Original Article

Development of a Pharmacist-Led Opt-Out Cessation Treatment Protocol for Combustible Tobacco Smoking Within Inpatient Settings

Hospital Pharmacy
1–9

DOI: 10.1177/0018578721999809
journals.sagepub.com/home/hpx
SAGE

Philip J. Trapskin[1,2,3], Ann Sheehy[1,2,4,5], Paul D. Creswell[1,4,5,6], Danielle E. McCarthy[1,2,4,5,6], Amy Skora[1,4,5,6], Rob T. Adsit[1,4,5,6], Anne E. Rose[1,2,3], Candace Bishop[1,2,3], Jessica Bugg[1,2,3], Emily Iglar[1,2,3], Mark E. Zehner[1,4,5,6], Daniel Shirley[1,2,5], Brian S. Williams[1,2,4,5,6], Adam J. Hood[1,3], Krista McElray[1,2,3], Timothy B. Baker[1,4,5,6], and Michael C. Fiore[1,2,4,5,6]

Abstract

Background: Although people who smoke cigarettes are overrepresented among hospital inpatients, few are connected with smoking cessation treatment during their hospitalization. Training, accountability for medication use, and monitoring of all patients position pharmacists well to deliver cessation interventions to all hospitalized patients who smoke. **Methods:** A large Midwestern University hospital implemented a pharmacist-led smoking cessation intervention. A delegation protocol for hospital pharmacy inpatients who smoked cigarettes gave hospital pharmacists the authority to order nicotine replacement therapy (NRT) during hospitalization and upon discharge, and for referral to the Wisconsin Tobacco Quit Line (WTQL) at discharge. Eligible patients received the smoking cessation intervention unless they actively refused (ie, "opt-out"). The program was pilot tested in phases, with pharmacist feedback between phases, and then implemented hospital-wide. Interviews, surveys, and informal mechanisms identified ways to improve implementation and workflows. **Results:** Feedback from pharmacists led to changes that improved workflow, training and patient education materials, and enhanced adoption and reach. Refining implementation strategies across pilot phases increased the percentage of eligible smokers offered pharmacist-delivered cessation support from 37% to 76%, prescribed NRT from 2% to 44%, and referred to the WTQL from 3% to 32%. **Conclusion:** Hospitalizations provide an ideal opportunity for patients to make a tobacco quit attempt, and pharmacists can capitalize on this opportunity by integrating smoking cessation treatment into existing inpatient medication reconciliation workflows. Pharmacist-led implementation strategies developed in this study may be applicable in other inpatient settings.

Keywords
clinical services, staff development, medication process

Introduction

Despite national declines, nearly 1 in 7 adults in the United States still smoke cigarettes, and tobacco use remains the leading preventable cause of death in the nation.[1,2] In Wisconsin, the number is closer to 1 in 6 adults.[3] Hospitalization and re-hospitalization within a year are more likely in those who smoke than in those who never smoked.[4] Furthermore, there is an overrepresentation of people who smoke within inpatient settings.[5] Hospitalization of patients who smoke accounts for $110 billion of the approximately $170 billion in added smoking-attributable health care costs annually.[6] The frequency and costs of smoking-related hospitalization highlight the importance of addressing tobacco use during every hospital stay.

Hospitalization provides opportunities to engage patients in smoking cessation treatment by capitalizing on both the salient health concerns that prompted hospitalization and the temporary abstinence mandated by the inpatient stay.[7-11] Multiple trials suggest that intensive inpatient smoking cessation interventions can improve abstinence, regardless of the admitting diagnosis.[9,12] Assessing smoking status and assisting patients who smoke with quitting in healthcare

[1]University of Wisconsin, Madison, WI, USA
[2]UW Health, Madison, WI, USA
[3]UW School of Pharmacy, Madison, WI, USA
[4]UW Department of Medicine, Madison, WI, USA
[5]UW School of Medicine and Public Health, Madison, WI, USA
[6]UW Center for Tobacco Research and Intervention (UW-CTRI), Madison, WI, USA

Corresponding Author:
Paul D. Creswell, UW Center for Tobacco Research and Intervention (UW-CTRI), 1930 Monroe Street, Suite 200, Madison, WI 53706, USA.
Email: pdcreswell@wisc.edu

settings is critical to enhancing patient outcomes and advancing public health, as recommended by the US Public Health Service Clinical Practice Guideline: *Treating Tobacco Use and Dependence*.[13,14] Moreover, the Joint Commission includes documentation of tobacco use status and evidence of provision of cessation counseling and medication during hospitalization and discharge for patients who use tobacco among their performance measures for hospitals.[15,16] However, implementing smoking cessation interventions consistently within inpatient settings has presented significant challenges.[17]

One way to enhance implementation may be to enact system changes to make identification and treatment of tobacco dependence the default, and to harness the electronic health record (EHR) to prompt this default intervention. Such "opt-out" approaches, in which the default is for all patients who smoke to receive services as part of a routine standard of care *unless* they refuse the service, has been shown to increase the reach of smoking cessation treatment in outpatient settings.[18,19] An opt-out approach may also provide an effective way to meet the Joint Commission's (2015) standards for assessing and addressing tobacco use during a hospitalization.[15] For an opt-out approach to work well, it is critical to identify a workforce and workflows that are likely to contact nearly every inpatient who smokes, within and across hospital units.

