



Published in final edited form as:

*Support Care Cancer*. ; 31(8): 483. doi:10.1007/s00520-023-07956-4.

## Qualitative Evaluation of the Implementation and Future Sustainability of an E-referral System for Smoking Cessation at a US NCI-Designated Comprehensive Cancer Center: Lessons Learned

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### Abstract

**Background:** Promoting smoking cessation is recognized as an essential part of cancer care. Moffitt Cancer Center, supported by the National Cancer Institute Cancer Moonshot Cancer Center Cessation Initiative, developed and implemented an opt-out based automatic electronic health record (EHR)-mediated referral (e-referral) system for Tobacco Quitline services along with

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Funding: VNS

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Data curation: HJF, MLM

Data analysis: MJY, HJF, MLM

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All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

**Competing Interests:** Thomas H. Brandon, Ph.D. is on the advisory board for Hava Health, Inc.

**Ethics Approval:** The current study protocol was reviewed by the Moffitt Cancer Center Scientific Review Committee and deemed to be Institutional Review Board exempt and classified as a quality improvement project at the Moffitt Cancer Center.

**Consent to Participate:** All participants consented to participate in this study.

**Consent to Publish:** All participants consented to publish the results.

options for local group cessation support and an in-house tobacco treatment specialist. This study evaluated barriers and facilitators for implementation of the e-referral system.

**Method:** Steering committee members (N=12) responsible for developing and implementing the new clinical workflow, and nurses (N=12) who were expected to use the new e-referral system completed semi-structured interviews. Qualitative thematic content analyses were conducted.

**Results:** Interviewees perceived the e-referral system as an effective strategy for identifying and referring smokers to cessation services. However, barriers were noted including competing demands and perceptions that smoking cessation was a low priority and that some patients were likely to have low motivation to quit smoking. Suggestions to improve future implementation and sustainability included providing regular trainings and e-referral outcome reports and increasing the visibility of the e-referral system within the EHR.

**Conclusion:** Initial implementation of the e-referral system was perceived as successful; however, additional implementation strategies are needed to ensure sustainability at both the clinician and system levels. Recommendations for future modifications include providing regular clinician trainings and developing a fully closed-loop system.

**Implications for Cancer Survivors:** Initial implementation of an e-referral system for smoking cessation for cancer patients revealed opportunities to improve the smoking cessation referral process at cancer centers.

### Keywords

smoking cessation; cancer patients; nurses; qualitative research; implementation

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### Introduction

Continued smoking after a diagnosis of cancer is associated with reduced cancer treatment effectiveness, greater risk of mortality and developing second primary tumors, impaired quality of life [1–3], and increased cancer treatment costs [4]. Despite significant adverse health outcomes associated with continued smoking for cancer patients, only one third of smokers who receive a diagnosis of cancer quit smoking [5]. Among those who make a quit attempt (31.4%, [6]), relapse rates are high (e.g., 49.1% [6]; 13-60% [7]). Therefore, promoting sustained smoking cessation is recognized as an essential part of cancer care [8, 9]. However, identification of smokers and provision of evidence-based smoking cessation treatment in oncology settings have been minimal: In 2009, 41% of the 58 National Cancer Institute (NCI) – designated cancer centers reported having no in-house tobacco treatment services and over 60% did not identify tobacco use as a vital sign in patient records [10]. To enhance the collective systematic implementation and dissemination of smoking cessation treatment within oncology settings, the NCI launched the Cancer Center Cessation Initiative (C3I) in 2017 as part of the NCI Cancer Moonshot Program [11]. Specifically, the C3I aimed to support the infrastructure at NCI designated cancer centers needed to improve the systematic assessment of smoking status and the reach of smoking cessation treatment among cancer patients [12].

The C3I-funded cancer centers implemented tobacco treatment programs in various ways (e.g., providing counseling at clinic visits, referring to external tobacco treatment programs) to address patient-, clinician-, and health care systems-level barriers to implementing smoking cessation treatment in oncology settings. Many of these programs aimed to use the electronic health record (EHR) to improve documentation of current smoking status, referral to internal/external tobacco treatment programs, and monitoring uptake of the smoking cessation services and cessation outcomes [3, 13, 14]. Half of the C3I-funded cancer centers implemented EHR-mediated referral (e-referral) systems into their EHRs [3]. Subsequently, promising outcomes were reported. The first cohort of funded cancer centers reported a meaningful increase in tobacco treatment programs offered, the number of tobacco treatment specialists hired, and an increase in automatic EHR-based referrals to cessation programs [15]. Notably, factors associated with better outcomes in reach and effectiveness of the C3I-funded tobacco treatment programs among the first and second funded cohorts included the implementation of the C3I programs in both in-patient and outpatient settings and the use of an e-referral system with a closed-loop system [14]. Findings also indicated that the C3I-funded programs led to meaningful reductions in racial/ethnic disparities in tobacco treatment reach [16]. Among 38 C3I-funded cancer centers, 28.3% of cancer patients identified as current smokers received cessation treatment, and among the subset of cancer centers that collected cessation outcome data, smoking abstinence was approximately 20% at 6-months [17]. Further, the cost-per-quit of the C3I-funded tobacco treatment programs was 57% lower than the standard care for smoking cessation [18].

To date, a few studies have examined barriers or facilitators to the implementation of C3I-funded tobacco treatment programs. The minimal data that have been reported indicate that one key facilitator of implementation was organizational buy-in [3, 13]. Specifically, champions (e.g., physicians, nurses, IT staff) who were influential and knowledgeable about the importance of smoking cessation in cancer care played crucial roles in promoting new workflow, facilitating training, and serving as models in encouraging the use of the tobacco treatment programs implemented. However, challenges to implementing the C3I-funded tobacco treatment program in oncology settings remain. These challenges include lack of consistent documentation [19, 20], workflow barriers [19], and organizational support and costs associated with cancer center-wide implementation of new workflows to sustain new tobacco treatment programs [18–20]. Furthermore, there is a lack of literature that has systematically evaluated barriers and facilitators of the C3I-funded tobacco treatment programs. Given that the e-referral system was one of the commonly implemented models among the C3I-funded cancer centers, there is a need to systematically evaluate the implementation of C3I-funded e-referral systems for tobacco treatment and to identify potential solutions to inform future implementation.

