Title

Evaluation of a Pharmacist-Linked Smoking Cessation Intervention for Adults Experiencing Homelessness

Journal

Substance Use & Misuse, ahead-of-print(ahead-of-print)

ISSN

1082-6084

Authors

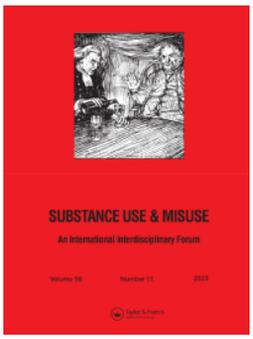
De Los Reyes, Gea
Ng, Amena
Chavez, Jazmin Valencia
et al.

Publication Date

2023-07-03

DOI

10.1080/10826084.2023.2231060



Substance Use & Misuse

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/isum20

Evaluation of a Pharmacist-Linked Smoking Cessation Intervention for Adults Experiencing Homelessness

Gea De Los Reyes, Amena Ng, Jazmin Valencia Chavez, Dorie E. Apollonio, Lisa Kroon, Phoebe Lee & Maya Vijayaraghavan

To cite this article: Gea De Los Reyes, Amena Ng, Jazmin Valencia Chavez, Dorie E. Apollonio, Lisa Kroon, Phoebe Lee & Maya Vijayaraghavan (2023): Evaluation of a Pharmacist-Linked Smoking Cessation Intervention for Adults Experiencing Homelessness, Substance Use & Misuse, DOI: 10.1080/10826084.2023.2231060

To link to this article: https://doi.org/10.1080/10826084.2023.2231060

Published online: 03 Jul 2023.

SUBSTANCE USE & MISUSE
https://doi.org/10.1080/10826084.2023.2231060

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Evaluation of a Pharmacist-Linked Smoking Cessation Intervention for Adults Experiencing Homelessness

Gea De Los Reyes[a*], Amena Ng[a*], Jazmin Valencia Chavez[a*], Dorie E. Apollonio[a], Lisa Kroon[a], Phoebe Lee[b] and Maya Vijayaraghavan[b]

[a]School of Pharmacy, University of California, San Francisco, California, USA; [b]Division of General Internal Medicine, School of Medicine, University of California, San Francisco, California, USA

ABSTRACT

Background: Interventions are needed to increase access to tobacco treatment for people experiencing homelessness. We developed a community pharmacist-linked cessation program for adults experiencing homelessness that included one-time, pharmacist-delivered counseling and furnishing nicotine replacement therapy (NRT) for 3 months. *Methods*: We conducted a single-arm, uncontrolled trial of the pharmacist-linked intervention among adults experiencing homelessness recruited from three homeless shelters in San Francisco, CA. We asked participants to complete questionnaires at baseline and during 12 weekly follow-up visits. We obtained information on cigarette consumption, use of NRT, and quit attempts at each visit, and reported cumulative proportions during the study interval. We used Poisson regression and logistic regression, respectively, to examine factors associated with weekly cigarette consumption and quit attempts. We conducted in-depth interviews with residents to understand barriers to and facilitators of engagement. *Results*: Among 51 participants, average daily cigarette consumption reduced 55% from 10 cigarettes per day at baseline to 4.5 cigarettes at 13 wk follow-up, and 56.3% had CO-verified abstinence. Use of medications in the past week was associated with a 29% reduction in weekly consumption (IRR 0.71, 95% CI 0.67–0.74), and increased the odds of a quit attempt (adjusted odds ratio (AOR), 2.37, 95% CI 1.13–4.99). While residents benefited from engaging in the pharmacist-linked program to increase quit attempts, they felt that to sustain abstinence, longitudinal tobacco treatment was needed. *Conclusions*: A pharmacist-linked smoking cessation program at transitional homeless shelters can reduce structural barriers to cessation care and reduce tobacco use among people experiencing homelessness.

KEYWORDS

Smoking cessation; populations experiencing homelessness; pharmacist-linked tobacco treatment

Introduction

Tobacco use is responsible for approximately 480,000 deaths yearly in the United States. Tobacco use is especially prevalent among people experiencing homelessness, at 70% to 80% versus 15% in the general population (Baggett et al., 2013). As a result, people experiencing homelessness have high rates of smoking-attributed cancer, cardiovascular disease, and lung disease that contribute to morbidity and premature mortality (Fazel et al., 2014). Adults experiencing homelessness die three to five times earlier than those who are housed (Baggett et al., 2015). Tobacco cessation can prevent or partially reverse smoking-related diseases. Over 60% of people experiencing homelessness attempt to quit smoking yearly, a rate similar to the general population (Brown et al., 2022). However, they are less likely to quit successfully (9% to 13% quit ratio vs. 61.7%) (Creamer et al., 2019; Vijayaraghavan et al., 2013; 2016) and most quit attempts are unassisted (Vijayaraghavan et al., 2016); highlighting the need to increase access to treatment (Vijayaraghavan et al., 2017).