In hospitals where pharmacists are accountable for obtaining medication histories, and completing medication reconciliation and medication-related education for all patients, the pharmacist offers a nearly universal access point to address tobacco use and deliver a cessation intervention.[20,21] Also, pharmacists often have the training and skills needed to recommend appropriate smoking cessation pharmacotherapies (eg, nicotine replacement therapies [NRT]) and can facilitate connections with counseling through proactive referrals to external services, such as low-barrier, toll-free tobacco quitlines. Tobacco quitlines are available in all 50 states, the District of Columbia, Guam, and Puerto Rico and have demonstrated effectiveness.[22]

This formative study describes the development and refinement of a pharmacist-led intervention through pilot testing to full implementation, with input from pharmacists and others. The RE-AIM (reach, effectiveness, adoption, implementation, and maintenance) framework[23] was used to plan and evaluate the implementation and effects of this pharmacist-led intervention. The intervention comprises the provision of NRT pharmacotherapy during and after the inpatient stay, and EHR-based referral ("eReferral") counseling via the Wisconsin Tobacco QuitLine (WTQL).[13,24] This work represents a real-world attempt to deliver US Public Health Service Guideline-based[14] tobacco cessation treatment interventions consistent with the Joint Commission's standards[15] in inpatient settings using a novel delivery approach centered on pharmacists.

Methods

Beginning in 2016, 3 leaders from a tertiary care Midwest health-system (Pharmacy Manager, Division Chief of Hospital Medicine, and Tobacco Cessation Physician Lead) convened a multidisciplinary team to integrate a smoking cessation intervention (ie, brief counseling, pharmacotherapy, and quitline referral) for all inpatients who smoked. The team considered existing workflows and multidisciplinary team structures and identified the admitting nurse as best suited to screen for smoking status and the pharmacists as the clinician with the most consistent and universal access to provide the cessation intervention. Pharmacists were already accountable for obtaining medication histories, completing medication reconciliation at all care transitions, and providing discharge medication counseling for all inpatients. Research demonstrates the efficacy and cost-effectiveness of pharmacist-led programs.[25,26] The team deemed a pharmacist-delivered program was the most feasible and sustainable way to integrate smoking cessation into existing inpatient workflows. To further streamline workflows and minimize handoffs in tobacco dependence care, a delegation protocol allowed pharmacists to order NRT (ie, gum, lozenge, and/or patch), without requiring the approval/signature of the attending physician, during the inpatient stay and upon discharge for patients who did not opt-out of pharmacotherapy. The multidisciplinary leadership team also worked with leaders of multiple services and units to encourage buy-in, address stakeholder concerns (eg, regarding NRT effects on wound healing), and advocate for broad adoption of the intervention. The smoking cessation intervention protocol was approved by the hospital's Pharmacy and Therapeutics Committee and Medical Board.

Target Populations

Patients targeted for intervention were adults (age 18 years or older) admitted to a participating inpatient unit and service who were identified via an EHR entry on admission as currently smoking cigarettes (at any level of smoking), with or without other forms of tobacco use. Intervention exclusion criteria included patients who: exclusively use forms of tobacco other than combustible cigarettes (eg, chewing tobacco, e-cigarettes), were pregnant, receiving intensive care unit (ICU) level of care, had a cerebrovascular bypass in the past 12 weeks, cerebrovascular aneurysm or vasospasm in the past 4 weeks, or were located on a hospital service where the service chief requested patients be excluded (burn unit, breast reconstruction surgery, any surgery using a flap or free-flap technique, vascular surgery, orthopedic or spinal surgery). Exclusions applied to roughly 15% of eligible patients who smoked.

The target population for implementing the interventions included pharmacists and pharmacy learners working with

