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Cancer Epidemiology 78 (2022) 102005

Contents lists available at ScienceDirect

Cancer Epidemiology

journal homepage: www.elsevier.com/locate/canep

Point of care tobacco treatment sustains during COVID-19, a global pandemic

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ARTICLE INFO

Keywords:
Sustainability
Tobacco cessation
EHR
Cancer care
COVID-19

ABSTRACT

Background: Tobacco cessation treatment for cancer patients is essential to providing comprehensive oncologic care. We have implemented a point of care tobacco treatment care model enabled by electronic health record (EHR) modifications in a comprehensive cancer center. Data are needed on the sustainability of both reach of treatment and effectiveness over time, including the COVID-19 pandemic.

Methods: Using EHR data from the pre-implementation (P: 5 months) and post-implementation periods (6 month-blocks, T1-T5 for a total of 30 months), we compared two primary outcomes: 1) reach of treatment among those smoking and 2) effectiveness assessed by smoking cessation among those smoking in the subsequent 6 month period. We analyzed the data using generalized estimation equation regression models.

Results: With the point of care tobacco treatment care model, reach of treatment increased from pre to post T5 (3.2 % vs. 48.4 %, RR 15.50, 95 % CI 10.56–22.74, $p < 0.0001$). Reach of treatment in all post periods (T1-T5 including the COVID-19 pandemic time) remained significantly higher than the pre period. Effectiveness, defined by smoking cessation among those smoking, increased from pre to post T2 before the pandemic (12.4 % vs. 21.4 %, RR 1.57, 95 % CI 1.31–1.87, $p < 0.0001$). However, effectiveness, while higher in later post periods (T3, T4), was no longer significantly increased compared with the pre period.

Conclusion: A point of care EHR-enabled tobacco treatment care model demonstrates sustained reach up to 30 months following implementation, even during the COVID-19 pandemic and changes in healthcare prioritization. Effectiveness was sustained for 12 months, but did not sustain through the subsequent 12 months.

1. Introduction

Tobacco use disorder is a complex problem in the United States, leading to significant morbidity and mortality. Quitting smoking improves longevity [1,2], even after a cancer diagnosis, positively modifies responses to cancer treatment, and lowers the risk of developing secondary cancers. Also, tobacco use may increase risk for developing severe illness and mortality associated with COVID-19 infection [3–5]. Despite the high need to prevent and treat these negative outcomes, evidence-based smoking cessation treatments in clinical settings are often underutilized due to provider barriers of time and resource constraints [2,6–8].

Patients want evidence-based treatment to help them quit or reduce smoking; [9–11] yet, cancer centers often do not prioritize this and

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https://doi.org/10.1016/j.canep.2021.102005
Received 31 March 2021; Received in revised form 4 August 2021; Accepted 7 August 2021
Available online 18 August 2021

providers only modestly deliver treatment components that benefit patients and decrease mortality. Low-burden programs that are robust, sustainable, decentralized, and unaffected by staff turnover are needed to consistently deliver smoking cessation evidence-based treatments with broad reach [12].

As part of the National Cancer Institute (NCI) Cancer Moonshot program, the Cancer Center Cessation Initiative (C3I), we implemented a point of care tobacco treatment program entitled Electronic Health Record-Enabled Evidence-based Smoking Cessation Treatment (ELEVATE) [11–14]. As a result, the point of care model has enabled broad reach, comparable effectiveness, and lower costs compared to the traditional model of specialist referral [12,15–17]. This point of care tobacco treatment program is built upon strong leadership support and an efficient, integrated workflow, and has been subjected to a systematic evaluation of its reach and effectiveness [18,19].