Several controlled and uncontrolled studies have evaluated the feasibility of providing guideline-recommended smoking cessation pharmacotherapy and behavioral counseling to people experiencing homelessness (Baggett et al., 2018; 2019; Burling et al., 2001; Dawkins et al., 2020; NCT01932996, 2013; NCT2245308, 2019; Ojo-Fati et al., 2015; Okuyemi et al., 2006; 2013; Rash et al., 2018; Vijayaraghavan et al., 2020). These trials have shown that interventions for smoking cessation are feasible to implement and may be associated with quitting. A community-based clinical trial for smoking cessation for people experiencing homelessness, Power to Quit, showed that intervention participants receiving the intervention of motivational interviewing and nicotine replacement therapy (NRT) had slightly higher, but non-significant rates of abstinence compared to control participants who received a single session of motivational interviewing and NRT (9.3% vs. 5.6%) (Okuyemi

CONTACT Maya Vijayaraghavan maya.vijayaraghavan@ucsf.edu Division of General Internal Medicine/Zuckerberg San Francisco General Hospital, University of California, San Francisco, 1001 Potrero Avenue, Box 1364, San Francisco, CA 94110, USA.
*Equal contributions by these authors

et al., 2013). Other studies that included behavioral counseling and pharmacotherapy and contingent financial reinforcement for cessation demonstrated higher abstinence rates (22% at 4 wk follow-up and 48% at 8 wk follow-up) (Baggett et al., 2018; Rash et al., 2018). However, these trials were not integrated into homeless services, nor did they rely on pharmacists to provide cessation services.

In 2019, we developed and evaluated a community-based, pharmacist-linked intervention for smoking cessation for people experiencing homelessness (Hartman-Filson et al., 2022). We conducted the study in phases, beginning by partnering with shelters to improve their capacity to offer cessation services through training their staff on how to provide brief cessation counseling. We selected two sites to pilot a smoking cessation program, where study investigators trained in tobacco treatment provided in-depth training to staff at those sites to serve as cessation champions and implemented a cessation program for their residents. The cessation program involved connecting residents by telephone to a community pharmacist who provided counseling, assessed appropriateness for NRT and dosing, furnished NRT and provided medication education. The NRT was delivered at no cost to residents on-site at the shelters. We enrolled 52 residents in the first iteration of the program and followed them weekly over the three months. Average daily cigarette consumption reduced by 50%, from 10 to 5 cigarettes per day, and quitting behaviors increased by 37%, with 70% attempting to quit at least once during the study, and 84% using pharmacotherapy for cessation.

In this study, we evaluated the second iteration of this ongoing community-based pharmacist-linked smoking cessation program in reducing tobacco use among people experiencing homelessness. We expanded our previous work by (a) adding a third site, an emergency homeless shelter that served people with criminal legal system involvement, and (b) conducting qualitative in-depth interviews with pharmacists, residents, and staff at shelters to identify barriers to and facilitators of engaging in the pharmacist-linked smoking cessation program.

Methods

Study design

We conducted a single-arm, community-based, uncontrolled trial of a community pharmacist-linked intervention to increase access to smoking cessation services among people experiencing homelessness between August 2021 and August 2022 (Figure 1). The intervention took place in 3 shelters in San Francisco, CA. From March 2022 to April 2022, we also conducted in-depth semi-structured interviews with pharmacists, residents, and staff at shelters to understand barriers to and facilitators of providing services and engaging in the cessation program.

Setting and participants

We followed the same procedures documented in previous research (Hartman-Filson et al., 2022). We implemented the intervention in three sites: two offered transitional shelter and services, and one offered emergency shelter and services. Participants were eligible for the study if they met the following criteria: 1) at least 18 years old, 2) resident at one of the sites, 3) currently smoking at least 5 cigarettes per day biochemically verified using expired carbon monoxide (CO, ≥ 5 parts per million), 4) interested in quitting within the next month, and 5) willing to use medications for smoking cessation.