The overarching aim of the current study was to use in-depth interviews to evaluate contextual factors that facilitated and challenged the implementation of a new e-referral system for smoking cessation at Moffitt Cancer Center (“Moffitt”), one of the 53 NCI-designated comprehensive cancer centers in the United States. Moffitt was supported by the NCI Cancer Moonshot C3I. We aim to identify barriers and facilitators at clinician- and system-levels. Lessons learned can be used to inform improvements and long-term

sustainability of the e-referral system for tobacco treatment programs as well as new workflow development in other cancer centers and clinics.

## Methods

### Overview

Using funding from the C3I initiative, an e-referral system was designed to use the EHR to facilitate the systematic assessment of patients' smoking status, the delivery of brief advice to quit, and the automated connection of patients who smoke with smoking cessation treatment. Based on the Ask-Advise-Connect model [21] and existing workflows, a two-step process was developed : (1) At each new patient appointment, medical assistants asked whether patients had smoked in the past 30 days; and, (2) among patients reporting any smoking in the past 30 days, nurses were trained to provide brief advice to quit and to automatically connect patients with cessation treatment delivered by the state quitline (opt-out), local support groups (opt-in), or the in-house tobacco treatment specialist (opt-in). After pilot testing the new e-referral system in the thoracic and gynecologic clinics, it was launched Moffitt-wide in all 16 clinics in March 2021. In this study, we report the results of semi-structured in-depth interviews conducted with key stakeholders (i.e., steering committee members, nurses) involved in the development and implementation of the e-referral system.

### Recruitment and Sampling Strategy

Participants were multi-disciplinary members of the steering committee (n=12) who were responsible for developing and implementing the new clinical workflow to support the e-referral system, and nurses (n=12) who were expected to use the new e-referral system at Moffitt. Participants were recruited via email between January and June 2022. Committee members comprised behavioral researchers, physicians, nurses, a tobacco treatment specialist, and informatics specialists. Given that our focus was to identify barriers and facilitators to using the e-referral system, two groups of nurses were recruited: (1) 6 nurses who had been regularly using the system since it was launched (user group) and (2) 6 nurses who had never/rarely used the system (nonuser group). Based on prior studies, 8 to 16 interviews have generally shown to be adequate to achieve thematic saturation in qualitative research [22] and the median sample size in qualitative research falls between 15 and 31 [23]. As such, a total of 24 interviewees participated in this study, which was deemed sufficient to achieve thematic saturation. Among the 24 interviewees, some committee members were known to members of the research team given their involvement in the development and implementation of the e-referral system. However, capturing their experiences was essential to obtain perspectives on the facilitators and barriers that cut across various phases of implementation of the e-referral system. To mitigate any biases, the interviews, and all data analyses, were conducted by a separate team of researchers who did not have prior relationships with the participants.

### Procedures and Data Collection

Eligible participants were identified as follows: (1) participants in the steering committee group were identified via an existing list of the committee members and (2) nurses

were identified by reviewing the nurses' history of utilization of the smoking cessation referral tool within the EHR as well as interviewees' nomination of potential participants. Potentially eligible individuals were contacted via email with an explanation of the study aims and an invitation to participate. Individuals who agreed to participate were then scheduled for a 15 to 30-minute individual interview. All interviews were conducted via videoconferencing (Zoom) by one of three interviewers: a clinical psychologist with extensive experience in conducting semi-structured interviews (MJY), one doctoral level researcher with expertise in qualitative methods, and one graduate-level qualitative interviewer (HJF). The interview began by introducing the study and obtaining verbal informed consent from participants. The study protocol was reviewed by the Moffitt Cancer Center's Scientific Review Committee and deemed to be Institutional Review Board exempt as a quality improvement project.

### **Semi-Structured Interview**

The interview guide was developed following the Reach, Effectiveness, Adoption, Implementation, and Maintenance Qualitative Evaluation for Systematic Translation (RE-AIM QuEST; [24, 25]) theoretical framework. The RE-AIM framework has been widely used to evaluate implementation outcomes [26] and was applied to the C3I-funded tobacco treatment programs [20]. A working draft interview guide was developed by the research team with expertise in implementation science and qualitative methods and was then tested in mock interviews with the interviewing team and refined as needed. The final version of the interview guide was organized following the RE-AIM domains (Supplementary Material): (1) Reach - How effective is the e-referral system in identifying and referring patients?; (2) Adoption - Are the clinics/clinicians using the e-referral system?; (3) Implementation - How is the e-referral system consistently used in each clinic and/or by each clinician?; (4) Maintenance - Are the clinics or clinicians continuing to use the e-referral system?; (5) Effectiveness - Are the patients receiving the referred interventions and quitting smoking? Because our interview guide was semi-structured, interviewers had the flexibility to use probing questions in case further elaboration and/or clarification of interviewees' responses was needed as well as pursue new topics as needed.

### **Data Analysis**

Interviews were audio recorded, transcribed verbatim, and de-identified. NVivo 12 (Melbourne, Australia) was used for qualitative data analysis using inductive applied thematic analysis [27]. Two co-authors with expertise in qualitative analyses (HJF and MLM) developed a comprehensive list of codes. Codes were initially generated following an inductive approach and were then refined during the initial coding process. When the codes were finalized and formally defined in the codebook, HJF and MLM independently coded a randomly selected section from each of 9 interviews (3 for committee, 4 for user group, and 2 for nonuser group). Coded sections from 3 interviews were discussed and recoded as needed. Three meetings were held to achieve strong consensus (inter-rater reliability = .873; [28]). After the final codebook was created and consensus was achieved, all interviews were split between the two coders.