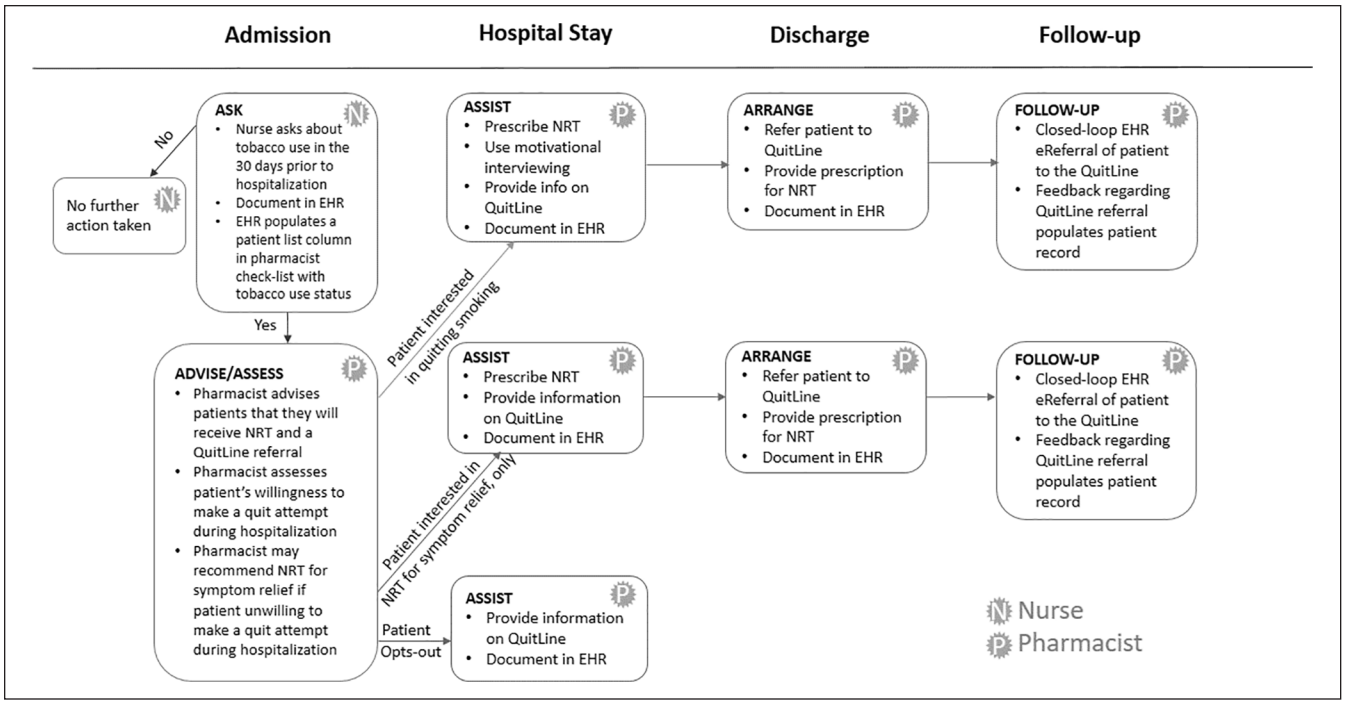

Figure 1. Intervention workflow.

eligible inpatients. After nurses verified patient smoking status at admission, the remaining steps in the workflow were the responsibility of pharmacists, as shown in Figure 1. As such, the study team engaged pharmacists and pharmacy learners in the development, refinement, and implementation of the smoking cessation intervention.

Workflow

The final workflow (Figure 1) was based on the United States Public Health Service Guideline's Five A's of addressing tobacco use (**Ask** about tobacco use, **Advise** to quit tobacco use [NOTE: Advise was modified in this opt-out protocol to "The pharmacist advises the patient that they will receive NRT and a WTQL referral during the hospitalization"], **Assess** interest in quitting, **Assist** with quitting medication and/or counseling, and **Arrange** follow-up).[14]

In the workflow that preceded the new initiative, nurses screened and documented in the EHR tobacco use status upon admission for all patients; physicians were responsible for ordering smoking cessation medications, counseling, or both, but this occurred rarely. In the new workflow, nurses asked patients about their tobacco use in the 30 days before their hospitalization and documented their response in the EHR; pharmacists then addressed tobacco use for all patients identified as smoking within the past 30 days, as shown in Figure 1.

In the new workflow, nurses still screened and documented tobacco use status in the EHR. Then pharmacists, as part of their post-admission medication reconciliation workflow, informed patients who smoked that they would receive NRT during the hospitalization and upon discharge, and they would be referred to the WTQL (via a closed-loop EHR-based "eReferral"). Patients were then assessed in terms of their interest in quitting. If interested in quitting, pharmacists provided brief cessation counseling. If patients indicated that they did not want NRT or a referral to the WTQL (ie, they opted-out of the program altogether), they were provided a tobacco cessation handout and information about the WTQL. All steps of the process were prompted by alerts and documentation requirements in the EHR (Figure 2). The University of Wisconsin-Madison's Health Sciences Institutional Review Board (IRB) deemed this project to be a quality improvement study and exempt from review.

Training

The study team provided a 15 minute training to pharmacists before each of the 2 phases of implementation. Moreover, pharmacists were given refresher trainings at staff meetings and feedback was collected at daily huddles throughout the process. In addition to step-by-step training in the tobacco intervention workflow and documentation of completion of workflow steps in the EHR, pharmacists received information on counseling and motivational interviewing (MI; eg, strategies to address patient ambivalence). The training emphasized the opt-out approach and provided suggested scripting for bedside interactions (eg, "At this hospital we