The sustainability of program implementation, and their results, is critical to the continuity of high-quality care and an important, understudied topic in implementation research [20–22]. Implementation science scholars have described three operational indicators of sustainability: maintenance of health benefit delivery, institutionalization of the program, and capacity building [23]. Maintenance describes the continued delivery of the health benefit after the initial implementation period has ended. This often aligns with institutionalization, during which the intervention transitions from a single event to routine practice. Lastly, capacity building includes activities that allow the intervention to continue after initial external support has terminated, such as training, pursuit of additional funding, and internal changes (i.e. designated staff, space or resources) [23]. The RE-AIM framework is one of the most widely used implementation frameworks and chosen by C3I to evaluate tobacco cessation programs at NCI-designated Cancer Centers. RE-AIM refers to reach, effectiveness, adoption, implementation and maintenance. Early outcomes of ELEVATE were evaluated by D'Angelo et al. using this framework. For this paper, we have focused on the maintenance of reach and effectiveness, which are most directly related to the delivery of evidence-based research and clinical impact.

We aim to assess maintenance of health benefit delivery during and after program introduction. This is measured in terms of sustained program reach and effectiveness and will be discussed with regard to program institutionalization and capacity building.

There is concern regarding sustainability of programs addressing preventative health measures during the COVID-19 pandemic as facilities shifted in priorities and limitations in service delivery [24,25]. Efficient in-person clinic workflows and telehealth tools to address tobacco cessation, especially during a pandemic, remain an important component of comprehensive care [24,25]. Very few studies have evaluated the sustainability of evidence-based interventions overtime in the real world settings [26], highlighting a critical research and practice gap in its own right, and particularly within the context of an ongoing pandemic.

Using data from the electronic health record before and after the implementation of ELEVATE, this study provides a critical examination of its impact, specifically regarding the sustainment of reach of treatment and effectiveness over time. This evaluation includes time periods of pre-implementation, early post-implementation, and late post-implementation including the COVID-19 pandemic.

2. Methods

2.1. Overview

This is an implementation study to improve tobacco treatment for cancer center patients as part of the National Cancer Center (NCI) Cancer Moonshot program [13,14]. We implemented a point of care tobacco treatment program, ELEVATE, in June of 2018 for medical oncology outpatient clinics at the Siteman Cancer Center, a NCI Comprehensive Cancer Center located in St. Louis. The goal of this study is to evaluate reach of assessment, treatment and effectiveness among those who smoke with the pre-post design using data from the pre-implementation and post-implementation periods.

2.2. Participants

All clinical staff (medical assistants, nurses, doctors) at the 21 medical oncology clinics who were involved in routine medical oncology outpatient care participated in this implementation study by incorporating tobacco treatment at point of care as guided by the EHR. All patients aged 18 and older seen in these clinics were included in the pre-post analyses.

2.3. Intervention

The "5 A's" tobacco cessation intervention framework was used to design this intervention, which refer to ask, advise, assess, assist and arrange [18]. Details on the ELEVATE intervention and data extraction are described in a prior publication by Ramsey et al. [12]. Briefly, ELEVATE utilizes a module in the EHR to simplify assessment (asking patients about smoking status), provide a scripted brief advice to quit smoking, and discuss treatment options (medication and counseling). Treatment options that the patient is willing to pursue are selected and reviewed by the provider. Providers received decision support via a SmartSet with embedded smoking cessation medication prescribing guidelines. In addition, a closed-loop referral sends an electronic referral to smoking cessation counseling services and returns referral outcome back to the EHR with a reminder message to the provider [27]. All providers received training on the workflow, EHR functions, and tobacco treatment. EHR data was extracted using a data query system to evaluate outcomes of the intervention. Data from discrete fields regarding smoking status and treatment delivered was obtained. Data on smoking status was extracted from the EHR from the section on tobacco use within the social history and patient problem list. Data on treatment was extracted from the EHR, from the social history, tobacco use section, counseling flowsheets, best practice alerts, and smoking deterrent medications accepted. Discrete fields regarding smoking assessment and intervention were available in the current EHR platform, but not available in our previous EHR. For the prior platform, manual coding was used for data extraction. This information was presented as data feedback for the clinic and individual providers on smoking prevalence and treatment [12].

2.4. Study timeframes

To evaluate program sustainability, we defined one time block before program implementation, and five blocks after implementation. Specifically, we define the time block P, (for pre-implementation (January to May 2018)), and the blocks T1 to T5 representing five post-implementation 6-month blocks, spanning from June 2018-December 2020.

