatment programs in cancer care settings, and addressing smoking in medically underserved and vulnerable cancer populations. In addition, the editorial team reviewed the experience of the NCI Cancer Moonshot℠–funded Cancer Center Cessation Initiative, which provides real-world examples of how to address the challenges of integrating smoking cessation treatment into cancer care.

WHAT WE FOUND: Smoking cessation after the diagnosis of cancer is highly likely to reduce both all-cause mortality and cancer-specific mortality and may also reduce the cost of cancer care. For this reason, smoking cessation should be a high priority for patients with cancer, clinicians, and cancer care settings.

BIAS, CONFOUNDING FACTORS, DRAWBACKS: The Monograph focuses primarily on addressing cigarette smoking because it is the most common form of tobacco use among adults, and the form of tobacco use for which the most cessation data exist. However, the tobacco product marketplace and consumer use patterns are changing for the general population and for patients with cancer, posing challenges to both clinicians and researchers. Additionally, the Monograph acknowledges that there is at present limited evidence on how best to adapt existing smoking cessation treatments for diverse populations of patients with cancer, including medically underserved and vulnerable populations.

REAL-LIFE IMPLICATIONS: Tobacco use remains prevalent among patients across the continuum of cancer care, from screening, through treatment, to survivorship. NCI Tobacco Control Monograph 23, *Treating Smoking in Cancer Patients: An Essential Component of Cancer Care*, affirms that increased smoking cessation in the cancer care setting has the potential to yield multiple benefits, including better tolerance of cancer treatment, better cancer treatment outcomes, reduced development of second primary tumors, reduced all-cause and cancer-specific mortality, and improved quality of life. Patients and their cancer care team should recognize that smoking cessation treatment is an essential component of high-quality cancer care.

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CORRESPONDING AUTHOR

Michele H. Bloch, MD, PhD, Tobacco Control Research Branch, National Cancer Institute, National Institutes of Health, 9609 Medical Center Drive, Rockville, MD 20850; e-mail: blochm@mail.nih.gov.

FOCUS ON QUALITY

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abstract

PURPOSE Continued smoking after the diagnosis of cancer can markedly worsen oncology treatment side effects, cancer outcomes, cancer mortality, and all-cause mortality. Conversely, mounting evidence demonstrates that smoking cessation by patients with cancer improves outcomes. A cancer diagnosis often serves as a teachable moment, characterized by high motivation to quit. However, too few patients with cancer who smoke are offered evidence-based smoking cessation treatment, and too few engage in such treatment.

METHODS AND MATERIALS The National Cancer Institute commissioned Tobacco Control Monograph 23, *Treating Smoking in Cancer Patients: An Essential Component of Cancer Care*, to review and synthesize the evidence that clarifies the need to intervene with smoking in cancer care.

RESULTS Although many patients with newly diagnosed cancer who smoke make quit attempts, many of these are unsuccessful, and among those who successfully quit, relapse is common. Indeed, an estimated 12.2% of adults ever diagnosed with cancer reported they currently smoked (National Health Interview Survey, 2020). Patients with cancer who smoke are likely to benefit from smoking cessation treatments, including counseling and US Food and Drug Administration–approved medications, and there are many effective strategies to increase delivery of smoking cessation treatment in cancer care settings.

CONCLUSION Smoking cessation is among the most effective treatment options for improving the likelihood of survival, quality of life, and overall health of patients with cancer who smoke. It is important for cancer care clinicians and patients to realize that it is never too late to quit smoking and that there are clear benefits to doing so, regardless of cancer type.

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INTRODUCTION

For more than half a century, tobacco use has been known to cause a broad range of cancers and other adverse health outcomes,[1,2] with cigarette smoking being the predominant causal agent. Despite substantial declines in adult tobacco use over many decades, cigarette smoking *remains* the leading cause of preventable disease and premature death,[2] accounting for about 30% of all cancer deaths in the United States.[3,4] While smoking is unequaled as a preventable cause of cancer, there has been a paradoxical lack of focus on reducing smoking among patients diagnosed with cancer, perhaps because the adverse effects of smoking in this population may not be widely recognized.