## Results

### Participants

A total of 42 Moffitt members were initially contacted via email. Of the 15 steering committee members invited, 12 were enrolled and completed the interview (n=3 declined). Among the nurses who used the system, 9 were initially approached, 7 were enrolled (n=1 declined; n=1 no response) and 6 completed the interview (n=1 no response). Among the nurses who rarely used the system, 18 were initially approached and 6 were enrolled and completed the interview (n=6 declined; n=6 no response). Interviewees in the steering committee group were multidisciplinary including leadership personnel (n=5), data/EHR specialists (n=3), a physician (n=1), tobacco treatment/nursing education specialists (n=2), and a behavioral researcher (n=1). Nurses in the user group were from three oncology clinics (Thoracic [n=3], Head and Neck [n=2], and Gynecological [n=1]) whereas nurses in the nonuser group were from various oncology clinics (Cutaneous [n=2], Gastrointestinal [n=2], Endocrine [n=1], and Hematology [n=1]).

### Identified Themes

Seven themes emerged in the thematic analysis. Below we present each theme along with illustrative quotes. Table 1 shows the overview of the themes and the number of participants who endorsed each theme.

**Theme 1: Motivations for using and supporting the e-referral system.**—Both committee members and nurses reported similar motivations for supporting use of the new e-referral system. The interviewees reported commitment to patients' health as a primary motivation to use and support the system. They elaborated that the e-referral system is crucial to help patients quit smoking because it is directly associated with effective cancer treatment (e.g., surgery) and recovery.

“... for patients undergoing surgery, we have an effort to try to optimize their health, related to their potential diabetes, and getting that under control, smoking cessation, anemia, malnutrition. So, rather than looking at smoking cessation as somehow separate, we should say in the PAT [Pre-Anesthesia Testing] Clinic for pre-operative patients, we should be looking at all four of those elements and how we can optimize all four of those elements. So, being part of that larger effort, I think, is going to be important.” (Committee member, ID308)

“And when we see patients, most patients are preop. So, smoking cessation is one chance to talk to them about decreasing their chances of recurrence and also wound healing.” (Nurse in the user group, ID502)

Also, a few committee members emphasized Moffitt's role as a comprehensive cancer center in providing total cancer care noting that Moffitt is responsible for providing long-term care for cancer patients including promoting health behaviors.

“It's too important to the health of our patients. And as a National Cancer Institute Comprehensive Cancer Center, it's really our responsibility to make sure that patients quit smoking. Because we know if they don't, it's gonna have a negative

impact on treatment. And so, we need sustainable options to continue to reach our patients.” (Committee member, ID310)

**Theme 2: Committee expectations on the e-referral system.**—The committee members expressed their initial expectations on the e-referral system. There were three subthemes: Seamless workflow integration in the EHR to consolidate the referral process, buy-in of all stakeholders, and building an opt-out based system.

**Subtheme 2.1: Seamless workflow integration.:** One of the primary goals for the C3I initiative was to seamlessly integrate the system in the EHR and in the nurses’ workflow so that it is easy to use with maximal reach. Nurses have many responsibilities and a limited amount of time to spend with each patient. Therefore, the steering committee aimed to streamline the referral process.

“... using a documentation that was already something nurses were familiar with, and having nurses on our committee to help guide the process. We really were invested in trying to create something that would be the least disruptive to the clinical workflow.” (Committee member, ID310)

“And this is our end designed on a check marks kind of things in Cerner, so that the nurse just checks off what they’ve done and if they choose on the patients the 1-800 number, then what happens is the system automatically takes out the information and sends it outside of Moffitt to the 1-800 number. If they check AHEC [Area Health Education Center], it sends it to AHEC, and a tobacco treatment specialist is internal, so it sends them, release an order to call the patient. So, it should truly in practice be seamless.” (Committee member, ID304)

**Subtheme 2.2: Aiming to achieve buy-in.:** Buy-in of all personnel – from leadership to nurses – was noted to be a crucial part of developing the e-referral system. Securing infrastructure and support to build the e-referral system from leadership and a commitment to use the system across clinics were key.

“We were fortunate that I think we had very good support from the Chief Medical Officer, to all of the different representatives on our various committees that we put together for the Clinical Workflow Committee and our Tobacco Cessation Steering Committee and nurses. And we know how important that is, and to have buy-in from our stakeholders.” (Committee member, ID310)

Committee members noted that to achieve buy-in, multi-disciplinary collaboration was crucial - from leadership, informatics specialist, and tobacco treatment specialists. The committee members reported working with various departments, including Information Technology and Nursing to implement their plans to promote tobacco cessation, with the stated goals of developing a seamless workflow integrated in the existing EHR.

“So, the ambulatory nursing directors and the managers sat on the steering committees and helped with the designs. We developed scripting for the nurses, we created job aids, we have posters, we didn’t just develop everything. We redesigned all of the patient education pieces, because that was the other thing. ... So, we

shrunk it down to just one, one document, went through the benefits of quitting, surgical outcomes, response to chemotherapy, all that includes all of the resources.” (Committee member, ID304)

**Subtheme 2.3: Opt-out based system.:** Committee members also noted strong enthusiasm for developing an opt-out system in which patients who currently smoke could be automatically referred to smoking cessation services unless they explicitly stated that they were not interested. The committee members expressed that designing the system to be “Opt-out” would help to increase referrals as well as reach patients who were ambivalent about quitting smoking.

“... what we ultimately developed was an opt-out program, where smokers received referral to the Tobacco Quitline once we identified that they were smokers. Nurses, we determined, would be in the best role to do this, would advise them to quit, and would tell them that their information was being sent to the Quit Line. Now, if a patient refused that, we could certainly note their refusal.” (Committee member, ID310)

**Theme 3: Successes in implementation.**—Both committee members and nurses in both groups shared two notable successes in implementation of the e-referral system: the seamless workflow integration and e-referral system as an opportunity to provide information relevant to smoking cessation even to patients who were not yet interested in quitting.

**Subtheme 3.1: Seamless workflow.:** Some committee members and many nurses reported that the e-referral system was very simple and easy to use as only one-click was required as opposed to placing a referral order for tobacco cessation services. Nurses in both user and nonuser groups found that it was well integrated in the day-to-day workflow.