At enrollment, study staff facilitated a telephone conversation between the participants and a pharmacist where the pharmacist assessed appropriateness for NRT, selected the NRT treatment (which could include combination NRT therapy), the NRT dose, and provided one-on-one counseling on NRT and smoking cessation; a courier then delivered the NRT medications free of charge to participants at the shelter. Participants had Medi-Cal coverage for these medications with zero copay. Enrolled participants in the cessation program completed a baseline questionnaire and 12 weekly follow-up questionnaires to assess abstinence. Participants received a $15 gift card for completing the baseline questionnaire, a $5 gift card for each weekly follow-up questionnaire, and a $20 gift card for the final follow-up at 3-months.

For the in-depth interviews, we recruited resident and shelter staff participants at two study sites where participants had either completed the program or were nearing the end of their participation. We began implementation of the cessation program at the third site at the same time as this qualitative sub-study; therefore, we were unable to recruit participants from this site because participants were in the early phase of the study. We also enrolled a pharmacist from the community pharmacy. Participants were informed about the study and those interested were consented to participate in the qualitative sub-study. Study staff (AN, JVC, GD) conducted interviews on site in a private room. Interviews lasted between 30 and 60 min and were recorded using a digital voice recorder and transcribed verbatim by a professional transcriptionist. Participants received a $25 gift card for completing the interviews. The UCSF Institutional Review Board approved all study procedures (#20-29865).

Theoretical framework

We used the Precede-Proceed framework to identify predisposing, reinforcing, and enabling factors related to implementing an ongoing cessation program in a community setting (Green & Kreuter, 2005). This framework may help identify factors needed to longitudinally sustain such a program in a population with limited access to services. We categorized predisposing factors as knowledge and beliefs and attitudes toward smoking cessation. Enabling factors were resources to engage in smoking cessation, the physical and social environment at shelters, and skill-building to engage in smoking cessation. Reinforcing factors were supporting factors (e.g. reminders) that facilitated smoking cessation. We used this framework to evaluate how well the ongoing smoking cessation program met the needs of residents to engage in cessation behaviors.

Quantitative data Collection

Study staff administered a questionnaire to resident participants at baseline and during 12 weekly follow-up visits.

Baseline measures

Participants reported whether they were daily or non-daily smokers, the number of days they smoked cigarettes in the past 7 days, and the number of cigarettes smoked on smoking days. We used these measures to calculate average daily cigarette consumption. We asked participants to report the time it took to smoke their first cigarette after waking (within 5 min, 6–30 min, 31–60 min, or after 60 min), their intention to quit smoking ("never expect to quit", "may quit", "will quit in the next 6 months", or "will quit in the next month"), and whether they made a quit attempt for 1 day or longer in the past year. Participants reported their age, gender (female, male, or transgender), race/ethnicity (American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander, Black/African American, Hispanic/Latinx, White, other/more than one race), and length of stay at the shelter. Participants reported whether they had experienced homelessness continuously in the past year, or if they had four or more episodes of homelessness in the past 3 years, which constitute the criteria for chronic homelessness.

Follow-up measures

At each of the 12 weekly follow-up visits, we asked participants about any quit attempts in the past week and methods they had used to quit smoking. Among those who received NRT, we asked whether they had used it, and if so, the NRT formulation(s) they had used (patch, gum, lozenge, oral inhaler, and nasal spray), and how many days they had used it in the past week. If they had not used medications every day, participants were asked to explain their reasons for not doing so. Participants also provided an expired CO sample at baseline and all follow-up visits, which we used to assess abstinence (defined as < 5 parts per million) (Benowitz et al., 2020).

Qualitative data Collection

We mapped responses to interview questions to the three constructs of the Precede-Proceed framework—predisposing, enabling, and reinforcing. We asked resident participants to describe their knowledge on tobacco use, beliefs and attitudes toward tobacco cessation, and factors that influenced their motivation to quit. We asked them to describe their experiences with engaging in the pharmacist-linked smoking cessation program, focusing on implementation factors such as the time it took to receive these services. We asked shelter staff to describe their experiences engaging with residents around tobacco cessation, and whether they experienced challenges. We asked the pharmacist participant to describe their prior training in providing cessation counseling and their experiences with engaging with the program.