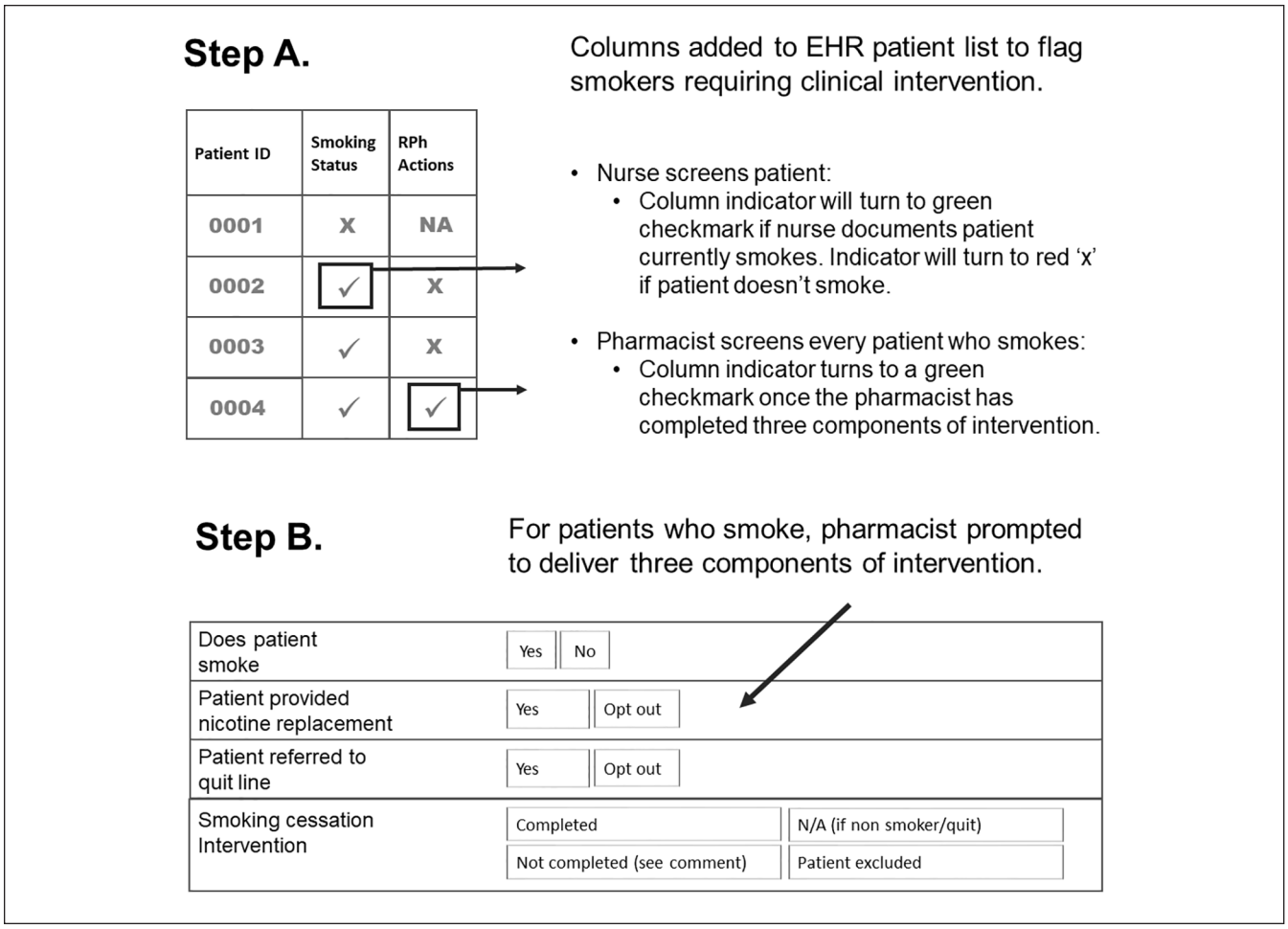

Figure 2. EHR workflows that assisted pharmacists in implementing the intervention.

start nicotine medicine for all patients who smoke" or "We will be referring you to the WTQL upon discharge—to help you with your smoking"). Pharmacists could adapt the language and intervention timing based on their preferences. Pharmacists were also encouraged to give each patient who smoked a handout that included information on the benefits of quitting smoking, the smoke-free hospital policy, smoking cessation resources (eg, details about medication options), and the WTQL. While the handout was not in multiple languages, interpreters were available in the hospital upon request. Finally, pharmacists were encouraged to solicit feedback from patients about their experiences of the intervention process.

In accordance with guideline recommendations,[14] the decision to provide combination or monotherapy nicotine replacement was determined as follows.[27] For patients who smoked at least 10 cigarettes per day, pharmacists provided combination therapy: a nicotine patch (21 mg) with a fast-acting NRT, either mini-lozenge or gum (depending on patient preference). For patients who smoked fewer than 10 cigarettes per day, pharmacists provided monotherapy: either nicotine patch (14 mg), gum, or mini-lozenge (depending on patient preference). Dosing of fast acting nicotine replacement was (4 mg) for patients whose first cigarette was less than 30 minutes before waking or (2 mg) if first cigarette was at least 30 minutes after waking. These guidelines were built into the smart set options which also allowed the practitioner to choose the preferred delivery mechanism. Pharmacists could also recommend other pharmacotherapies (eg, bupropion or varenicline), that were not included in the delegation protocol, but a provider needed to place the order. If pharmacists recommended these medications to the patient's provider, the risk assessment and prescribing process was the same as during routine care.

Measures

Data to evaluate pharmacist implementation (ie, rates of adoption and reach of the intervention) came from a review of discrete data elements on the EHR tobacco workflow. Outcomes of interest included the percentages of adult patients (18 and older) who smoke who: (1) received the

intervention (ie, for whom the pharmacist documented relevant activity in the EHR); (2) had NRT ordered at admission and discharge; and (3) were referred to the WTQL). The development of the program was refined over 2 phases that took place over approximately 18 months from 2017 to 2019. Additional information about the EHR tools, patient education materials, and training materials are available on request.

Phase I

In 2017 and 2018, the team worked with the hospital's health information technology teams to build, test, and refine the EHR tools needed to implement the opt-out intervention. The hospital uses an Epic Systems Corp. (Verona, WI) EHR. In mid-2018, once the EHR tools had been created, the intervention was pilot tested with 4 hospitalist services with an average daily census of 60 patients. Pharmacy clinical services, in an integrated model, were available from 7:00 am to 10:00 pm, 7-days per week from a rotating team of approximately 10 to 15 pharmacists and some pharmacy learners (eg, students, interns, residents). Testing of Phase I ran from August 1, 2018 to September 30, 2018. The team then used quantitative EHR data and informal qualitative feedback to refine the intervention and implementation strategies between Phase I and Phase II of pilot testing.