2.5. Study measures

Two primary outcomes, reach of treatment and effectiveness, are evaluated for each of the time blocks. Additionally, rate of assessment (patients asked about smoking status) was measured. The first outcome of interest is reach of treatment, which is defined as the proportion of smokers receiving any treatment (brief advice, referral for counseling, or medication documented in the EHR by any providers) during the designated six-month block among all smokers. The second outcome of interest is effectiveness, which is defined by the proportion of smoking cessation among smokers during the subsequent 6 months among all smokers. For each time period, smoking cessation in the next 6 months is determined based on smoking status documented in the most recent follow-up appointments during the subsequent 6 months in the

electronic medical record. If there is no return visit or no documented smoking status in the subsequent 6 months for a patient, we assumed continued smoking status.

2.6. Statistical analysis

In the primary analyses, we conducted pairwise comparison of the outcome (reach of treatment or effectiveness among smokers) in each of the post-implementation time periods (T1-T5) vs. the pre-implementation period (P) to evaluate the program effect (e.g., P vs. T1, P vs. T2, …, P vs. T5). Data analyses were performed at the patient level. To adjust for overlapping patients across different time periods, we use GEE models to compare the key outcomes in different time periods. We adjusted for covariates of age, sex, and race in the regression models.

3. Results

The sample demographics for all patients and also for just those who smoked in medical oncology are shown in Table S1. The percentage of smoking assessment significantly increased from P to T1 (44.3 % vs. 90.2 %, RR 2.04, 95 % CI 2.01–2.08, $p < 0.0001$). This increase was sustained throughout the post intervention periods (Fig. 1).

3.1. Reach of treatment

We evaluated the reach of treatment by the proportion of smokers receiving any treatment among all those who smoke. Table 1 shows reach and effectiveness over the time periods (P vs. T1-T5) and whether there are significant differences between each of the post-implementation blocks vs. pre-implementation. With the point of care tobacco treatment care model, reach of treatment increased from pre to post T5 (3.2 % vs. 48.4 %, RR 15.50, 95 % CI 10.56–22.74, $p < 0.0001$). Reach of treatment in later post periods (T1-T5) remained significantly higher than in the pre period (Table 1, Fig. 1).

Regarding the reach of specific treatment components, the percentage of current smokers receiving medication was 2.6 % at baseline and increased to 13.4 % in T1 (RR 5.42, 95 % CI 3.57–8.22, $p < 0.0001$). Medication rates in later post periods (T2-T5) all remained significantly higher than in the pre period. Table 1 shows reach of specific treatment components for pre-implementation (P) and 30 months post-implementation (T1-T5).

3.2. Reach during the COVID-19 Pandemic

We evaluated whether reach and effectiveness were maintained during the COVID-19 pandemic in 2020 and during the later post-implementation periods. We found that reach of treatment using ELEVATE was largely maintained even during that time. Table 1 and Fig. 1 show the reach of treatment during the height of the COVID-19 pandemic.

3.3. Effectiveness

The effectiveness outcome was defined as smoking cessation among smokers. For smokers identified in each time period, we identified if they quit smoking by tracking their smoking status documented in a return visit during the next 6 months. For example, smokers identified in T1 who quit smoking in the subsequent 6 months are included in the quit rate for T1. Effectiveness defined by smoking cessation among smokers increased from P to T2 (12.4 % vs. 21.4 %, RR 1.57, 95 % CI 1.31–1.87, $p < 0.0001$). We found that program effectiveness was largely maintained over time in 12 months post-implementation before the COVID-19 pandemic.

3.4. Effectiveness during the COVID-19 Pandemic

Effectiveness (smoking cessation among smokers) in later post periods (T3, T4) were higher but no longer significant compared with the pre period (P); these cessation outcomes occurred and were ascertained during the pandemic. For example, effectiveness defined by smoking cessation among smokers changed from P to T3 (12.4 % vs. 15.5 %, RR 1.22, 95 % CI 1.00–1.49, $p = 0.052$). Further, effectiveness defined by smoking cessation among smokers changed from P to T4 (12.4 % vs. 15.3 %, RR 1.18, 95 % CI 0.97–1.45, $p = 0.096$). Smoking cessation among smokers for T3 and T4 were ascertained in 1–6/2020 and 7–12/2020 during COVID (Table 1 and Fig. 2). In addition, we evaluated the quit rate for treated smokers, and non-treated smokers (Fig. 3). Generally, quit rates for treated smokers are higher than those for untreated smokers.