Statistical analysis

We described sample characteristics and tobacco use at baseline using proportions for categorical variables and median (interquartile range [IQR]) for continuous variables. We estimated cumulative proportions of quit attempts, use of NRT, type(s) of NRT used, median number of days used, and reasons for not using. We used mixed effects Poisson and logistic regression models, accounting for repeated measures within participants to examine factors associated with weekly cigarette consumption ($N = 365$ observations) and CO-verified point prevalence abstinence ($N = 385$ observations), respectively. We adjusted for age, gender, and baseline time to first cigarette after waking as fixed effects in the model, and cigarette consumption, encounters with shelter staff on smoking, and use of NRT in the past week as random effects. Intra-subject correlation of repeated observations was accommodated using a random intercept for each subject. Statistical analysis results are described using predicted counts and probabilities for interpretability. We conducted quantitative analyses in Stata 16.

Qualitative data analysis

The audio recorded in-depth, semi-structured interviews were transcribed verbatim by a contracted professional transcription service, and transcribed texts were redacted of any personal identification data. We used Atlas.ti.8 qualitative data analysis software to facilitate efficient coding, and analyzed transcripts using content analysis (Hsieh & Shannon, 2005). AN, JVC, and GD coded the transcripts, and the team met frequently during the coding process with the PI (MV) to refine the codebook and resolve disagreements in assignment of codes or their description. To identify themes, we refined and reduced the number of overall codes by grouping them into a short list mapped to the precede-proceed framework. Exemplar quotations were selected to reflect each theme.

Results

Sample characteristics and tobacco use behaviors

Of the 51 participants, 33 (64.7%) attended all 13 study visits. On average, participants attended 7 study visits. Of the 51 participants, median age was 46.5 years (IQR 41.2–57.1), 62.8% were male (62.8%), 33.3% identified as Black/African American, and 13.7% identified as Hispanic/Latinx (Table 1). Most participants (78.4%) reported they had experienced chronic homelessness.

At baseline, all participants reported smoking daily and the median number of cigarettes smoked was 8.5 (IQR 8, Table 1). Most participants smoked within 30 min of waking. More than half the participants (66.7%) reported making a quit attempt in the past year, and some of the attempts were unassisted (41.2%).

Weekly consumption, quit attempts, and medication use

During the study, average daily cigarette consumption reduced 55% from 10 cigarettes per day at baseline to 4.5

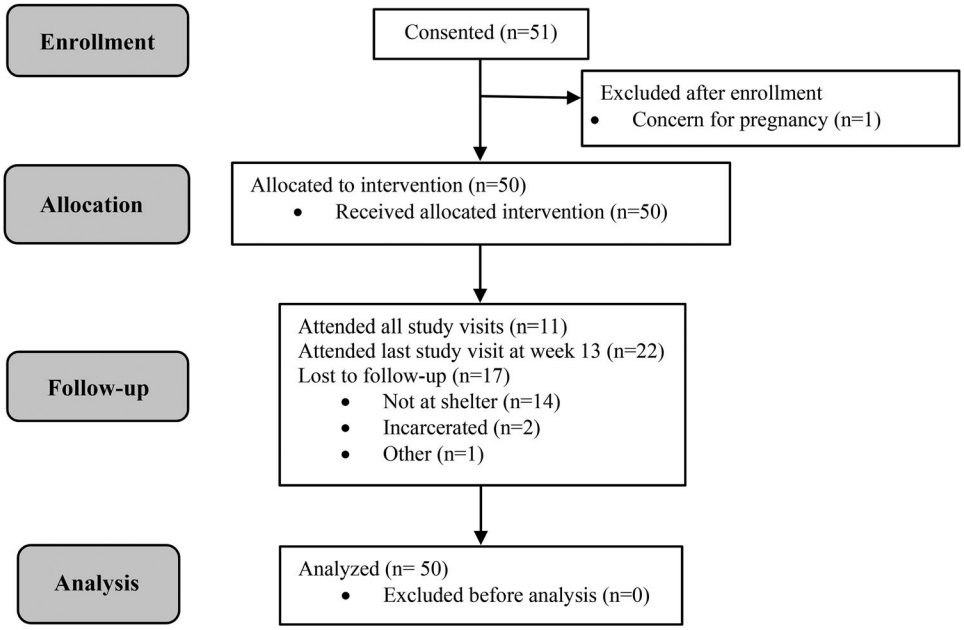


Figure 1. Consort diagram for the study.

Table 1. Sample and tobacco use characteristics at baseline ($N = 51$).

