

Tobacco Treatment Program Implementation at NCI Cancer Centers: Progress of the NCI Cancer Moonshot-Funded Cancer Center Cessation Initiative



Heather D'Angelo¹, Betsy Rolland^{1,2}, Robert Adsit³, Timothy B. Baker^{1,3}, Marika Rosenblum^{3,4}, Danielle Pauk¹, Glen D. Morgan⁵, and Michael C. Fiore^{1,3}

Abstract

Quitting smoking leads to improved outcomes for patients with cancer, yet too few patients receive cessation services during their oncology healthcare visits. The National Cancer Institute (NCI) dedicated Cancer Moonshot funding for NCI-Designated Cancer Centers to develop a population-based approach to reach all patients who smoke with tobacco treatment services. As a result, the Cancer Center Cessation Initiative (C3I) offers an unparalleled opportunity to identify effective implementation strategies and barriers to delivering tobacco treatment services across multiple clinical oncology settings. Over one year after receiving funding, the first cohort of C3I funded

Centers demonstrated progress in hiring tobacco treatment specialists, adding new tobacco treatment programs, and integrating EHR-based tobacco treatment referrals. However, tobacco treatment program reach remains low in some settings, even using a broad definition of patient engagement. Centers identified implementation challenges related to staff training needs, devising new clinical workflows, and engagement of IT leadership. Understanding implementation challenges may help other clinical oncology settings effectively implement tobacco treatment programs, leading to improved cancer outcomes by helping patients quit smoking.

Continuing to smoke after a cancer diagnosis results in poorer outcomes, including increased risk of a second primary cancer and decreased survival (1). Nearly 30% of self-identified adult cancer survivors in the United States ages 18 to 44, and 16.6% of survivors ages 45 to 64 report current cigarette smoking (2). Although the benefits of smoking cessation among patients with cancer are well documented (3), many patients with cancer are not receiving smoking cessation services within oncology healthcare settings (4–6). The National Cancer Institute (NCI) and the

American Association for Cancer Research have both recommended consistent documentation of tobacco use as a "vital sign," in the electronic health record (EHR) as an essential tool for identifying and referring smokers to a tobacco cessation treatment program (7, 8). Furthermore, the American Society of Clinical Oncology (9), the International Society of Nurses in Cancer Care (10), the National Comprehensive Cancer Network (11) and the International Association for the Study of Lung Cancer (12) all advocate for providing smoking cessation services as a part of cancer care.

Despite clear recommendations, tobacco use screening and referral to cessation services is not consistently performed in clinical oncology settings. A survey of NCI-Designated Cancer Centers found that only 38% routinely identified tobacco use as a vital sign in patient records, and only 59% had a designated tobacco treatment program within the Cancer Center (5). A survey of 28 community cancer settings found that only 39% used an optimal approach as determined by established guidelines (13) to identifying and documenting tobacco use, and only 32% linked smokers with cessation resources such as the quitline (6). Oncology providers have identified several obstacles to their lack of consistent intervention with smokers:

¹University of Wisconsin-Madison, Carbone Cancer Center, Madison, Wisconsin. ²University of Wisconsin-Madison, Institute for Clinical and Translational Research, Madison, Wisconsin. ³University of Wisconsin-Madison, Center for Tobacco Research and Intervention, Madison, Wisconsin. ⁴William S. Middleton Memorial Veterans Hospital. ⁵Department of Family Medicine, University of North Carolina at Chapel Hill.

Corresponding Author: Heather D'Angelo, University of Wisconsin-Madison, 610 Walnut St, Madison, WI 53726. Phone: 608-265-3185; E-mail: hdangelo@wisc.edu

Cancer Prev Res 2019;12:735–40

doi: 10.1158/1940-6207.CAPR-19-0182

©2019 American Association for Cancer Research.