3.5. First post-implementation period (T1) vs. Later post-implementation periods (T2-T5)

We conducted additional analyses to compare reach of treatment and effectiveness between the first post-implementation period, T1 to each of the later post-implementation periods (T2-T5) (e.g., T1 vs. T2, T1 vs. T3,…). Compared to T1, effectiveness did not change significantly in T2, but reduced significantly during the two later postimplementation periods. Of note, smoking cessation status for current smokers that received treatment during T3 and T4 was ascertained in 1–6/2020 and 7–12/2020 during the COVID-19 pandemic.

4. Discussion

This is one of first studies to evaluate sustainment of reach and effectiveness for a point of care tobacco treatment model in a comprehensive cancer care center. First, our study evaluated sustainment of assessment of smoking status, treatment delivery and health benefit of the point of care EHR based program (ELEVATE). Most research focuses

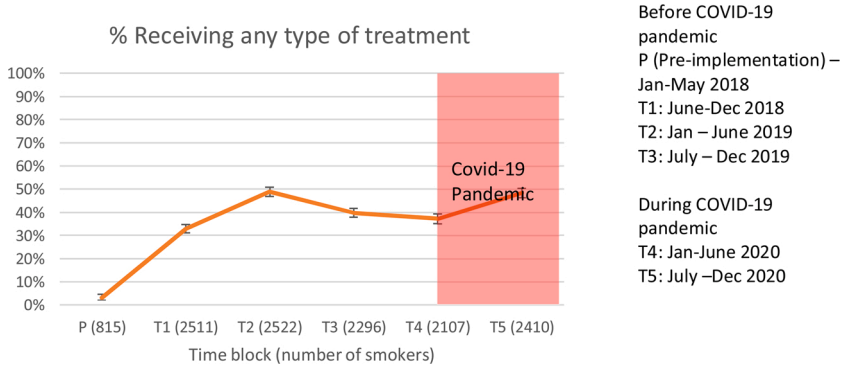

Fig. 1. Reach of Tobacco Treatment during pre-implementation and post-implementation periods.

Table 1
Comparison of Reach and Effectiveness over time (Comparison with Pre-implementation and T1).

GEE model results	Pre-implementation (P) Jan-May 2018			T1 June-Dec 2018				
			Pre-implementation			*Comparison with Pre-implementation*		*Comparison with T1*
	N	%		N	%	RR (95 % CI)	p	RR (95 % CI)
Reach								
% total patients asked smoking status	7817	44.3	Reference	19,179	90.2	2.04 (2.01, 2.08)	<0.0001	Reference
% smokers provided any treatment	26	3.2	Reference	823	32.8	10.06 (6.89, 14.68)	<0.0001	Reference
% smokers accepted smoking deterrent medication	21	2.6	Reference	336	13.4	5.42 (3.57, 8.22)	<0.0001	Reference
% Accepted referral/counseling	8	1.0	Reference	64	2.5	2.65 (1.27, 5.55)	0.0095	Reference
% Received brief Advice	❖	❖	❖	499	19.9	❖	❖	Reference
Effectiveness								
% Quit rate for all smokers	101	12.4	Reference	503	20	1.47 (1.25, 1.74)	<0.0001	Reference
	Total Patients = 17,642 Total Smokers = 815*			Total Patients = 21,271 Total Smokers = 2511				