“I think the process in its entirety is pretty easy. And I don’t really think there’s much in terms of the process that can be improved...” (Nurse in the user group, ID502)

“It’s [the e-referral system] really easy...” (Nurse in the nonuser group, ID512)

“To just automatically put in the referral as you said, you enter it and it spits right over. Right to the referral center and things get scheduled and things get handled. So, it couldn’t be easier.” (Committee member, ID307)

**Subtheme 3.2: Opportunity to provide information and options for quitting.:** Nurses found that the opt-out based e-referral system is helpful even when patients are ambivalent about smoking cessation because this could be an opportunity to put them in contact with services they would not otherwise seek out. In particular, they found that some patients expressed no interest in quitting smoking but were willing to learn about the available options. Thus, participants thought that being in contact with these resources allowed patients to better explore the range of options they might not have previously considered.



“Even if they’re not really interested in quitting [smoking], but they are interested in speaking to someone, that’s something that we’re more able to work with if it’s just a phone call or just a virtual visit versus an in-person visit.” (Nurse in the user group, ID502)

“Yep. And that’s why we love the idea of being able to give our patients options. Because we know not one size fits all.” (Committee member, ID310)

**Theme 4: Barriers in implementation.**—Participants in both committee and nurse groups noted that there were several gaps in implementation resulting in four subthemes: Low visibility of the e-referral system in the EHR, lack of clarity regarding opt-out, insufficient training regarding how to use the e-referral system, and no feedback about the referral outcomes.

**Subtheme 4.1: Low visibility of the e-referral system in the EHR.:** Interviewees noted difficulty with navigating the workflow in the EHR due to low visibility of the e-referral system. Nurses noted that the location of the tobacco use screening items and the e-referral link was buried under a separate tab, “Social History.” Many nurses, and even some committee members, noted that this was not intuitive and, therefore, was sometimes missed by nurses who already have competing demands. Many noted that the link to the e-referral system should either be its own category or should just be part of the main clinic form rather than within a sub-category.

“Sometimes when you haven’t used it for a while, you have to remember where in the documentation it is because it is a few pages back and you have to scroll a little bit to get to where it’s at. ... It’s just hard to identify where it is, especially if you haven’t used it in a few weeks. ‘Cause it’s not actually a page that we have to use all the time in our documentation, so it’s not something that you see every time you document.” (Nurse in the user group, ID506)

“It’s definitely something that you have to remember to do. Even on my prep, I do a little area that I have to check off myself to remind myself to go look. I think if it were like the distress or the pain and it showed on the vitals area as well, it would encourage people to again, remember to do it because it’s right there, they don’t have to go into something extra to open it.” (Nurse in the user group, ID501)

“[Do you know where you can find this e-referral system?] I don’t.” (Nurse in the nonuser group, ID515)

**Subtheme 4.2: Lack of clarity regarding opt-out procedures.:** Participants also indicated that the opt-out procedures were unclear, leading nurses to adopt different approaches. For example, some nurses reported that they asked patients if they were interested in the cessation programs and used this as the opportunity for uninterested patients to opt-out. Other times, the nurses just placed the e-referral for *all* patients who used tobacco, regardless of patients’ interest.

“... patients were saying they didn’t necessarily want the referral. And then, we were instructed to put it in anyways and let them know they can decline it later. I

think from the patient’s standpoint, they get upset with that, because they’re like, “I’ve already declined it, I don’t want to continue to decline it. You guys don’t have to call me and harass me to do this.” (Nurse in the user group, ID501)

**Subtheme 4.3: Infrequent Training.:** The nurses expressed that some of the ambiguity regarding exactly how and when the e-referral system should be used stemmed from inconsistent and infrequent training. Nurses reported various levels of training (e.g., online training, in-person presentation on the e-referral system) including who trained them and how in-depth the training was. One committee member noted that some of these inconsistencies in training resulted from the COVID-19 pandemic, which was accompanied by higher nurse turnover.

“We have had a tremendous turnover of nurses lately... I do not think this [e-referral process] is covered in orientation.” (Committee member, ID312)

“I think they presented it once, but there hasn’t been any follow up that I know of.” (Nurse in the nonuser group, ID504)

In particular, one major reason nurses reported that they were hesitant with using the e-referral system was low confidence referring patients because of a limited clarity in the distinction between the three referral options – Quitline, local support groups, and in-house tobacco treatment specialist. One nurse who recently started working at Moffitt said that she was not aware of any training regarding the e-referral system.

“... I’m kinda confused after that. Like I don’t know what the major differences are, the three different types of referrals. ... it’s like do I refer to all three, do I just refer to the one, or which?... And I’m not sure which one, I mean, and which ones are free.” (Nurse in the user group, ID506)

“... we did have one patient that was being referred and that was the one and only time that I was shown. ... No formal training [on the e-referral system].” (Nurse in the nonuser group, ID515)

**Subtheme 4.4: No Feedback.:** Nurses expressed low confidence and motivation in using the e-referral system because of the lack of feedback after they “click” the referral button. Nurses expressed a desire to know whether the referral went through, if patients engaged in treatment, and whether their referral ultimately led to changes in patients’ smoking behavior. Nurses noted that unless patients voluntarily share their progress, there is no systematic way to follow-up with the patients after the e-referral has been made. Committee members also noted the lack of feedback regarding compliance with the new workflow as one barrier to using the system.

“And there’s no confirmation or anything. So, I was still so skeptical that I did it correctly. ... I don’t know what is involved with the referral once the referral happens. What happens after? What’s the next step?” (Nurse in the nonuser group, ID515)

“There was no way of me knowing which of my clinics were not adhering. ... So, not knowing, over the long term, who was complying and even within the

clinic, who maybe was less compliant, who was the least compliant, was not there. ... I don't know how many patients have been referred throughout Moffitt, but this smoking cessation thing, it's like we know it's there, but, I mean, is it being utilized?" (Committee member, ID305)

**Theme 5: Reasons for not using the new e-referral system.**—Three subthemes emerged when interviewees were asked what discouraged them from using the new e-referral system: Having their own strategies to address smoking, perceived patient priority and resistance, and perceived low relevance of cancer to smoking cessation.