For example, a lack of clinician education, time constraints, and a lack of smoking cessation referral resources (14, 15). In response to this gap in care, the NCI created the Cancer Center Cessation Initiative (C3I) as part of the NCI Cancer Moonshot,SM following recommendations from the Blue Ribbon Panel Implementation Science Working Group. In 2017, the first cohort of NCI-Designated Cancer Centers ("Centers") received two years of funding to implement evidence-based tobacco treatment programs for patients with cancer who smoke through a supplement to the NCI P30 Cancer Center Support Grant (16). The purpose of these administrative supplements to P30-funded Cancer Centers was to develop tobacco cessation treatment capacity and infrastructure for patients with cancer, leading to the implementation and dissemination of a sustainable, population-based tobacco cessation treatment program within the Cancer Center. By examining the implementation processes of these programs, we hope to identify key opportunities and barriers that influence implementation of tobacco treatment programs in clinical oncology settings. This focus on implementation is supported by evidence that a failure to formalize tobacco use assessment and referral to treatment is a principal impediment to the effective treatment of tobacco use in healthcare settings (5, 15). Thus, examining the implementation process of the C3I-funded Cancer Center programs allows us to identify key opportunities and barriers that influence implementation.

The C3I Coordinating Center, based at the University of Wisconsin-Madison Carbone Cancer Center, provides scientific and technical assistance to grantees in integrating evidence-based tobacco treatment services into clinical care. As part of receiving C3I funding, Centers reported data for one six-month period before receiving funding

(in 2017), then every six months during the funding period (in 2018). Centers reported tobacco treatment program characteristics (e.g., services offered, staff hired), implementation strategies, tobacco use screening rates, and the reach of tobacco treatment programs. We describe the early stages of implementation progress to highlight the changes made in tobacco treatment program characteristics among the 22 Centers in the first cohort of C3I, before (January to June 2017) and after receiving C3I funding (January to June, and July to December 2018). The study was determined to be exempt from IRB approval as there was no patient data used, and the study was categorized as program evaluation by the University of Wisconsin-Madison IRB.

Tobacco treatment programs at cancer centers: observations and discussion

The Centers varied in the level of tobacco treatment services they offered at baseline, and the types of treatment referral methods, strategies, and implementation methods used after receiving funding. The Centers showed progress in several aspects of integrating tobacco treatment services into the existing clinical workflows. After receiving C3I funding, the number of C3I-funded Centers offering any type of tobacco treatment program increased from 17 to 20 of the 22 Centers (Table 1). Eight Centers added an in-person counseling program, whereas 13 more Centers expanded to offer cessation medications as part of their tobacco treatment services. Before receiving funding, only one Center offered text- or web-based programs; after one year of funding, six Centers offered text and five offered web-based services. Centers also increased their capacity to deliver tobacco treatment services to patients, with the

Table 1. Tobacco treatment programs, staffing levels and referral methods at C3I funded NCI-Designated Cancer Centers, before and after receiving funding^a (N = 22)

	Pre-funding n (%)	18 Months post-funding n (%)
Tobacco Treatment Program Offered		
Any program offered	17 (77.2)	20 (90.9)
Quitline referral	11 (50.0)	13 (59.1)
In-person program	10 (45.5)	18 (81.8)
Cessation medication program	3 (13.6)	16 (72.7)
Integrated Voice Response	1 (4.5)	1 (4.5)
Text based program	1 (4.5)	6 (27.3)
Web resource (e.g., Smokefree.gov)	1 (4.5)	5 (22.7)
Tobacco Treatment Specialists on Staff		
1 or more part-time	8 (36.4)	15 (68.2)
1 or more full-time	4 (18.2)	10 (45.5)
Referral Method to Tobacco Treatment		
No referrals offered/given	5 (22.7)	1 (4.5)
Patient initiated enrollment	11 (50.0)	11 (50.0)
Manual clinician referral (phone or fax, not EHR-based)	13 (59.1)	11 (50.0)
Optional EHR-based referral	6 (27.3)	11 (50.0)
Automatic EHR-based referral	1 (4.5)	9 (40.9)

NOTE: Categories are not mutually exclusive.