Age (Median, interquartile range [IQR])	46.5 (41.2–57.1)
Gender (N, %)	
Male	32 (62.8)
Female	17 (33.3)
Transgender	2 (4)
Race/Ethnicity (N, %)a	
White	20 (39.2)
Black/African American	17 (33.3)
Hispanic/Latinx	7 (13.7)
American Indian/Alaska Native	1 (1.9)
Native Hawaiian/Pacific Islander	1 (1.9)
Other/More than one race	4 (7.84)
Chronic homelessnessb	40 (78.4)
Length of stay at the shelter in days (Median, IQR)	60 (172)
Tobacco and nicotine product use	
Cigarettes smoked per day (Median, IQR)	8.5 (8.0)
Daily use (N, %)	51 (100.0)
Time to first cigarette upon waking (N, %)	
Within the first 5 minutes	16 (31.4)
6–30 minutes	23 (45.1)
31–60 minutes	10 (19.6)
More than 60 minutes	2 (3.9)
Intention to quit smoking (N, %)	
Never expect to quit	1 (1.9)
May quit	10 (19.6)
Will quit in the next 6 months	22 (43.1)
Will quit in the next month	18 (35.3)
Past year quit attempt (N, %)	34 (66.7)

[a]One participant did not report their race/ethnicity.
[b]Continuously homeless in the past year or 3 or more episodes of homelessness in the past 4 years.

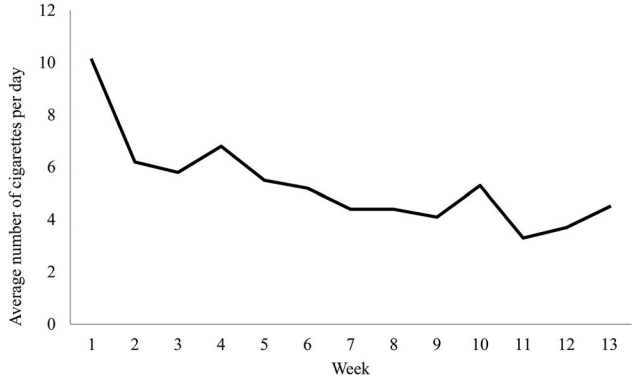


Figure 2. Average daily cigarette consumption during the study.

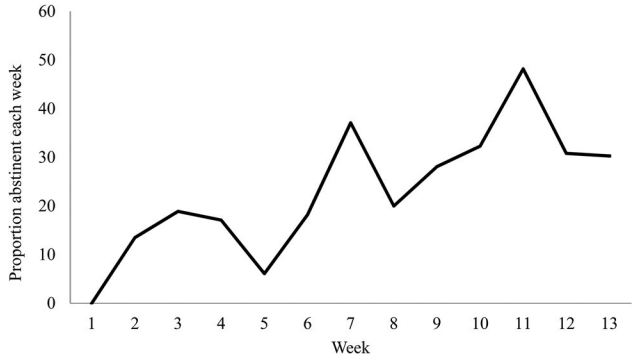


Figure 3. Average weekly CO-verified quit attempts during the study.

cigarettes at 13 wk follow-up (Figure 2). CO-verified abstinence increased from 13% at week 2 to 30.3% at week 13 (Figure 3). During the study, 56.3% had CO-verified abstinence, whereas 72.9% self-reported a quit attempt. On average, 64.5% reported using cessation medications during the study, and the median number of days per week that participants used medications was 4 (IQR 5). The most used medications were the patch (45.8%), gum (33.3%), lozenge (10.4%), and varenicline (2.1%). The most common reasons for not using medications were bad taste (18.8%), side effects (10.4%), delays with obtaining medications from the pharmacy (31.3%), theft of medications (8.3%), and participant perception that they were not working (8.3%). Over the study duration, 31.3% had encounters with shelter staff regarding smoking cessation.

Factors associated with weekly consumption and quit attempts

In adjusted Poisson regression, having an encounter with shelter staff was associated with higher weekly consumption (Incidence rate ratio [IRR] 1.43, 95% CI 1.32–1.54), whereas using smoking cessation medications in the past week was associated with a 29% reduction in weekly consumption (IRR 0.71, 95% CI 0.67–0.74, Table 2). The adjusted weekly consumption for those who had encounters with staff was 48 cigarettes weekly (95% CI 38.9–58.3), and for those who did not have encounters with staff was 34 cigarettes weekly (95% CI 27.6–40.4). The adjusted weekly consumption for those who used medications in the past week was 28 cigarettes (95% CI 22.7–33.2), and for those who did not use medications, 39 cigarettes (95% CI 32.1–46.7).