**Subtheme 5.1: Other strategies to address smoking.**: Among nurses in the nonuser group, the main reason reported for not using the e-referral system was that they implemented their own strategies when encountering patients who smoke. These strategies included placing a direct order to the in-house tobacco treatment specialist and limiting smoking cessation intervention based on the level of patients' interests.

"I usually put an order in for the smoking cessation clinic appointment, I think is how I usually do it. ... It's probably just habit, because I've done it that way for so long." (Nurse in the nonuser group, ID511)

"Instead of forcing this education on them, [I] just find a way how to just add that component into their education. To let them be aware that, even though right now their cancer might not be bad, and they feel like smoking helps with your anxiety and all, learning that they have a new diagnosis. The way we approach it, and the way I talk to the patient, I feel like we can reach them just by using a softer tone, and just speaking to them in a language that they can understand." (Nurse in the nonuser group, ID513)

**Subtheme 5.2: Perceived patient priority and resistance.**: Although most nurses noted that they encourage patients to stop smoking, they also acknowledged that smoking cessation was perceived as low priority due to many competing clinical demands. This was particularly evident among nurses in the nonuser group.

"You're trying to get your priorities first over other things ... Probably, to tell you the truth, [smoking cessation is] probably your last thing to think of, because either you're going to see the patient in the clinic, talk about it, or post-op, otherwise, you just can't follow up anymore ..." (Nurse in the nonuser group, ID514)

"... we already have whole lot of things we have to do ... I'm not too sure we would be able to do all of that." (Nurse in the user group, ID503)

Another barrier to using the system reported by the nurses was that some patients adamantly reject any smoking cessation service. Some nurses noted that some patients think smoking helps manage their stress and/or that quitting smoking now would be too stressful. In addition, patients may not have the knowledge regarding the link between their cancer diagnosis and smoking (for further description, see subtheme 5.3).

“... some of them will say I’m too stressed to think about that right now, and I’ll just say, Well, it’s available if you need help in the future.” (Nurse in the user group, ID504)

“I think they’re overwhelmed a lot with the cancer diagnosis, so keeping it as simple as possible for them is going to aid buy-in and compliance.” (Nurse in the nonuser group, ID516)

**Subtheme 5.3: Impact of cancer/clinic type on the perceived importance of smoking cessation.** Nurses in both user and nonuser groups expressed the importance of smoking cessation, regardless of their using the e-referral system. However, differences were noted by nurses in patient attitudes or receptiveness to smoking cessation based on the type of cancer and respective clinic. Nurses reported that patients were more likely to be receptive to the referral options when they recognized or acknowledged that their smoking could have played a role in their cancer etiology or when smoking cessation could be beneficial. For example, nurses from the thoracic and head and neck cancer clinics noted their patients recognized the importance of smoking cessation.

“... they [clinicians] actually tell patients don’t worry about that [smoking cessation] now. And the patients want to do something. [Patients ask] I’m so powerless, what can I do? Well, you’ll have to quit when you get your breast implants. Like you don’t have to quit now, you just have to quit when you want reconstruction. What a twisted message.” (Committee member, ID311)

“It’s usually a touchy subject because they’re more concerned about their cancer. And a lot of times we [nurses] have patients – it’s not lung-related, and because our patients are mostly thyroid patients, and they’re not getting chemotherapy and all, so the whole education piece about chemotherapy, and smoking, and the disease process doesn’t come into play.” (Nurse in the nonuser group, ID513)

**Theme 6: COVID-19 challenges.**—Most of the committee members and a few nurses noted COVID-19 related challenges with implementation of the e-referral system. Two themes emerged: Staff shortage across the board and high nurse turnover during the COVID-19 pandemic.

**Subtheme 6.1: Staff shortages at all levels.** Many committee members reported difficulties with implementation that were related to the timing of the e-referral system’s launch that occurred during the COVID-19 pandemic outbreak. Both committee members and nurses noted that the pandemic drove rapidly changing workflows (i.e., moving to telehealth visits) and the need to focus on imminent medical needs, resulting in a lack of prioritization for smoking cessation.

“Yeah, I think it [implementation of the e-referral system] definitely went down during COVID. I would say it was very low on our priority tree.” (Committee member, ID309)

“We just didn’t see as many patients and we probably didn’t address the smoking issue as much. ... It probably really wasn’t as high of a priority as it is now getting back into the regular flow of things.” (Nurse in the nonuser group, ID511)

However, a few participants noted the silver lining of the pandemic on the e-referral system: Increasing the availability of smoking cessation interventions via telehealth may actually have the potential to meet more patients’ needs with its increased flexibility.

“So, that [telehealth] was one positive of COVID. Because we tried early in the grant to get [tobacco treatment specialist] to have the telehealth visits, and it just wasn’t feasible. And then once COVID hit, and the cancer center started having to do it all over the place, then all of a sudden, it became feasible for us to also use that as a smoking cessation modality.” (Committee member, ID310)

**Subtheme 6.2: High nurse turnover.:** Committee members noted that the pandemic resulted in hiring temporary nurses that did not receive the same degree of training on the importance of smoking cessation at the institution and using the e-referral system, as training priorities had shifted.

“... you’re never going to get the same buy in from a [temporary nurse] that you will a fulltime employee. ... imagine onboarding kind of as a temp nurse, and during COVID, nonetheless. That’s a lot to digest, so anything kind of quote-unquote “extra” might fall off the plate, I imagine.” (Committee member, ID304)

“When somebody leaves, the next nurse or whoever comes on and goes through training. Training, you cannot touch every single item.” (Committee member, ID303)

**Theme 7: How to improve the e-referral system.—**Both committee members and nurses provided opinions on ways to improve the e-referral system and make it sustainable. There were six main subthemes: Increase in visibility of the e-referral process within the EHR, reminders and refreshers on the use of the e-referral system to refer patients who smoke, providing handouts to both nurses and patients, a standardized procedure for unmotivated patients, regular outcome reports, and using medical assistants as the referral point.

**Subtheme 7.1: Increase in visibility of the e-referral process within the EHR.:** Interviewees suggested making the e-referral link and relevant information more visible. Participants suggested relocating them to the main body of the EHR forms rather than under the tab of “Social History.” Many participants believed that including smoking information as a vital sign would be a better alternative to increase visibility.