^aPre-funding: January 1 to June 30, 2017; 18 months post-funding July 1 to December 31, 2018.

number of Centers employing full-time tobacco treatment specialists more than doubling (from 4 to 10) between early 2017 and the end of 2018. Cancer diagnosis has been identified as an opportune moment to discuss tobacco use and cessation options (17), and these results suggest that C3I-funded Centers have increased their ability to capitalize on this moment.

Ideally, providers should counsel and refer patients to treatment during the clinical encounter; however, many providers are not trained in tobacco cessation treatment, may not be aware of tobacco cessation resources, and may feel that they do not have the time to discuss tobacco use with their patients (8, 15). To address these barriers, C3I-funded Centers implemented new referral systems integrated into the EHR to streamline the process of referring smokers to tobacco treatment during their Cancer Center appointment. Pre-funding, only six Centers used optional EHR referrals (e.g., where provider initiates a referral order via EHR) and only one Center used automatic EHR-based referrals (e.g., referral order automatically sent to TTP for all smokers). By the end of 2018, five additional Centers implemented optional EHR-based referrals and eight additional Centers implemented automatic EHR-based referrals (Table 1). An automatic connection to an evidence-based tobacco treatment program triggered by a patient's tobacco use status (e.g., current smoker, some-day/every-day smoker) may be an especially efficient method for reaching patients with cancer who smoke with cessation resources (18) and for supplementing treatments provided by the clinician. Furthermore, by integrating referrals to tobacco treatment programs at the point of care, Centers are able to intervene when motivation to quit may be high, for example, after a cancer diagnosis and before cancer treatment begins (19). This is timely, as data show that smoking cessation treatment at the time of cancer diagnosis substantially improves the prognosis for patients who smoke (3).

Implementation progress and challenges

Despite demonstrated progress among the majority of Centers, a few had not yet implemented a tobacco treatment program by the end of 2018, over one year after receiving C3I funding. To further examine implementation challenges, we identified 15 implementation strategies derived from previous work implementing tobacco treatment programs into clinical care via the EHR (20), and categorized the strategies as planning, engaging, or executing using an application of the Consolidated Framework for Implementation Research (Table 2; ref. 21). C3I Project Leads reported the status of each strategy in mid-2018. Strategies that were not yet completed suggested important implementation "bottlenecks" or barriers to the integration of tobacco treatment services into oncology clinical care (Fig. 1).

Among the planning strategies, (i) developing a new clinical workflow and (ii) training clinicians may be important bottlenecks. By mid-2018, ten Centers (45.5%) had

Table 2. Application of the Consolidated Framework for Implementation Research Process Domain to Tobacco Treatment Program Implementation at NCI-Designated Cancer Centers in the Cancer Center Cessation Initiative