	T2 Jan-Jun 2019						T3 July-Dec 2019					
			Comparison with Pre-implementation		*Comparison with T1*				*Comparison with Pre-implementation*		*Comparison with T1*	
	N	%	RR (95 % CI)	p	RR (95 % CI)	p	N	%	RR (95 % CI)	p	RR (95 % CI)	p
Reach												
% total patients asked smoking status	18,529	90.4	2.05 (2.01, 2.08)	<0.0001	1.00 (0.99, 1.00)	0.277	19,786	94.5	2.14 (2.10, 2.17)	<0.0001	1.05 (1.04, 1.05)	<0.0001
% smokers provided any treatment	1231	48.8	14.26 (9.92, 20.50)	<0.0001	1.46 (1.37, 1.55)	<0.0001	912	39.7	12.49 (8.54, 18.28)	<0.0001	1.22 (1.14, 1.31)	<0.0001
% smokers accepted smoking deterrent medication	343	13.6	5.40 (3.55, 8.20)	<0.0001	1.09 (0.97, 1.22)	0.147	349	15.2	6.13 (4.01, 9.37)	<0.0001	1.14 (1.00, 1.29)	0.0483
% Accepted referral/ counseling	129	5.1	5.66 (2.77, 11.58)	<0.0001	2.00 (1.49, 2.68)	<0.0001	86	3.7	4.32 (2.02, 9.23)	0.0002	1.49 (1.08, 2.06)	0.0141
% Received brief Advice	881	34.9	❖	❖	1.71 (1.57, 1.86)	<0.0001	606	26.4	❖	❖	1.33 (1.21, 1.46)	<0.0001
Effectivness												
% Quit rate for all smokers	540	21.4	1.57 (1.31, 1.87)	<0.0001	1.08 (1.00, 1.17)	0.0639	357	15.5	1.22 (1.00, 1.49)	0.052	0.80 (0.72, 0.90)	<0.0001
	Total Patients = 20,498 Total Smokers = 2522						Total Patients = 20,944 Total Smokers = 2296					

	T4 Jan-Jun 2020						T5 July-Dec 2020					
			Comparison with Pre-implementation		*Comparison with T1*				*Comparison with Pre-implementation*		*Comparison with T1*	
	N	%	RR (95 % CI)	p	RR (95 % CI)	p	N	%	RR (95 % CI)	p	RR (95 % CI)	p
Reach												
% total patients asked smoking status	17,897	93.1	2.11 (2.07, 2.14)	<0.0001	1.03 (1.03, 1.04)	<0.0001	20,184	94.6	2.14 (2.11, 2.18)	<0.0001	1.05 (1.04, 1.05)	<0.0001
% smokers provided any treatment	784	37.2	11.84 (8.10, 17.32)	<0.0001	1.14 (1.06, 1.23)	<0.0005	1167	48.4	15.50 (10.56, 22.74)	<0.0001	1.47 (1.38, 1.57)	<0.0001
% smokers accepted smoking deterrent medication	392	18.6	7.51 (4.90, 11.52)	<0.0001	1.37 (1.21, 1.55)	<0.0001	449	18.6	7.59 (4.94, 11.65)	<0.0001	1.37 (1.21, 1.55)	<0.0001
% Accepted referral/ counseling	106	5.0	5.38 (2.60, 11.13)	<0.0001	1.96 (1.45, 2.67)	<0.0001	113	4.7	5.20 (2.52, 10.73)	<0.0001	1.85 (1.37, 2.50)	<0.0001
% Received brief advice	428	20.3	❖	❖	1.04 (0.93, 1.16)	0.522	793	32.9	❖	❖	1.65 (1.51, 1.82)	<0.0001
Effectiveness												
% Quit rate for all smokers	322	15.3	1.18 (0.97, 1.45)	0.096	0.78 (0.70, 0.88)	<0.0001	✣		✣		✣	
	Total Patients = 19,225 Total Smokers = 2107						Total Patients = 21,335 Total Smokers = 2410					

❖ Brief advice data not available for pre-implementation.
✣ Quit rate data for T5 not available.