In adjusted logistic regression, using medications in the past week increased the odds of a quit attempt 2.37-fold compared to not using any medications (Adjusted odds ratio (AOR), 2.37, 95% CI 1.13–4.99), whereas encounters with staff was not associated with CO-verified point prevalence abstinence in the past week. The adjusted CO-verified abstinence was 31.5% (95% CI 0.22–0.41) among those who used medications compared to 20% (95% CI 0.13–0.27) among those who did not use medications.

Qualitative results

We conducted 12 in-depth interviews: nine with residents, two with shelter staff, and one with a pharmacist (Table 3).

Predisposing factors

Knowledge about tobacco use and previous experiences with cessation. Participants were interested in smoking cessation, and many had attempted to quit prior to enrollment in the cessation program. Most of those quit attempts were unassisted or forced due to incarceration or pregnancy and resulted in relapse to smoking. However, some of the participants had used NRT for a short period of time and reported bad taste, side effects such as nightmares and dizziness, and lack of efficacy as reasons for not using them as long-term cessation aids. A few participants acknowledged that while they had access to pharmacotherapy, they had used medications incorrectly or the dosages were inadequate to meet their needs.

Beliefs & attitudes toward tobacco cessation. Participants acknowledged that tobacco cessation was challenging without support to quit. Three participants expressed a need for peer support, whereas others expressed a preference for a structured program with regular check-ins from shelter staff to support the quitting process. Some participants described challenges with tobacco cessation in an environment where tobacco use was normalized.

Enabling factors

Resources to engage in smoking cessation. Most participants reported that the smoking cessation program was a beneficial resource as it increased motivation to quit and provided tools to stop smoking. One of the participants had found a renewed interest in smoking cessation after having gone through the program in its previous iteration. Many participants enrolled in the program because it provided incentives for participation, reporting that access to additional money was an important motivator for quitting as it allowed them to meet basic needs. A staff participant engaged in the program to stop smoking and encouraged residents to participate in the cessation program. After participating in the program, the staff member vouched for its benefits, which included smoking cessation and receiving financial incentives to quit.

Participants reported that they benefited from the connection to a pharmacist, but almost all participants described barriers to telephonically engaging with pharmacists. One participant reported that they appreciated having access to NRT, but they had not been educated about the different forms of NRT and their side effects. A few participants felt that a one-time, brief interaction with the pharmacist was limiting as they were unable to forge a personal connection with the pharmacist. One participant admitted to adjusting their medications in ways that may have been counter-productive (e.g. cutting a nicotine patch in half). One of the participants had experienced delays in receiving his nicotine gum and switched to vaping nicotine-containing e-cigarettes to avoid withdrawal symptoms. Participants described other barriers, including challenges connecting

Table 2. Poisson and logistic regression models of factors associated with weekly cigarette consumption and quit attempts, respectively ($N = 51$).

	Weekly consumption Incidence rate ratio (95% Confidence Interval)	Quit attempts in the past week Adjusted odds ratio (95% Confidence Interval)
Week	0.97 (0.96–0.97)***	1.17 (1.07–1.28)***
Age	0.99 (0.97–1.00)	1.02 (0.96–1.07)
Gender (Ref. Female)		
Male	0.81 (0.57–1.15)	1.89 (0.56–6.37)
Baseline consumption	1.01 (1.01–1.02)***	0.98 (0.96–1.00)*
Baseline time to first cigarette after waking (Ref. within 5 minutes of waking)		
6 minutes to > 1 hour	0.98 (0.81–1.19)	1.15 (0.60–2.21)
Encounters with staff on smoking	1.43 (1.32–1.54)***	0.61 (0.18–2.06)
Medication use in the past week	0.71 (0.67–0.74)***	2.37 (1.13–4.99)*

***$p < 0.001$, *$p < 0.05$.

Table 3. Quotes illustrative of themes and sub-themes.