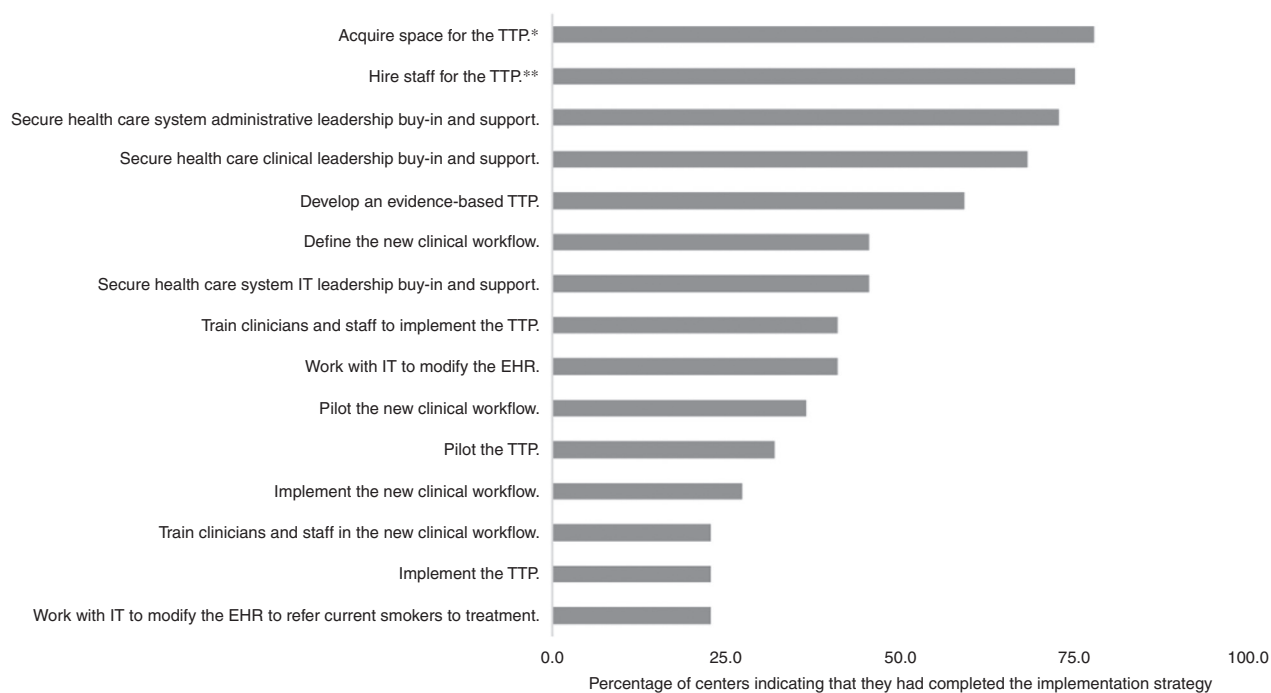
Planning Strategies
Develop an evidence based tobacco treatment program.
Counseling
Quitline referrals
Cessation medications
Text-based programs
Web resources
Acquire space
Hire staff
Define the new clinical workflow.
Patient or clinician manual (phone or fax-based) referrals
Optional EHR-based referrals
Automatic EHR-based referrals
Train clinicians and staff in implementing the new clinical workflow.
Train clinicians and staff in implementing the tobacco treatment program.
Engaging Strategies
Secure administrative, clinical and IT leadership buy-in and support.
Executing Strategies
Work with IT to modify the EHR to identify and refer current smokers to treatment.
Pilot and implement the new clinical workflow.
Pilot and implement the new tobacco treatment program.

completed the process of developing a new clinical workflow for screening and referring smokers to treatment (Fig. 1). Moreover, only five Centers (22.7%) had completed training clinicians/staff in implementing this new clinical workflow (e.g., screening and referring patients to treatment), and only nine Centers (40.9%) had completed training clinicians/staff in delivering the tobacco treatment program. This is consistent with findings from a survey of NCI Cancer Centers in 2010, where only 41% of Centers with tobacco treatment programs reported that providers had adequate training in delivering tobacco treatment services (5). Given the barriers of clinician time demands and workload (6, 22). Centers should begin early and use innovative and efficient methods to deliver training to clinicians and staff, such as through conducting presentations at staff meetings, or during Grand Rounds.

Another potential bottleneck falls in the category of engaging strategies: securing the support of Cancer Center IT leadership. This support is critical to ensuring that the necessary EHR modifications are executed according to the project timeline (23). Among the executing strategies, modification of the EHR has been cited as a critical determinant of implementation success in a review of health information system implementation studies (24). Only five (22.7%) of the Centers had completed the EHR modifications needed for smoker identification and treatment referral approximately eight months after receiving funding (Fig. 1), reflecting the challenge of executing this key step in tobacco treatment program integration into clinical care.

Tobacco use screening and tobacco treatment program reach

The population-based approach to tobacco treatment in Cancer Care is a core goal of the C3I; therefore assessing



*Among $n = 20$ Centers who were planning to hire staff; **Among $n = 18$ Centers who were planning to acquire space.

Figure 1.