A convenience sample of 3 pharmacists participated in semi-structured phone interviews 30-days post launch during Phase I. These interviews assessed the pharmacists' appraisals of which intervention components or implementation strategies were effective, and which needed to be changed; how the intervention was integrated (or not) into workflows; and any other recommended adaptations. Most of the questions in the interview used a Likert-style scale, but others were multiple choice or binary (yes/no). Interviewers used these initial responses to probe for more information.

Phase II

Following adjustments of the protocol and new training, a second test phase (Phase II) ran from February 14, 2019 to April 14, 2019. Implementation and reach were evaluated using EHR data and a survey of participating pharmacists. Further refinements, based on informal feedback mechanisms such as daily huddles on inpatient units, were made before the launch of the final program in May 2019.

Pharmacy residents leading program implementation gathered informal feedback from participating pharmacists (eg, during daily huddles) and from patients (eg, at bedside) throughout development phases. Patients and pharmacists were not asked a specific set of questions, but were asked generally about what aspects of the protocol they thought worked well (or did not work well). This informal information collected during Phase I was used to help improve Phase II. In addition, following Phase II, a convenience sample of pharmacists (N = 9) completed a brief online survey (Table 1) designed to assess the efficacy and implementation of the intervention. This survey used the same questions as the phone interviews in Phase I.

Results

Phase I

Adoption and reach. In the first 60 days of Phase I implementation, participating hospitalist services admitted a total of N = 533 patients. Patients who smoked combustible cigarettes accounted for 18.4% (n = 98) of these admissions. Pharmacists completed intervention screening on 36.7% (n = 36) of eligible patients, of which, only 2.0% (n = 2) had NRT prescribed during hospitalization, and only 3.1% (n = 3) had referrals to the WTQL (see Figure 3). These findings suggested a disconnect between eligible patients and completion of the intervention (ie, prescribing of NRT and WTQL referrals).

Interviews. Phone interviews with 3 pharmacists documented significant challenges in program implementation. Participants indicated it took too long to identify eligible patients and they had trouble integrating the intervention into their workflow due to competing priorities and a cumbersome EHR documentation process. In daily huddles and discussion with program leaders, pharmacists identified similar challenges, including a lack of clarity about who was responsible for assessing and documenting smoking status at admission (ie, nurses or pharmacists), a cumbersome EHR workflow, and time to complete the intervention.

Adaptations: As a result of feedback collected from pharmacists and patients in Phases I and II, the team adapted workflow and training prior to the hospital-wide rollout of the program in May of 2019. For instance, roles in the workflow were better defined and communicated so that both nurses and pharmacists were aware that nurses were responsible for documenting past 30-day tobacco use at admission, and that pharmacists were responsible for all subsequent steps in the workflow (Figure 1). Prior to Phase II, evaluating tobacco use status was made a requirement for nurses, but not a "hard-stop" in the EHR. Nurses were not expected to assess patient interest in quitting, however. Another change, based on patient feedback, resulted in the addition of nicotine *mini-lozenges* to the formulary. These replaced regular nicotine lozenges, which some patients found to be too large and unpleasant to use.

EHR workflow improvements included the addition of nurse-assessed smoking cessation intervention status to the pharmacists' patient lists to aid in identifying patients who smoked. As a result, the pharmacist didn't have to remember to ask each patient about their smoking status or to search for smoking status in other parts of the EHR. Also, pharmacists

Table 1. Descriptive Statistics for Post-Phase II Survey Responses (N = 9).

	Mean	SD	Median	Mode	Modal response	Range
How often have you provided the intervention to at least one patient in the past month? (rated 1 = "I have not provided the intervention in the last month" to 6 = "Every day")	3.6	1.5	3	5	"A few times a week"	1-5
For about how many patient encounters have you provided the smoking cessation intervention in the past month? (rated 1 = "0" to 5 = ">15", in 5-encounter intervals)	3.0	1.2	3	3	"6-10 encounters"	1-5
On average, how long does the intervention usually take overall? (rated 1 = "Less than 5 min" to 5 = "More than 20 min" in 5-min intervals)	1.8	1	2	1	"Less than 5 min"	1-4
How often do you use the "Breathe Easy" handout in your patient interactions? (rated 1 = "Never" to 5 = "Always")	2.3	1.7	1	1	"Never"	1-5
How do you think patients feel about being able to talk to a pharmacist about quitting? (rated 1 = "Not at all valuable" to 5 = "Extremely valuable")	3.1	0.6	4	3	"Somewhat valuable"	2-4
How receptive do patients seem about talking with you about smoking? (rated 1 = "Not at all interested" to 5 = "Extremely interested")	2.8	0.8	3	3	"Somewhat interested"	1-4
How do you think patients feel about being given the opportunity to stop smoking while in the hospital? (rated 1 = "Not at all important" to 4 = "The most important priority")	2.1	0.3	2	2	"Not very important"	2-3
The smoking cessation intervention fits well into my workflow/routine. (rated 1 = "Strongly disagree" to 5 = "Strongly agree")	2.7	1.1	3	3	"Neither agree nor disagree"	1-4
Is the intervention ever a burden or interruption to your routine? (rated 1 = "Never" to 5 = "Always")	3.0	1.1	3	3	"Sometimes"	1-5
How do you prioritize the smoking cessation intervention in your daily workflow/routine? (rated 1 = "Not important at all" to 4 = "The most important priority")	2.3	0.5	2	2	"Not very important"	2-3
Have you noticed the intervention being adopted by pharmacists on certain units more than others, or for certain patient populations more than others? (Binary: "Yes" or "No")	1.2	0.4	1	1	"No"	1-2

could update the intervention status to display "completed," "not completed," or "not applicable" (eg, for pediatric patients) directly in the patient list, without further navigation.