Themes	Subthemes	Quotations
Predisposing Factors	Knowledge about tobacco use and previous experiences with cessation	"So a lot of times when you're out here [shelter] you don't think about the little things like, you think about not having a place to live but you don't really think about how smoking is slowly killing you." – *52-year-old Black male, resident*
		"I stopped when I was pregnant, that was no problem, but after I had the baby, that's when I started again, I guess because of the stress. And then when I got incarcerated, I stopped." – *56-year-old Native Hawaiian/Pacific Islander female, resident*
	Beliefs and attitudes toward tobacco cessation	"Yeah, not very successful at all. I smoked on the patch the first time I tried it and then they said to make a plan and do all of that, I made it like four days and then I was bawling like a baby so I, it was like go get cigarettes." – *54-year-old White female, resident*
		"And also because like, because I've been smoking like for years, and I know people that have like, like my auntie's boyfriend, and she passed away, he had a couple of heart attacks, and this other guy that wound up in a coma from smoking. I definitely want to stop." – *43-year-old Hispanic/Latino male, resident*
Enabling Factors	Resources to engage in smoking cessation	"I heard guests at my program actually going to [the cessation program] and I actually seen people stop using drugs from, throughout your program from trying to quit using drugs and smoking cigarettes. But it was also, it was just a positive vibe and also getting other people involved." – *27-year-old Black male, resident*
		"That's why I had asked [the pharmacist] if I can probably get a higher dosage [of the patch]. The pharmacist said that wouldn't be good because of, you know, it's my first time and it might not be, you know, they don't recommend it. So then I just stopped using the patch." – *56-year-old Native Hawaiian/Pacific Islander female, resident*
		"When the medicine took kind of long to come, the chewing gum to stop me from smoking, which I translated to not smoking cigarettes to vaping. So now I vape, which I feel like is a better transition for me. So I feel like if I could stop smoking cigarettes I could stop vaping." – *27-year-old non-Hispanic black male, resident*
		"I would say probably the biggest opportunity for change would be to find a way to make this slightly more scheduled. You know, with, the way that our phone system works, it is a bit like roulette, you could get anything, it could be a patient consult, it could be a doctor calling in a verbal, it could be a drug manufacturer calling back about a question that we had, and you have to be able to, you know, address any of those needs. And for something like this that requires a little bit more focus and a very specific standard [pharmacy] workflow, if we had a way to schedule these interactions a little bit more without them feeling, not necessarily as random." – *31-year-old White male, pharmacist*
	Social and physical environment	"If I was going to try to quit smoking, I wouldn't be someplace where my choices are limited here and a lot of people smoke so there's, constantly you smell tobacco, if you're a person trying to stop using drugs you're not going to leave them in a drug infested environment. Same thing I think with cigarette supplies, I would kind of remove myself, if you're going through it you're trying to walk a line and then you start smelling cigarettes and whatnot the craving comes back, all those little things kind of trigger you." – *52-year-old Black male, resident*
	Skills to engage in smoking cessation	"No, what I, what I did is I just, I was, it took me a while to change my routine and then, so what I did is just little challenges to, okay, wait a half hour, right, and I then wait an hour and, you know, and I just, and it's, then that just became part of my routine." – *58-year-old White male, resident*
Reinforcing Factors	Reminders	"Even if it was just a brief check-in maybe two or three times a week, because it's a constant thing and people need to check in and be able to say, hey, I'm having trouble with this or somewhere where people can offer ideas, well, hey, I've been doing this and this works for me, or just to communicate more, I think that would be good" – *52-year-old Black male, resident*
	Reinforcement	"I didn't see any need for improvement other than maybe a continued support like maybe once a month or once a week, I did not feel like I had done as good as I want to do, and so if it were more regulated or if it were more often, maybe it was fully a year, I don't know how you guys can do it or what the budget allows for or whatever it is, but I believe that if it was a continued thing that it would probably take off more effectively." – *54-year-old White female, resident*
		"I'm not drinking and I'm not using very much, but I still do on occasions, consequences never change my behavior, it's rewards. And I'm joking, I said five dollars goes a long way around here, but, but little, little rewards, whether it's daily or weekly, and not necessarily monetary" – *58-year-old White male, resident*
	Social Support	"I think the more interaction we have as a whole the more successful the program will be all the way around, not just with the, the alternatives or the subgroups, or whatever you want to call it, I just think that it would build a tighter knit community and basically make it easier for each party to respect each other, you know." – *54-year-old White female, resident*

with the pharmacist by phone (e.g. long wait-times to connect a call or and not being able to contact the pharmacist at a time when they had access to a telephone).

From the pharmacist's perspective, the barriers to providing cessation care to residents at shelters ranged from the timing of the interaction to their availability for providing counseling. Despite leadership support there were logistical barriers that impeded implementation of the program. Scheduling the telephone counseling, rather than having ad hoc counseling sessions, or offering a window of time when pharmacists could be available was proposed as a strategy to mitigate some of the barriers. However, the

unpredictability of residents' schedules made these options less feasible.

Social and physical environment. One staff participant estimated that 95% of residents at their site used tobacco. Resident participants indicated that it was difficult to quit smoking in an environment where everyone else smoked, and that having their own housing would facilitate smoking cessation. Nonetheless, participants endorsed the smoking cessation program at their sites, and believed the support offered by the program helped address the negative effects of living in an environment where smoking was pervasive. The program motivated a group of people to enroll who had previously not considered quitting and created a positive environment supportive of tobacco cessation.