Tobacco Treatment Program Implementation Progress among C3I Cancer Center Settings ($n = 22$), as of mid-2018. TTP, Tobacco Treatment Program.

the reach of tobacco treatment programs is one of the key evaluation metrics. Centers report on tobacco use screening, current tobacco use and patient engagement in tobacco treatment services to assess program reach. Reach was defined broadly, and could include engagement of current smokers in any of the following types of evidence-based tobacco treatment: counseling (in-person, group, telephone), quitline referrals via fax or EHR, cessation medications, text, or web-based programs. The measures were developed so that Centers could use existing EHR components and reporting capabilities, to reduce the burden placed on the Cancer Center staff. Centers also varied on where they were delivering services (the "setting"), and therefore common measures were designed that could be applied across diverse settings where tobacco treatment

services were being delivered (e.g., entire Cancer Centers, community hospitals, or a Medical Oncology unit).

Thirteen Centers reported on the reach of tobacco treatment programs based in 18 clinical oncology settings in the last six months of 2018. Table 3 shows the measures used to capture patient visits, tobacco use screening rates, current smoking prevalence, and tobacco treatment program reach. On average, 12,424 patients were seen during this time period, but the range varied substantially by setting. Tobacco use screening rates were generally high, with a median of 95.5% of patients screened for tobacco use, but again, the range varied from 45.7% to all patients being screened for tobacco use. Between 4.5% and 22.0% of patients were identified as current smokers, a range that represents geographic disparities in smoking rates (25). Among the current smokers visiting the settings during this time period, 24.7% were reached on average (median = 17.1%) by at least one type of evidence-based tobacco treatment program or service. Reach ranged from a low of 3.4% to a high of 87.3% of smokers receiving evidence-based tobacco treatment as a result of their visit to the Center setting.

Table 3. Screening for tobacco use and reach of cessation services at NCI-Designated Cancer Centers in the Cancer Center Cessation Initiative, July 1 to December 31, 2018 ($n = 13$ Centers, 18 settings^a)

Measure	Mean	Median	Min	Max
Adult patients with visits to the setting (n)	12,424	7,677	467	48,512
Adult patients screened for tobacco use (%)	86.4	95.5	45.7	100.0
Current smokers (%)	11.3	10.6	4.5	22.0
Reach: Smokers who engaged in any tobacco treatment services ^b (%)	24.7	17.1	3.4	87.3

^aTobacco treatment programs were based at 18 settings within or affiliated with 13 NCI-Designated Cancer Centers.

^bEngagement in tobacco treatment services could include any of the following: counseling (in-person, group, telephone), quitline referrals, cessation medications, text, or web-based programs.

Conclusion

The Cancer Center Cessation Initiative supports NCI-Designated Cancer Centers in taking a population-based approach to providing tobacco treatment services for

all patients with cancer who smoke. The first cohort of C3I funded Centers demonstrated progress over a single year of funding. Yet, more progress is needed as evidenced by relatively low tobacco treatment program reach in some settings, even using a broad definition of engagement. However, average reach rate in the C3I programs (about 25%) should be interpreted in light of the fact that reach rates for tobacco treatment in primary care settings are typically 15% or much lower (26, 27).

At baseline, even among these highly resourced NCI-Designated Comprehensive Cancer Centers, only one Center had already implemented automatic EHR-based referrals to tobacco treatment for all patients who smoke. EHR changes affect not only the Cancer Center clinical workflows, but are often made throughout an entire healthcare system and require significant financial and organizational leadership support. Researchers implementing the referral and delivery of tobacco treatment services in clinical settings may benefit from training or assistance in strategies designed to enlist support from administrative leadership and key IT staff.

Understanding where NCI-Designated Cancer Centers experience implementation challenges can help not only other Cancer Centers, but also other clinical oncology settings planning to implement tobacco treatment programs for their patients. The NCI funded a second cohort of 20 Centers in Fall 2018, and the C3I Coordinating Center will disseminate the findings from the implementation process of all 42 Centers moving forward. Future research will also document whether there are disparities in the receipt of tobacco treatment services by patient socio-demographics, especially given that racial/ethnic minorities have lower rates of smoking cessation (28) and a high burden of tobacco-related cancer incidence mortality (29). Multiple factors across the cancer control continuum may contribute to these differences in cancer outcomes, and access to tobacco treatment services is a key component to addressing those differences (30). In addition, the Initiative will also track whether Cancer Centers are assess-

ing patient use of electronic nicotine devices (ENDS) or e-cigarettes, as this is an important area for smoking cessation treatment (12).