“I think it’d be helpful just to have it there [on the vital form] just because again, we already have the distress, we have the pain, we have the...if they’re [patients are] having any troubles with their ADLs [Activities of Daily Living] or their falls, so those are also not necessarily vital signs, but they’re a quick glance right there in the vitals area. Or even it [smoking status] was on the top toolbar area for them

[patients] by their MRN [Medical Record Number] or anything like that if it said it there, it's just a quick glance.” (Nurse in the user group, ID501)

**Subtheme 7.2: Refreshers.:** Many participants indicated that more training and periodic refresher courses would be helpful. For example, newly hired nurses should be oriented to the use of the e-referral system during their orientation. Participants noted that regular refresher trainings and reminders to use the system would increase the likelihood of maintaining smoking cessation as a high priority for patient care.

“Like if there's something for us to review like a reminder every so many weeks or so to remind everybody to be referring them. ... Just a reminder that, I think we've gotten it before, this is how many referrals we had, you know, per month and if it's like three, obviously we know we're not referring enough people, so maybe like some statistic like that saying this is how many referrals we had this month and then I could send it out to everybody and say, hey, don't forget to refer people.” (Nurse in the nonuser group, 504)

“That might be helpful, definitely, because we always have new staff coming in and it's always good just to have a reminder of this is an easy way to refer the patient and it takes less work off of us for having to enter extra orders or send out extra emails or something. Then that would be good. So, I think a refresher course would be a nice idea.” (Nurse in the nonuser group, ID511)

**Subtheme 7.3: Handouts.:** Multiple interviewees also suggested that handouts/flyers would be helpful for reminding nurses to use the e-referral system and for explaining the different referral options, process, and what to expect. Although a few individuals noted the existence of training and refresher materials on the intranet, most noted that these resources are not useful if users are unaware of them. Many participants indicated that having a paper handout with information about smoking cessation services could be beneficial to both nurses and patients.

“If we got a better understanding of exactly what the smoking cessation program was; whether it be a small little flyer identifying once a patient is referred, these are the following things that the patient should expect. Then we could have a better conversation with these patients. ... Something the department can hand out to us, or where we sit at our clinic workstations, we have things on the boards for every single nurse as a referral. Every single nurse can get an idea of what – because I can't be the only one that doesn't know.” (Nurse in the nonuser group, ID515)

Some interviewees thought that it would be helpful to have handouts available for patients as well. These handouts could be used to offer more information to patients about the options for assistance with smoking cessation and how they work. The handouts could also be given to those patients who decide to opt-out, so that they know who they can contact should they change their mind.

“...perhaps a document in front of them or they understand what resources are available, they could hand the patient a written document and say, “Oh, here's a nice brochure.” I think each clinic could also place brochures in their waiting rooms

so patients could take a look at them while they're waiting for their clinic visit.”  
(Committee member, ID312)

**Subtheme 7.4: Standardized procedure for unmotivated patients.:** Some interviewees expressed the needs to standardize procedures for patients who are uninterested in quitting smoking. For example, whereas patients with ambivalence could be immediately referred with further education via the e-referral system, for patients who explicitly decline a referral should be followed up on their interest during their subsequent clinic visits.

“I think it makes sense for us to chart that they decline it, that they don't want to be contacted just because again, they don't want to feel harassed. But giving them that education if we can create something saying that they are available if you ever want to schedule in the future that way, we can give them a handout so we can say that they declined, but we've given them the information on how to follow up if they want to in the future.” (Nurse in the user group, ID501)

**Subtheme 7.5: The importance of feedback.:** Many interviewees were eager to learn about the impact of their work on patient health including referral rate, acceptance rate, and abstinence or smoking reduction rate. They suggested providing feedback could help to maintain or even increase motivation to continue using the e-referral system.

“...the only thing I would prefer is a detailed note to see if the patient actually talked to them [referred services], and if they were planning on quitting.” (Nurse in the nonuser group, ID512)

Some participants wanted to learn the details of referral/acceptance rates stratified by clinic and nurses.

“I think some accountability would be very helpful. ... Now, if somebody over me shows that to them and says, come on, at least 10% of your patients need to be referred. And that's what they do to get motivation.” (Committee member, ID311)

Relatedly, committee members recognized the need to “close the loop” to regularly monitor the impact of the investments in developing and implementing the e-referral system on patients' health. Having regular feedback and statistics on the referral/acceptance rate and change in smoking behavior stratified by each referral option would also help to reevaluate the referral options on the e-referral system.

“But we were never able to really fully close the loop. So, if you don't fully close the loop and have that information, it doesn't give you the wherewithal to go back and address the patient that maybe – What was their experience with the Quitline if indeed they were seen? If they never responded to the Quitline, but they agreed to have a call from the Quitline, why now did that change? Was it an issue of their phone line not working? Was there some issue, and it wasn't intentional? Is it now intentional, and the patient has changed their mind?” (Committee member, ID305)

**Subtheme 7.6: Referral: Nurses vs medical assistants.:** Upon the launch of the e-referral system, the steering committee members designated nurses as point of referral given their role as patient educators. However, some interviewees suggested that medical assistants,

who capture patient vitals, might be an alternative point of referral given they are frequently a first contact point during patient appointments. However, there was no clear consensus. For example, some committee members and one nurse in the nonuser group expressed that nurses should be the ones referring patients to smoking cessation services because they spend more time with patients and are usually in charge of patient education. Some participants noted that medical assistants focus exclusively on taking information from the patients and thus may not be suited for this role.