About half of patients with cancer report a history of smoking and 10%-18% report current smoking.[5-7] Many patients with cancer try to quit smoking without formal smoking cessation treatment, and data show that, in general, about half or more of patients with cancer are unsuccessful in their attempts to do so.[8,9] Unfortunately, a failure to quit is highly consequential. The 2014 and 2020 Surgeon General's reports documented that smoking by patients with cancer poses substantial risks for their recovery from cancer and their well-being.[2,10] Continued smoking following a cancer diagnosis increases the risk of cancer-related mortality and the risk of mortality due to other causes, such as heart disease, noncancer pulmonary disease, and stroke.[2,11] Furthermore, continued smoking increases the risk of cancer recurrence, second primary cancers, and adverse treatment-related outcomes, including postoperative pulmonary complications, poor surgical healing, and decreased response to systemic drugs and

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radiation, all of which lead to poorer outcomes and higher health care costs.[12-14] These findings have led to calls to designate smoking cessation treatment as the Fourth Pillar of Cancer Care, along with surgery, chemotherapy/immunotherapy, and radiation therapy.[15]

METHODS

To focus attention on and address continued smoking by patients with cancer, the National Cancer Institute (NCI) commissioned Tobacco Control Monograph 23, *Treating Smoking in Cancer Patients: An Essential Component of Cancer Care*.[16] This Monograph leverages and builds upon the Surgeon General's reports and other evidence by (1) providing a brief overview of the relationship of smoking to cancer outcomes and biological aspects of cancer, (2) reviewing and evaluating the evidence that smoking cessation treatment enhances cessation rates for patients who smoke in general and for patients with cancer in particular, (3) describing and evaluating strategies that have the potential to enhance the delivery of smoking cessation treatment in the cancer care context, (4) identifying medically underserved and vulnerable populations that have high cancer burdens and evaluating their success in quitting and the special challenges they face in doing so, and (5) identifying important research gaps. The Monograph is aimed at researchers, clinicians, health care systems, policymakers, funding agencies, patients with cancer and survivors, and other stakeholders. It is intended to present these audiences with research findings, implementation models, and clear research needs to help support researchers and practitioners in addressing smoking in cancer care.

Cigarette smoking by patients with cancer deserves focused attention for multiple reasons. One is the danger posed by both smoking and cancer in this population, as smoking may adversely affect the biology of the cancer, may interfere with cancer treatment or reduce its success, and may lead to harmful cancer treatment side effects. Moreover, while considerable progress has been made in increasing the delivery of smoking cessation treatment in primary care and other health care settings, less has been made in oncology settings. Finally, the unique characteristics of patients with cancer require a targeted analysis of smoking and cessation treatment in this group. People with cancer who smoke are often highly nicotine-dependent, and the presence of depression, pain, anxiety, fatalism, or treatment side effects may influence their motivation and ability to quit smoking and maintain long-term smoking abstinence.

The Monograph is part of a larger effort by the NCI to address smoking by patients with cancer. Central to that effort is the Cancer Moonshot[SM]–funded NCI program, the *Cancer Center Cessation Initiative* (C3I).[17] Since 2017, NCI has invested almost $30 million US dollars in C3I to increase the delivery of smoking cessation treatment to patients with cancer, including underserved and vulnerable cancer populations. Since C3I's inception, 52 NCI-Designated Cancer Centers have been funded, and over 75,000 patients with cancer at these centers have received evidence-based cessation treatment services. C3I is also increasing the scientific evidence-base regarding smoking cessation treatment in the context of oncology care,[18-20] and the findings from this important initiative are incorporated into the Monograph.

Cigarettes are the most common form of tobacco used by adults, and they are also the type of tobacco product for which the most cessation treatment data exist. However, other forms of tobacco, such as cigars and smokeless tobacco, also play a role in the development of certain cancers, and their continued use is likely to be detrimental to patients. Polytobacco use (the use of more than one tobacco product) and co-use of tobacco with alcohol and other drugs are also common, and some patients with cancer report using e-cigarettes. Where possible, other tobacco products are discussed, and the Monograph identifies new tobacco products and other drug use in patients with cancer as important areas of focus for both clinicians and researchers.

RESULTS

The Effects of Continued Smoking Compared With Cessation

The 2020 Surgeon General's report concluded that there was suggestive evidence of a causal relationship between smoking cessation and improved all-cause mortality among patients currently smoking at the time of their cancer diagnosis on the basis of 10 studies published between 2000 and 2016.[10] This Monograph identifies an additional eight studies published between 2017 and 2021 that have examined the association between quitting smoking and all-cause mortality in patient groups diagnosed with different types of cancers.[21-28] These studies provide additional evidence that quitting smoking after a cancer diagnosis is associated with reduced all-cause mortality relative to continued smoking.

Identifying Effective Smoking Cessation Treatments

Multiple smoking cessation treatments, including both psychosocial and pharmacotherapy interventions, have been found to be consistently effective in promoting smoking cessation in the general population. This evidence strongly suggests that smoking cessation treatment will be effective and yield important benefits in patients with cancer as well. In addition, the Monograph reviews evidence on methods to enhance the effectiveness of smoking cessation treatment, respond to smoking relapse, and adapt treatment to patients receiving oncology care. However, important research gaps were also identified. For example, while it is clear that quitting smoking can greatly benefit patients with cancer, too little is known about which cessation treatments are most effective and cost-effective in patients with cancer and how they affect specific cancer outcomes, such as cancer treatment effectiveness, toxicity, and survival.