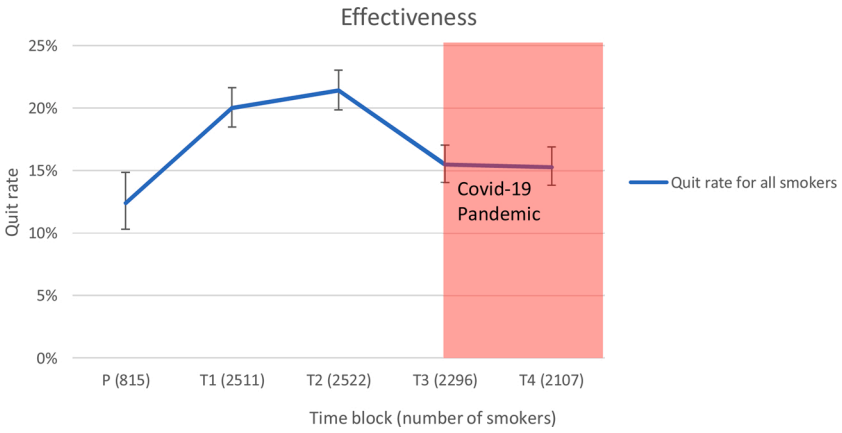

Fig. 2. Effectiveness of Tobacco Treatment during pre-implementation and post-implementation periods.
Timeframe of assessing smoking cessation. We identify smoking cessation for smokers in the next 6 month period. For example, smokers identified in pre-implementation (P) were ascertained for their smoking status during follow-up visits in the subsequent 6 months. Therefore, smokers identified during 7–12/2019 (T3) were ascertained for their smoking status in 1–6/2020, during the COVID-19 pandemic.

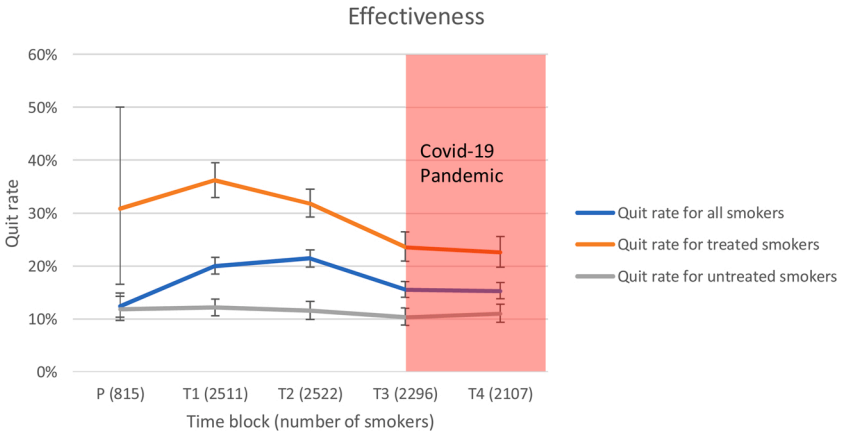

Fig. 3. Effectiveness of Tobacco Treatment during pre-implementation and post-implementation periods, stratified by treatment status.
Timeframe of assessing smoking cessation. We identify smoking cessation for smokers in the next 6 month period. For example, smokers identified in pre-implementation (P) were ascertained for their smoking status during follow-up visits in the subsequent 6 months. Therefore, smokers identified during 7–12/2019 (T3) were ascertained for their smoking status in 1–6/2020, during the COVID-19 pandemic.

on the demonstration of program effects during or immediately after active implementation efforts. Ongoing monitoring of the intervention provides information on performance, shortcomings, and barriers to address. Second, these data give an important example on the impact of a serious global pandemic on basic healthcare delivery (e.g., tobacco assessment and intervention) and patient outcomes. The reach of tobacco treatment was largely sustained due to its full integration into EHR. Our study demonstrates sustainment of health benefit for twelve months following implementation. However, treatment effectiveness might have been compromised due to many risk factors for tobacco use associated with the pandemic.

We found a sustained increase in reach of treatment with ELEVATE. A significantly greater proportion of patients received treatment following the implementation of ELEVATE, demonstrated by a 10-fold increase that was sustained through the study period, reaching statistical significance in all time blocks. This represents a clinically meaningful and sustained increase in reach of treatment compared to pre-implementation. This is an important demonstration of sustained reach long after the catalyzing effects of a new implementation effort had waned, likely resulting from systematic integration of tobacco treatment as part of the workflow supported by the EHR.