Evidence-based tobacco and smoking cessation treatments are effective in helping even unmotivated smokers quit (1) and there are clear guideline recommendations for implementing such treatments in clinical settings (7, 8, 10, 11). Providing tobacco treatment services to oncology patients is a particular imperative given the high rates of smoking among such patients and the poor outcomes of cancer care if they continue smoking. The goal of the Initiative is to ensure that all Cancer Center patients get screened for tobacco use, and all smokers receive some type of evidence-based tobacco treatment. The key to advancing smoking treatment in cancer care is the effective implementation of programs so that they reach every patient with cancer who smokes.

Disclosure of Potential Conflicts of Interest

T.B. Baker is a consultant at NCI/ICF. No potential conflicts of interest were disclosed by the other authors.

Authors' Contributions

Conception and design: H. D'Angelo, B. Rolland, R. Adsit, G.D. Morgan, M.C. Fiore

Development of methodology: H. D'Angelo, B. Rolland, T.B. Baker, M.C. Fiore

Analysis and interpretation of data (e.g., statistical analysis, biostatistics, computational analysis): H. D'Angelo, B. Rolland, T.B. Baker, M.C. Fiore

Writing, review, and/or revision of the manuscript: H. D'Angelo, B. Rolland, R. Adsit, T.B. Baker, M. Rosenblum, G.D. Morgan, M.C. Fiore

Administrative, technical, or material support (i.e., reporting or organizing data, constructing databases): H. D'Angelo, T.B. Baker, D. Pauk

Study supervision: G.D. Morgan, M.C. Fiore

Received April 4, 2019; revised May 24, 2019; accepted August 26, 2019; published first September 3, 2019.

References

1. U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. 2014.
2. National Cancer Institute. Cancer Survivors and Smoking 2017; <https://progressreport.cancer.gov/after/smoking>. Accessed November 1, 2017.
3. DeVita VT, Rosenberg SA, Lawrence TS. DeVita, Hellman, and Rosenberg's cancer. In: 11 ed.: Lippincott Williams & Wilkins; 2018.
4. Ramaswamy AT, Toll BA, Chagpar AB, Judson BL. Smoking, cessation, and cessation counseling in patients with cancer: a populationbased analysis. *Cancer* 2017;122:1247–1253.
5. Goldstein AO, Ripley-Moffitt CE, Pathman DE, Patsakhram KM. Tobacco Use Treatment at the U.S. National Cancer Institute's Designated Cancer Centers. *Nicotine & Tobacco Research* 2013; 15:52–58.
6. Cooley ME, Poghosyan H, Sprunck-Harrild K, Winickoff JP, Edge SB, Emmons KM. Tobacco treatment implementation within 28 commission on cancer accredited programs in the Northeast region of the USA: a pilot study. *Translat Behav Med* 2018;8: 706–713.
7. Toll BA, Brandon TH, Gritz ER, Warren GW, Herbst RS. Assessing Tobacco Use by Cancer Patients and Facilitating Cessation: An American Association for Cancer Research Policy Statement. 2013.
8. Morgan G, Schnoll RA, Alfano CM, et al. National Cancer Institute conference on treating tobacco dependence at cancer centers. *J Oncol Pract* 2011;7:178–182.