Implementation of Smoking Cessation Treatment in Oncology Care

Although continued smoking by patients with cancer increases their risk for adverse cancer outcomes, evidence reviewed for the Monograph shows that treatment for smoking is too rarely offered and delivered in cancer care settings.[15,29-33] For example, a 2019 review[34] found that few oncology clinicians recommend or arrange smoking cessation treatment or provide follow-up after a quit attempt. Low rates of addressing smoking cessation in oncology settings help explain why many cancer survivors continue to smoke. This Monograph reviews research that identifies efficient methods to meaningfully increase the delivery of smoking cessation treatment across a wide variety of medical settings (Table 1).

Vulnerable Populations

Cancers, including tobacco-related cancers, impose a high burden on individuals, families, and society. This burden is especially high in certain patient populations such as socioeconomically disadvantaged populations, people with behavioral health conditions, and some racial and ethnic minority populations.[4] This Monograph addresses how best to help these and other vulnerable and medically underserved populations that experience disparities in cancer outcomes related to smoking. It examines evidence related to their cancer burden, unique challenges that may affect their likelihood of successful smoking cessation, and their response to smoking cessation treatment.

TABLE 1. Strategies That Support the Dissemination, Adoption, and Reach of Smoking Treatment Programs in Cancer Clinical Settings

Strategies	Examples
Establish an evidence-based standard of smoking cessation care across cancer clinical delivery systems that includes	Tobacco user identification
	Advice to quit
	Provides/refers to evidence-based tobacco treatment
Measure and report the delivery of smoking treatment as performance metrics for	Clinicians
	Hospitals
	Health care system leadership
Develop resources that enable universal implementation of smoking treatment programs in cancer care settings, including strategies that	Reduce clinician burden
	Enhance clinical workflow compatibility
	Provide patients with easy access to multiple treatment options
Emphasize the delivery of smoking cessation treatment as an important evaluation criterion for oncologists and cancer clinics by professional oncology organizations	
Use EHR guides and other resources to prompt consistent smoking intervention workflows in cancer care	

Abbreviation: EHR, electronic health record.

Major Conclusions of the Monograph

On the basis of the evidence reviewed, this Monograph makes the following eight overall conclusions regarding smoking cessation treatment across the cancer care continuum:

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 Generals' 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 US Food and Drug Administration–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 patients with cancer, 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 electronic health record–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 patients with cancer 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 (ie, 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 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 US Food and Drug Administration–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 (eg, all-cause and cancer-specific mortality); and health care system changes and implementation strategies that are especially effective in engaging persons with cancer in evidence-based smoking cessation treatment.

In addition to these major conclusions, the Monograph contains numerous specific conclusions and identifies other major unmet research needs.

DISCUSSION

In summary, smoking worsens oncologic and other outcomes among patients with cancer, whereas quitting smoking brings numerous benefits. Moreover, effective smoking cessation treatments exist and can be integrated into cancer care clinical settings in multiple ways to promote cessation. Patients, families, and their clinicians should recognize that among the treatment options available to patients with cancer who smoke, smoking cessation is among the most effective in terms of improving the likelihood of survival, quality of life, and overall health. As this Monograph demonstrates, helping patients with cancer quit smoking is a fundamental, but largely unrealized, obligation of and opportunity for oncology care clinicians and programs. The strategies and research needs identified in NCI Tobacco Control Monograph 23 are intended to assist the oncology community to meet this responsibility efficiently and effectively.

AFFILIATIONS

[1]National Cancer Institute, National Institutes of Health, Bethesda, MD
[2]Center for Tobacco Research and Intervention, School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI
[3]Department of Medicine, School of Medicine and Public Health, University of Wisconsin-Madison, Madison, WI

CORRESPONDING AUTHOR

Michele H. Bloch, MD, PhD, Tobacco Control Research Branch, National Cancer Institute, National Institutes of Health, 9609 Medical Center Drive, Rockville, MD 20850; e-mail: blochm@mail.nih.gov.

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AUTHOR CONTRIBUTIONS

Conception and design: All authors
Administrative support: Timothy B. Baker
Data analysis and interpretation: Michael C. Fiore
Manuscript writing: All authors
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Open Payments is a public database containing information reported by companies about payments made to US-licensed physicians (Open Payments).

Douglas R. Lowy
Patents, Royalties, Other Intellectual Property: I am an inventor of technology that underlies the L1-based prophylactic virus-like particle (VLP) HPV vaccine and technology that underlies an L2-based candidate prophylactic HPV vaccine (Inst), Merck, GlaxoSmithKline

Michele Bloch
Patents, Royalties, Other Intellectual Property: My spouse is a co-inventor on patents obtained by the National Cancer Institute stemming from his government employment. He is now a retired federal employee (I)

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