This data also strengthened existing research on the sustainability of tobacco treatment programs by including 1) a longer post-implementation periods and 2) both reach and effectiveness outcomes. Flocke et al. [28] report improved and sustained reach of tobacco treatment delivery by comparing data during 3 months pre- and 6 months post-implementation of a EHR-based program in the primary care setting [28]. Baker and colleagues [26] examined reach of an EHR based referral system over 4 months pre-implementation and 8 months post-implementation; this showed elevated, but declining rates of electronic referral post-implementation. We present data on sustainment of program impact across a much longer time frame of 30 months post-implementation. Additionally, we also present data on effectiveness, an important patient outcome of smoking cessation,

The ultimate goal of ELEVATE is to increase not only reach, but also effectiveness of successful patient smoking cessation. The increase in smoking cessation among smokers (treated or untreated) is likely associated with two factors: 1) more smokers were treated (ELEVATE increased the reach of treatment) and 2) treated smokers were more likely to quit than untreated smokers due to the more consistent use of evidence-based treatment [18]. Following implementation of ELEVATE, a quit rate of 20 % was achieved in all smokers identified in T1, which was significantly higher than the pre-implementation rate of 12.4 %. This was sustained for smokers identified in early post-implementation periods before COVID. These data suggest that program effectiveness (quit rate) is sustained over time for smokers exposed to the program.

Providing cancer care during the COVID-19 pandemic has many challenges. The frequency and volume of outpatient visits may be reduced, and the focus may be shifted away from tobacco treatment during a serious pandemic. Despite these challenges, the reach of our intervention was sustained. This suggests that tobacco cessation remained a priority to clinicians and staff. It also illustrates the resilience of a point of care program with streamlined EHR-integration even during a major pandemic. However, there was a decline in successful smoking cessation for smokers in the later post-implementation periods during the COVID-19 pandemic in 2020. In 2020 during the COVID-19 pandemic, although these smoking cessation rates remained above the pre-implementation rate, they did not achieve statistical significance. The COVID-19 pandemic may have influenced patients' success to achieve smoking abstinence. Despite sustained reach of ELEVATE during

the COVID-19 pandemic, there was a decrease in effectiveness during T4 and T5. While some evidence suggesting that fear of increased COVID-19 may motivate smokers to quit [27,28], some factors may have contributed to difficulty quitting in the context of the COVID-19 pandemic. Increased stress and anxiety resulting from the pandemic may have made quitting more difficult. Further, social isolation may have led to loss of social support, which can be an important aid when attempting to quit [27,28]. Some patients may have encountered financial difficulties secondary to the pandemic, which has been demonstrated to compromise tobacco cessation efforts [29].

There are several limitations of the study. First, as a quasi-experimental pre-post study instead of a randomized trial, causality cannot be inferred. Observed changes could have been due to temporal changes such as increasing distribution of information regarding cessation medications and counseling options over time. In additional data, we evaluated similar data from clinics without program implementation and found a slight, smaller improvement during the same time period [29]. We encourage caution in interpreting data from pre-post evaluation and acknowledge the limitations of inferences afforded by the pragmatic design use in this real-world clinic setting. Second, EHR data are limited to patient visits and the extent of related documentation. We likely did not capture all tobacco of the treatment that was offered in the EHR. We also recognize that a change in EHR alone may have influenced documentation and data extraction of smoking status and treatment. In some cases, discrete fields were not available in the previous EHR and manual coding was used instead. Provider narratives within the medical record were not searched, which we also recognize as a limitation to this study. However, specific components within the new EHR were designed as a part of ELEVATE to improve both treatment and documentation. Thus, improvement in documentation is an expected result. However, specific components within the new EHR were designed as a part of ELEVATE to improve both treatment and documentation. Thus, improvement in documentation is an expected result. Additionally, smoking cessation is based on the EHR documentation of smoking status (former smoker or current smoker) ascertained by medical assistants during patient visits. We do not have time-based data on duration of smoking cessation i.e. 7-day abstinence versus 30-day abstinence. Individuals who were documented as smoking were assumed to be still smoking if they did not have any follow up visits during a given time period. We found comparable rates of follow up visits for smokers during 2020, but nevertheless that assumption was no doubt inaccurate for some patients. This issue is complicated since the documentation of smoking status increased dramatically from pre-to-post treatment, which could have affected the nature of the individuals referred in the two time periods. Future studies could consider bioverification of smoking abstinence. We recognize that abstinence may be interpreted differently by patients and providers. Patients not using cigarettes may have used other tobacco products. Future studies could include questions about all types of tobacco, as well as vaping. Also, the use of EHR data is limited, not allowing detailed, comprehensive information on multiple quit attempts or relapses. Lastly, this study operationalized sustainment of the intervention by assessing reach and effectiveness over time without directly measuring broader factors for sustainability such as clinical capacity building using the clinical sustainability assessment tool (CSAT) that could be utilized to examine predictors for sustainability (https://sustaintool.org/).