Between Phases I and II, training materials were also refined based on pharmacist input to include streamlined, step-by-step instructions with EHR-based screenshots. These instructions were made available at all pharmacist workstations. Once trained, pharmacists provided feedback that they preferred using an individualized phrasing and approach for the opt-out language over the scripted suggestions provided in training, and so typically adapted the opt-out approach to better match their clinical care approach.

Phase II

Adoption and reach. As shown in Figure 3, during Phase II, adoption and reach improved markedly. Patients identified as currently smoking and eligible for the program represented 21.4% (n = 178) of the N = 830 adult patients admitted in Phase II. Pharmacists completed intervention screening on 75.8% of eligible patients who smoked (n = 135). Among eligible patients who smoked, 44.4% (n = 79) had NRT prescribed during hospitalization and 31.5% (n = 56) had an eReferral sent to the WTQL.

Survey responses. In the survey of pharmacists conducted following Phase II (Table 1), most respondents reported adopting the intervention and delivering it with regularity in the previous month, with several reporting delivering the intervention several times a week, but some reporting no use of the intervention in the past month. Respondents reported, on average, that the intervention took between 5 and 10 minutes to deliver. They also reported using MI strategies to talk to the patient about quitting, with pharmacists reporting using an average of 2.3 different MI strategies (data not shown). Most respondents reported never using the tobacco cessation handout (both the mode and median response was "never" for this item).

Although respondents rated patient perceptions of the importance of quitting smoking during hospitalization as low, they rated the perceived patient value and interest in the intervention at above the midpoint on 5-point unipolar

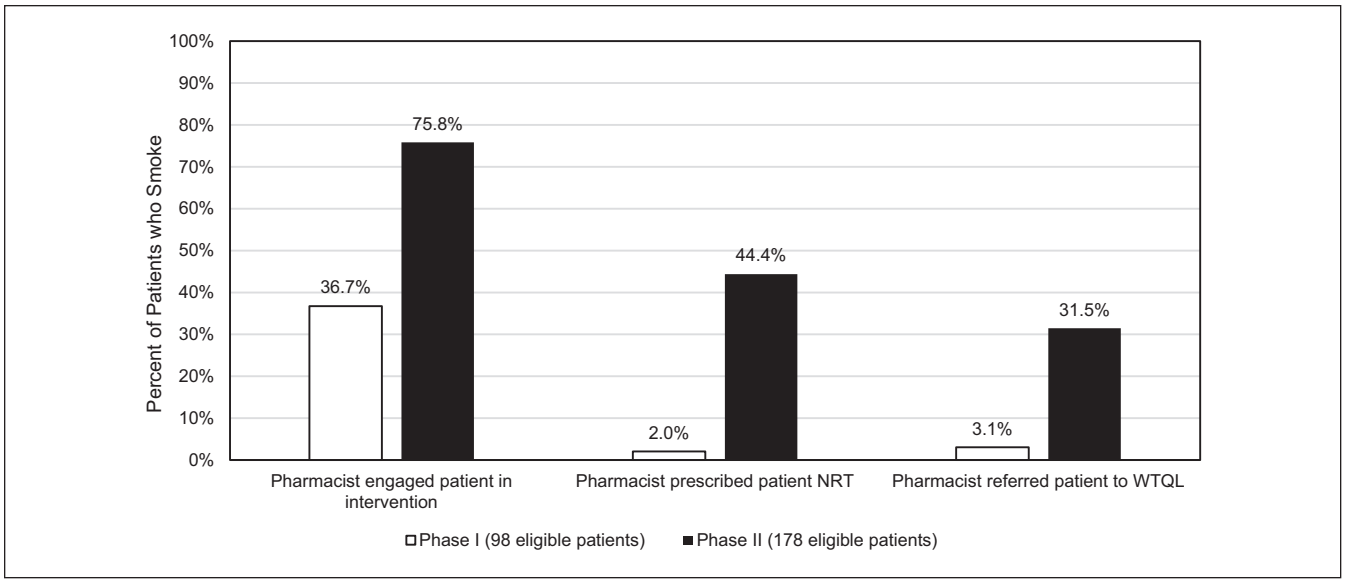

Figure 3. Rates of pharmacist documentation of intervention delivery, prescribing NRT, and referral to the Wisconsin Tobacco QuitLine (WTQL), by implementation phase. Rates shown are among adult inpatients who reported smoking in the 30 days prior to admission.

scales, on average. Also, although respondents tended to rate the intervention as sometimes burdensome, they agreed that the intervention fit well into their workflow. In terms of priority, the intervention was rated as not very important by most respondents. Most respondents reported that the intervention was being adopted equitably across units and patient groups. Participating hospitalist services averaged about 15 protocol eligible patients per month during the pilot phases.

The rates at which pharmacists adopted and implemented the intervention rose markedly over the 2 phases (from 36.7% in Phase I to 75.8% in Phase II), as did the reach of WTQL and NRT referral among patients (from 3.1% to 31.5% and from 2% to 44.4%, respectively).