“So, we did have the thought, well, maybe MAs [Medical Assistants] should be the ones doing this because they may have more bandwidth compared to nurses. But at that point, the issue was raised that MAs don’t typically serve in a patient education role. Whereas for nurses, it would come more naturally and is more aligned with their discipline and what they’re taught. And MAs maybe aren’t taught to do counseling or advise patients to quit. ... But something we might still need to consider in the future and think about what kind of training would be needed to supplement that patient education piece.” (Committee member, ID310)

“I don’t think it would be a good idea for the MAs. Maybe if the MAs identify the patients that are smokers, and then inform the nurses. And then we take it from there, and have the provider involved. Instead of putting it on the MAs. I think they should just be the first touchpoint, and if we have a patient that wants to quit smoking, or is identified as a smoker, then we should talk to that patient if that patient has interest.” (Nurse in the nonuser group, ID513)

However, both committee members and nurses expressed that MAs might actually be in a better position to use the e-referral system. Participants reported that because MAs are often the first-contact person and are in charge of gathering information from the patient, including smoking status, they should also be the ones making the referrals. Concerns were also raised regarding nurses’ multiple responsibilities, which limits their time with each patient.

“Yeah, I think it’s an absolute fabulous idea to have the MAs do the referral. They can ask the basic questions and they can go into the electronic medical record and make the referral. Absolutely. These MAs here are trained very well, and I think they’re quite capable of making the referral.” (Committee member, ID312)

“... sometimes I don’t see all of the patients because I’m in a room teaching one patient and the other patient is maybe just a patient who’s come in to just get their CT done. And they’re not really seeing the nurse, they’re just seeing the MA and they’re going to see the doctor. So, I think the MAs would be great. If they said that they wanted to quit, if there were a button for them that e-referred out that they can, you know. I mean I think that would be great, too.” (Nurse in the user group, ID506)

## Discussion

We conducted in-depth interviews with key stakeholders and nurses to evaluate barriers and facilitators of an NCI Cancer Moonshot C3I funded e-referral system for smoking cessation



at Moffitt Cancer Center one year after its launch. Overall, results showed that despite the seamless integration of the system in the clinic workflow, there were some identified gaps between the initial expectations and the actual functioning. The COVID-19 pandemic significantly impacted the implementation and adoption of the system due to changes in workflow priorities. In addition, participants suggested ways to improve and sustain the system such as increasing the visibility of the e-referral system and providing regular reminders to use the system as well as regular trainings on how to use it. Participants also suggested providing referral outcomes and designating non-nurse clinic staff as responsible for making the referrals. Below, we contextualized the findings with the extant C3I-funded tobacco treatment program (TTP) at clinician (nurses)- and system-levels aligned with the multilevel framework in the implementation success of the TTP [3, 29].

### Facilitators

At the clinician level, both committee members and nurses expressed continued support for the use of the e-referral system given the relevance of promoting smoking cessation to their core professional value of improving cancer outcomes. This finding is in line with prior research which found 92% of physicians and advanced practice providers were aware of the significant impact of continued smoking in cancer outcomes and 90% agreed that tobacco cessation should be part of standard care in oncology settings [30]. Further, our participants were enthusiastic about the e-referral system because it created an opportunity to provide smoking cessation resources to cancer patients, aligned with reports from providers in one of the C3I-funded cancer centers on the perceived usefulness of the tobacco cessation referral service [31].

At the system level, many participants found that the integration of the e-referral system within the EHR workflow eased the referral process. Indeed, developing e-referral systems was one of the top priorities for many of the C3I-funded TTPs to maximize reach by leveraging their existing EHR while minimizing disruptions in the current clinical workflow [3]. Some C3I-funded cancer centers have reported promising results that support increased reach and patient engagement in tobacco treatment as a result of the implementation of the e-referral system within the EHR [16, 32–36]. Thus, the identified facilitators were aligned with extant findings.

### Barriers

Several barriers were identified at the clinician level. Difficulty when navigating the referral workflow in the EHR and infrequent training were noted as barriers. For example, nurses felt that it was unclear when to opt-out and whether all patients would have to be referred regardless of their interest and/or motivation. More importantly, similar to providers' report in prior studies [3, 30, 31, 34], nurses reported having competing demands and priorities that limited their time for discussing smoking cessation and tobacco treatment referrals. Nurses felt that some patients were unmotivated to quit smoking and not interested in enrolling in smoking cessation services, in particular, those patients with non-tobacco-related cancers, consistent with previous research [37]. Clinicians' perceived lack of confidence in talking about quitting smoking with their cancer patients and their need for additional training has been frequently documented [3, 30, 31, 38]. Oncology providers seem to prioritize

smoking cessation if their patients have tobacco-related cancer diagnoses, recurrent cancers, and/or good prognoses, whereas smoking cessation is less prioritized in certain phases of cancer treatment (e.g., at the beginning of treatment) or if patients have terminal cancer [31]. These notions impact oncology providers' likelihood of offering smoking cessation interventions [3, 38]. An additional challenge noted in the literature is related to the lack of consistency in the timing of patient-clinician conversations occurring along the cancer care continuum (e.g., pre-surgery to post-therapy) [38]. To overcome clinicians' perceived difficulty in addressing smoking behavior and to increase reach and effectiveness once referred to smoking cessation treatment [39, 40], many C3I-funded cancer centers have implemented the opt-out system (e.g., [34, 41]). However, we still see clinician level barriers in navigating the opt-out system which also go hand-in-hand with infrequent training, underscoring the need for continuous reminders on how to use the e-referral system and relevant trainings to ease clinician's burden.

Regarding the system level barriers, committee members and nurses noted low usability and visibility of the e-referral workflow in the EHR as important barriers. Despite multiple resources to promote the use of the new e-referral system prior to launch (e.g., advertisements, rationale and expectations, scripts to handle conversations, physician champions), the combination of low visibility and lack of refresher trainings resulted in low use of the e-referral system. Further, both committee members and nurses pointed out the lack of a closed-loop system to provide feedback on the referral (e.g., referral confirmation, patient smoking outcomes) as an additional limitation. It is crucial for continuous care to integrate internal and external (e.g., tobacco quitlines) sources of patients' healthcare [42] besides enhancing reach and effectiveness [43].