This study demonstrates that the reach and effectiveness of a point of care EHR based program (ELEVATE) can be sustained 30 months following implementation. Currently, the point of tobacco treatment model remains a cost-effective approach to reduce tobacco use at our Cancer Center [17]. Additional efforts to increase sustainability may include refresher training and data feedback; however immediate efforts have been constrained by COVID-19. In the future, additional strategies to further enhance the point of care treatment model may include use of patient portal and outreach protocols. Most importantly, the program reach was sustained despite staff turnover, a natural disaster (the COVID-19 pandemic), and associated changes to how healthcare was provided, largely due to the established EHR-integrated point of care workflow as part of oncology care.

Authorship contribution

L-S Chen contributed to all aspects of authorship including substantial contributions to conception and design, conceptualization, investigation, methodology, writing – original draft preparation, writing-reviewing and editing, validation, data curation, formal analysis, project supervision. E.J. Craig contributed to conceptualization, methodology, writing- original draft preparation, writing –reviewing and editing, and visualization. A.T. Ramsey contributed to conceptualization, methodology, and writing – reviewing and editing. T.B. Baker contributed to conceptualization, writing-reviewing and editing. A.S. James contributed to conceptualization and writing – reviewing and editing. D.A. Luke contributed to writing- reviewing and editing. S Malone contributed to writing – reviewing and editing. J Chen and G Pham contributed to methodology, software, validation, formal analysis, data curation, writing - original draft preparation, writing - review and editing, and visualization. N Smock contributed to conceptualization, methodology, validation, data curation, writing - original draft preparation, writing - review and editing, visualization, and project administration. P Goldberg and R Govindan contributed to writing- review and editing. L.J. Bierut contributed to conceptualization, methodology, and writing – reviewing and editing.

Declaration of Competing Interest

Laura J. Bierut is listed as an inventor on Issued U.S. Patent 8,080,371,"Markers for Addiction" covering the use of certain SNPs in determining the diagnosis, prognosis, and treatment of addiction. All other authors declare no conflict of interest.

Acknowledgements

Li-Shiun Chen was supported by the National Cancer Institute of the National Institutes of Health under Award Number P30CA091842-19S5, P30CA091842-16S2 and P50 CA244431 and by the National Institute on Drug AbuseR01DA038076. Li-Shiun Chen and Aimee S. James were supported by the Alvin J. Siteman Cancer Center's Investment Program 5129- Barnard Trust and The Foundation of Barnes-Jewish Hospital Cancer Frontier Fund. Laura J Bierut was supported by the Siteman Cancer Center and by the National Institutes of Health under Award Number UL1 TR002345 and K12 DA041449. Timothy B. Baker was supported by the National Cancer Institute grants R35CA197573 and P01CA180945. Alex T. Ramsey was supported by the National Institute on Drug Abuse under Award numbers K12DA041449 and R34DA052928. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results. This content is solely the responsibility of the authors and does not reflect the official views of the funding sources.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.canep.2021.102005.

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