Discussion

Results of this multi-phased, pharmacist-led smoking cessation intervention rollout suggest that improving implementation strategies can meaningfully increase the rates at which hospitalized patients who smoke receive evidence-based smoking cessation treatment. This program, developed by a multidisciplinary team of stakeholders, capitalizes on the unique role of pharmacists who interact with nearly every inpatient at both admission and discharge. Iterative input from pharmacists was used to refine implementation strategies and better integrate smoking cessation intervention into existing workflows to enhance the reach of NRT and tobacco quitline referral among inpatients.

Feedback from pharmacists and patients was critical to improving the program. This feedback spurred multiple adaptations to the program across phases. Recognizing that nursing staff were already assessing smoking status provided an opportunity to adapt the EHR to generate a daily list of admitted patients who smoked and had not yet received the intervention, and eliminated the need for pharmacists to conduct individual patient chart reviews to identify smokers. This adaptation simplified the workflow for pharmacists while also prompting intervention. Other EHR modifications included changes to recommended workflows, and associated training in these, to clarify which team members (eg, nurses, pharmacists) are responsible for which key actions in the workflow. Also, input from stakeholders highlighted the need for ongoing training and implementation support (ie, through formal training and informal huddles and consultations) to help pharmacists adopt the intervention and adapt it to their setting and practice. This education could even be multi-modal (eg, online video trainings). Although model language was provided to pharmacists to illustrate how they might broach the topic of smoking cessation treatment with patients, and do this in a way that preserved the opt-out approach, this was not prescriptive. Pharmacists requested and were encouraged to adapt the language and timing of the intervention to their needs and preferences.

Pharmacists were also encouraged to solicit feedback from patients about their experiences, and this led to a change in the medication formulary (from standard-sized nicotine lozenges to mini-lozenges).

Improvement in the reach of NRT and WTQL referral among patients who smoke across phases suggest that refining implementation strategies effectively improved implementation. It is not possible to identify which changes to the

intervention (eg, nicotine mini-lozenge vs standard lozenge) or implementation strategies contributed to improvements in rates of adoption of the intervention and the reach of WTQL and NRT referral between Phases I and II. However, it is clear that improvement occurred and that pharmacists acknowledged and addressed tobacco use with the majority of the inpatients by the time the program was ready for roll-out hospital-wide.

Despite this increased engagement and the opt-out design, fewer than half of inpatients who smoke are receiving pharmacotherapy or counseling referrals, identifying substantial room for improvement. Survey data from a small sample of pharmacists who participated in Phase II also suggest that implementation challenges remain. For instance, pharmacy leadership may need to address questions of prioritization and workload. As this was added onto existing clinical duties, it is not surprising that some pharmacists felt the program could be burdensome. It is unclear why pharmacists did not distribute the smoking cessation handout, but it also may have been related to burden or time restrictions. Further iterative refinement of workflows, EHR tools, and implementation support strategies may be needed. Sustainability will also depend upon pharmacist engagement to prioritize tobacco cessation. Finally, sharing smoking cessation successes with the pharmacist team may help with program adherence and buy-in.

Limitations. Data collection was limited in this quality improvement initiative and relied on convenience samples and the collection of informal feedback from both pharmacists and patients. A more systematic assessment of stakeholders using validated tools could better elucidate key barriers and facilitators of program impact. Future work should focus on these potential barriers and facilitators by using larger samples and considering patient demographics (eg, race, gender, socioeconomic status) as well as different forms of nicotine and tobacco (eg, e-cigarettes). Assessing patient utilization of treatment (eg, using pharmacy records and quitline referral outcomes) and patient abstinence from smoking could also enhance evaluations of program effectiveness. Our limited sample size and time frame did not allow for differential follow-up of re-admitted individuals, but future work may be enhanced by EHR flags for re-admissions. In addition, without the inclusion of control sites, it is impossible to rule out the possibility that secular changes rather than refined intervention and implementation strategies contributed to the improvement in implementation outcomes across program phases. This research was also limited to a single hospital, and the degree to which the program and its findings are generalizable is unknown.

Conclusions

This collaborative quality improvement effort identified a novel approach with the potential to meaningfully increase the engagement of inpatients who smoke in tobacco dependence treatment during and after their hospital stay. A multidisciplinary team identified and harnessed the potential of pharmacists to address smoking with inpatients during routine medication history, medication reconciliation, and discharge counseling workflows. The team effectively engaged most hospital units and services in the program and engaged pharmacists in the refinement of the program through iterative pilot testing. This collaborative effort effectively increased the reach of smoking cessation treatments among inpatients in a way that may serve as a model for other inpatient hospital settings.

Acknowledgments

We acknowledge the support for this research by UW Health and the University of Wisconsin Hospitals and Clinics. We acknowledge the cooperation of Epic Systems Corp. We thank the treating pharmacists who participated in this quality improvement project. We also acknowledge the contributions of Bill Marten, at UW Health Enterprise Analytics, and Wendy Theobald, PhD, at the UW Center for Tobacco Research and Intervention (UW-CTRI), who provided assistance with this manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by The National Cancer Institute [grant number R35CA197573].