Lastly, the COVID-19 pandemic created additional system-level challenges in fully implementing the e-referral system. This is not surprising given the overall challenges across the US during the COVID-19 pandemic [44]. Specifically, there was a lack of continuity in using the e-referral system and training the new staff. The clinic visits transitioned to telehealth with streamlined steps (e.g., no meeting with MAs), and imminent medical needs were key targets. These challenges are aligned with common barriers experienced by C3I centers that implemented the C3I-funded TTP during the pandemic [45]. However, as the telehealth literature notes (e.g., [46]), access barrier related to in-person appointments were easily removed during the pandemic, which has expanded the potential reach in the long-term [45].

### **Limitations**

Limitations include interviewing committee members and nurses at a single cancer center and bias in sample selection. Although the language used in the interview questions was carefully constructed to encourage candid responses, it is possible that the interviewees' responses were influenced by social desirability and self-selection biases.

### **Recommendations**

Based on our findings, several considerations and recommendations at the clinician- and system-levels are made for the future development and implementation of an e-referral

system for tobacco treatment. At the clinician-level, providing regular trainings on how to use and the process involved in TTP referral is crucial [34]. In addition, clinicians' education regarding the importance of tobacco cessation regardless of the patient's cancer type and providing strategies to facilitate the communication around the referral could be taught (e.g., reframing tobacco use as a chronic condition rather than a personal weakness [47], using gain-framed messages [31, 48], introducing smoking cessation as a long-term goal [49]). Providing physical/electronic handouts on the overview of the referral procedure and characteristics of each treatment would be helpful for both clinicians and patients [49]. Further, medical assistants, as opposed to nurses, could be alternative referral points given their initial interactions with patients, whereas nurses or oncologists could simply sign off on the referral [19, 34, 50].

At the system level, increasing the visibility and usability of the e-referral workflow would be key, enabling the review of smoking status and initiation of the e-referral, for example, at the vital sign or problem list area as opposed to social history area [19, 42, 43, 49]. Indeed, smoking cessation treatment is regarded as 4<sup>th</sup> pillar of comprehensive cancer care [8] that deserves medical attention in oncology settings. When developing the e-referral workflow, a fully closed-loop system is crucial for continued care for smoking cessation in oncology settings [14, 42, 43]. With the closed-loop system, reports on patients' acceptance/engagement rates and quit rate stratified by referred services (e.g., quitline, in-house) and demographic information could be generated in addition to referral rate stratified by clinics and clinicians, which could motivate clinicians keep using the e-referral system [51]. Lastly, as noted by participants, continuous leadership support and infrastructure for the e-referral system is another crucial piece for a sustainability and maintenance of the e-referral system [3, 13].

## Conclusion

Despite the strong organizational support and seamless integration of the e-referral system for smoking cessation for cancer patients at Moffitt, implementation barriers emerged, including nurses' perceived lack of time, smoking cessation perceived as low priority, infrequent clinician training, and low visibility of the e-referral system within the EHR. These barriers and the identified solutions should inform future iterations of the e-referral system to enhance smoking cessation in oncology settings toward the ultimate goal of improving cancer care and outcomes.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Funding:

The research reported in this publication was supported by the Participant Research, Interventions, and Measurement Core and a Moonshot Supplement to the Cancer Center Support Grant (P30-CA076292, P30CA076292-22S3) at the H. Lee Moffitt Cancer Center & Research Institute, a comprehensive cancer center designated by the National Cancer Institute (NCI) and by NCI (T32CA090314, PI: Vadaparampil & Simmons; K99CA271040, PI: Yang).

## Data Availability:

The data are not publicly available due to privacy.

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Summary of emerging themes

Table 1.

Main Theme	Subtheme	Narrative Summary
1. Motivations for using and supporting the e-referral system (N=9)	n/a	Each group expressed their own reasons to support the system.
2. Committee expectations on the e-referral system (N=12)	2.1. Seamless workflow integration (n=11)	Integrating the workflow seamlessly
	2.2. Aiming to achieve buy-in (n=8)	What the committee strived to achieve to buy-in among the stakeholders.
	2.3. Opt-out based system (n=4)	Benefits of opt-out
3. Successes in implementation (N=17)	3.1. Seamless workflow (n=12)	Workflow is easy to use.
	3.2. Opportunity to provide information and options for quitting (n=8)	The e-referral provides uninterested patients to at least be in contact with someone to help quit.
4. Barriers in implementation (N=24)	4.1. Low visibility of the e-referral system in the EHR (n=8)	Difficulty with navigating referral workflow in the EHR.
	4.2. Lack of clarity regarding opt-out procedures (n=10)	Ambiguity in how to use opt-out.
	4.3. Infrequent training (n=14)	Training was not delivered as intended.
	4.4. No feedback (n=16)	No feedback from the system if the referral was made or not and if the patients engaged or not.
5. Reasons for not using the new e-referral system (N=19)	5.1. Other strategies to address smoking (n=6)	Other strategies in use (e.g., direct order to tobacco treatment specialists, individual strategies to talk with unmotivated patients, track in their own note).
	5.2. Perceived patient priority and resistance (n=11)	Nurses report that smoking cessation is a low priority due to competing demands/lack of knowledge and perceived patients' low motivation to quit due to distress from cancer diagnosis/lack of understanding.
	5.3. Impact of cancer/clinic type on the perceived importance of smoking cessation (n=12)	If cancer/clinic are perceived not relevant to smoking, then e-referral system is not used.
6. COVID-19 Challenges (N=14)	6.1. Staff shortages at all levels (n=13)	How overall staff shortage due to COVID impacted implementation and use of the system.
	6.2. High nurse turnover (n=6)	Impact of high nurse turnover due to COVID.
7. How to improve the e-referral system (N=24)	7.1. Increase in visibility of the e-referral process within the EHR (n=12)	Make the system more visible.
	7.2. Refreshers (n=15)	Reminders will help using the system.
	7.3. Handouts (n=9)	Have handouts for both nurses and patients on the referral options.
	7.4. Standardized procedure for unmotivated patients (n=7)	Need a standardized procedure to talk to uninterested patients.

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Main Theme	Subtheme	Narrative Summary
7.5. The importance of feedback (n=16)		Wanting to know the outcome of the e-referral system to encourage its use.
7.6. Referral: Nurses vs medical assistants (n=11)		Nurses or medical assistants should refer patients.