9. Hanna N, Mulshine J, Wollins DS, Tyne C, Dresler C. Tobacco cessation and control a decade later: American society of clinical oncology policy statement update. *J Clin Oncol* 2013;31:3147–3157.
10. Bialous SA, Sama L. ISNCC tobacco position statement. *Cancer Nurs* 2016;39:80–81.
11. Shields PG, Herbst RS, Arenberg D, et al. Smoking Cessation, Version 1.2016, NCCN Clinical Practice Guidelines in Oncology. *J Nat Compr Cancer Network* 2016;14:1430–1468.
12. Cummings KM, Dresler CM, Field JK, et al. E-cigarettes and cancer patients. *J Thoracic Oncol* 2014;9:438–441.
13. Fiore MC, Jaén CR, Baker TB, et al. Treating tobacco use and dependence: 2008 update. Rockville, MD: US Department of Health and Human Services. 2008.
14. Warren GW, Dibaj S, Hutson A, Cummings KM, Dresler C, Marshall JR. Identifying targeted strategies to improve smoking cessation support for cancer patients. *Journal of Thoracic Oncology* 2015;10:1532–1537.
15. Warren GW, Marshall JR, Cummings KM, et al. Practice patterns and perceptions of thoracic oncology providers on tobacco use and cessation in cancer patients. *J Thoracic Oncol* 2013;8:543–548.
16. 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;380:512–515.
17. Gritz ER, Toll BA, Warren GW. Tobacco use in the oncology setting: advancing clinical practice and research. *Cancer Epidemiol Prev Biomark* 2014;23:3–9.
18. Boyle R, Solberg L, Fiore M. Use of electronic health records to support smoking cessation. *The Cochrane database of systematic reviews* 2014(12).
19. Westmaas JL, Newton CC, Stevens VL, Flanders WD, Gapstur SM, Jacobs EJ. Does a Recent Cancer Diagnosis Predict Smoking Cessation? An Analysis From a Large Prospective US Cohort. *J Clin Oncol* 2015;33:1647–1652.
20. Adsit RT, Fox BM, Tsiolis T, et al. Using the electronic health record to connect primary care patients to evidence-based telephonic tobacco quitline services: a closed-loop demonstration project. *Translat Behavioral Med* 2014;4:324–332.
21. Leeman J, Birken SA, Powell BJ, Rohweder C, Shea CM. Beyond "implementation strategies": classifying the full range of strategies used in implementation science and practice. *Implement Sci* 2017;12:125.
22. McGinn CA, Grenier S, Duplantie J, Shaw N, Sicotte C, Mathieu L, et al. Comparison of user groups' perspectives of barriers and facilitators to implementing electronic health records: a systematic review. *BMC Med* 2011;9:46.
23. Rizer MK, Kaufman B, Sieck CJ, Hefner JL, McAlearney AS. Top 10 lessons learned from electronic medical record implementation in a large academic medical center. *Perspect Health Information Manag* 2015;12.
24. Sligo J, Gauld R, Roberts V, Villa L. A literature review for large-scale health information system project planning, implementation and evaluation. *Int J Med Inf* 2017;97:86–97.
25. Drope J, Liber AC, Cahn Z, et al. Who's still smoking? Disparities in adult cigarette smoking prevalence in the United States. *CA Cancer J Clin* 2018;68:106–115.
26. Fiore M, Adsit R, Zehner M, et al. An electronic health record-based interoperable eReferral system to enhance smoking Quitline treatment in primary care. *J Am Med Inform Assoc* 2019. Available from: <https://doi.org/10.1093/jamia/ocz044>.
27. Boyle RG, Solberg LI, Fiore MC. Electronic medical records to increase the clinical treatment of tobacco dependence: a systematic review. *Am J Prev Med* 2010;39:S77–S82.
28. Trinidad DR, Pérez-Stable EJ, White MM, Emery SL, Messer K. A nationwide analysis of US racial/ethnic disparities in smoking behaviors, smoking cessation, and cessation-related factors. *Am J Public Health* 2011;101:699–706.
29. Henley SJ. Vital signs: disparities in tobacco-related cancer incidence and mortality—United States, 2004–2013. *MMWR Morb Mortal Wkly Rep* 2016;65.
30. Simmons VN, Piñeiro B, Hooper MW, Gray JE, Brandon TH. Tobacco-related health disparities across the cancer care continuum. *Cancer Control* 2016;23:434–441.