ORCID iD

Paul D. Creswell https://orcid.org/0000-0001-8432-0017

References

1. Creamer MR, Wang TW, Babb S, et al. Tobacco product use and cessation indicators among adults – United States, 2018. *MMWR Morb Mortal Wkly Rep*. 2019;68:1013-1019.
2. U.S. Department of Health and Human Services. *Smoking cessation: a report of the Surgeon General*. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2020.
3. Centers for Disease Control and Prevention. Extinguishing the tobacco epidemic in Wisconsin. *State Fact Sheets*. 2020. Accessed January 21, 2021. https://www.cdc.gov/tobacco/about/osh/state-fact-sheets/wisconsin/
4. Kahende JW, Adhikari B, Maurice E, et al. Disparities in health care utilization by smoking status—NHANES 1999-2004. *Int J Environ Res Public Health*. 2009;6:1095-1106.
5. Gadomski AM, Stayton M, Krupa N, Jenkins P. Implementing a smoke-free medical campus: impact on inpatient and employee outcomes. *J Hosp Med*. 2010;5:51-54.

6. Xu X, Bishop EE, Kennedy SM, Simpson SA, Pechacek TF. Annual healthcare spending attributable to cigarette smoking: an update. *Am J Prev Med*. 2015;48:326-333.
7. McBride CM, Emmons KM, Lipkus IM. Understanding the potential of teachable moments: the case of smoking cessation. *Health Educ Res*. 2003;18:156-170.
8. Ockene JK. Are we pushing the limits of public health interventions for smoking cessation? *Health Psychol*. 1992;11: 277-279.
9. Rigotti NA, Clair C, Munafò MR, Stead LF. Interventions for smoking cessation in hospitalised patients. *Cochrane Database Syst Rev*. 2012;5:Cd001837.
10. Chui CY, Thomas D, Taylor S, et al. Factors associated with nicotine replacement therapy use among hospitalised smokers. *Drug Alcohol Rev*. 2018;37:514-519.
11. Adams J, Cymbala AA, Delate T, et al. Cluster-randomized trial of clinical pharmacist tobacco cessation counseling among patients with cardiovascular disease. *Popul Health Manag*. 2015;18:300-306.
12. Rigotti NA, Stoney CM. CHARTing the future course of tobacco-cessation interventions for hospitalized smokers. *Am J Prev Med*. 2016;51:549-550.
13. Fiore MC, Adsit R. Will hospitals finally "Do the right thing"? Providing evidence-based tobacco dependence treatments to hospitalized patients who smoke. *Jt Comm J Qual Patient Saf*. 2016;42:207-208.
14. Fiore MC, Jaén CR, Baker TB, et al. *Treating tobacco use and dependence: 2008 update*. U.S. Department of Health and Human Services. Public Health Service; 2008.
15. The Joint Commission. Tobacco treatment. 2015. Accessed August 25, 2020. https://www.jointcommission.org/measurement/measures/tobacco-treatment/
16. Fiore MC, Goplerud E, Schroeder SA. The Joint Commission's new tobacco-cessation measures—will hospitals do the right thing? *New Engl J Med*. 2012;366:1172-1174.
17. Bjornson WG, Gonzales DH, Markin CJ, et al. Two years in the life of a university hospital tobacco cessation service: recommendations for improving the quality of referrals. *Jt Comm J Qual Patient Saf*. 2016;42:209-218.
18. Buchanan C, Nahhas GJ, Guille C, Cummings KM, Wheeler C, McClure EA. Tobacco use prevalence and outcomes among perinatal patients assessed through an "opt-out" cessation and follow-up clinical program. *Matern Child Health*. 2017;21: 1790-1797.
19. Nahhas GJ, Wilson D, Talbot V, et al. Feasibility of implementing a hospital-based "opt-out" tobacco-cessation service. *Nicotine Tob Res*. 2017;19:937-943.
20. Dobrinas M, Blanc AL, Rouiller F, et al. Clinical pharmacist's role in implementing a smoking cessation intervention in a Swiss regional hospital: an exploratory study. *Int J Clin Pharm*. 2014;36:526-534.
21. Stack NM, Zillich AJ. Implementation of inpatient and outpatient tobacco-cessation programs. *Am J Health-Syst Pharm*. 2007;64:2074-2079.
22. Centers for Disease Control and Prevention. 1-800-QUIT-NOW; 15 years of helping people quit smoking. 2019. Accessed November 16, 2020. https://www.cdc.gov/tobacco/features/quitlines/15th-anniversary/index.html
23. Glasgow RE, Klesges LM, Dzewaltowski DA, Estabrooks PA, Vogt TM. Evaluating the impact of health promotion programs: using the RE-AIM framework to form summary measures for decision making involving complex issues. *Health Educ Res*. 2006;21:688-694.
24. Tindle HA, Daigh R, Reddy VK, et al. eReferral between hospitals and quitlines: an emerging tobacco control strategy. *Am J Prev Med*. 2016;51:522-526.
25. O'Reilly E, Frederick E, Palmer E. Models for pharmacist-delivered tobacco cessation services: a systematic review. *J Am Pharm Assoc (2003)*. 2019;59(5):742-752.
26. Dent LA, Harris KJ, Noonan CW. Randomized trial assessing the effectiveness of a pharmacist-delivered program for smoking cessation. *Ann Pharmacother*. 2009;43(2):194-201.
27. Fiore MC, Baker TB. Treating smokers in the health care setting. *N Engl J Med*. 2011;365(13):1222-1231.