Skills to engage in smoking cessation. Participants described several methods that increased their self-efficacy for tobacco cessation including smoking fewer cigarettes per day and using the method of cutting down to quit. Some participants delayed their first cigarette of the day. One participant consciously stopped using tobacco and alcohol to cut down on tobacco use even though they did not intend to quit completely.

Reinforcing factors

Reminders. Participants believed that frequent and regular check-ins to facilitate adherence and improve accountability regarding smoking cessation would be beneficial. A shelter staff participant also supported this idea and suggested that study staff spend time on site more frequently to support residents and facilitate contact with the pharmacist. Participants reported that they would have benefited from more contact with shelter staff. Shelter staff encouraged residents to engage in smoking cessation. but they did not provide one-on-one counseling. One participant felt that a one-on-one interaction with shelter staff would help build a tight-knit community where people are supportive of each other; however, this was dependent on the kind of relationship they had with shelter staff and their capacity to provide counseling.

Reinforcements. A few participants reported that having the smoking cessation program as a year-long resource would be beneficial as they felt they needed resources for a longer period to prevent relapse to smoking. Another participant stated a need for a "plan B" that would offer other ways to engage in smoking cessation if the existing strategies available through the program did not work. Participants offered ideas for other reinforcing factors including a log sheet, tip sheet, a treatment plan and having measurable and tangible goals. Participants believed that financial incentives and rewards were integral components of the program as they not only helped in quitting smoking but also helped participants meet their needs. Participants offered ideas that could support smoking cessation on-site including stop-smoking kits that included mints, cinnamon sticks, exercise, or visits by providers or nurses to address medical needs.

Social support. Participants expressed a desire for on-site, ongoing social and peer support that would provide encouragement, hold them accountable, and increase their efficacy for behavior change. These groups would cut-across health behaviors and support not only smoking cessation efforts but also other health behaviors, while building camaraderie and social support among residents. Some participants formed their own ad-hoc support groups to motivate each other and to support each other when cravings were difficult to manage and expressed a desire for a "hotline" to get additional support when study staff were not present on-site. Shelter staff recommended implementing additional on-site activities to minimize boredom, which was one of the triggers for tobacco use.

Discussion

In this study of a pharmacist-linked program for people experiencing homelessness with weekly follow-ups and participation incentives, we found that engagement in the 3-month program was associated with smoking reduction and cessation attempts. Average daily consumption reduced 55%, and 56.3% of participants had at least one CO-verified abstinence assessment during the study period. Consistent with findings from our previous research, (Hartman-Filson et al., 2022) use of NRT was associated with reduction in cigarette consumption and an increase in quit attempts. The findings suggest that pharmacist-linked smoking cessation program at transitional homeless shelters could reduce structural barriers to cessation care and reduce tobacco use among people experiencing homelessness.

In the US, 17 states have regulations that allow pharmacists to prescribe tobacco cessation medications (and provide medication counseling) as an independent prescriptive authority. Seven out of the 14 states allow pharmacists to prescribe all FDA-approved medications for cessation; the remaining 10 states, including California, allow pharmacists to prescribe only NRT (Barclays Official California Code of Regulations, 2022). Most states have a statewide protocol that guides medication therapy and counseling requirements. Pharmacist-delivered behavioral interventions have included face-to-face or telephone encounters that are brief or intensive (i.e. multiple, longer duration sessions) (Carson-Chahhoud et al., 2019). A recent meta-analysis of six pharmacy-based intervention studies showed increased tobacco abstinence at 6 months for more intensive interventions compared to less intensive interventions (Carson-Chahhoud et al., 2019). However, the quality of evidence was deemed to be low due to risk of bias and imprecise estimates—few people were successful at quitting tobacco use. Despite these limitations, the findings highlighted the potential of pharmacist-delivered smoking cessation care, which remains an under-utilized resource for smoking cessation among populations disproportionately impacted by tobacco use. These findings also lend support to previous calls for action to increase the role of pharmacists in providing cessation care (Hudmon et al., 2006).

Our study used a one-time, brief intervention model where pharmacists provided one-on-one telephone counseling for 5–10 min and prescribed, in most cases, combination NRT. The precede-proceed implementation framework demonstrated that residents were knowledgeable about tobacco use and cessation and had tried to quit in the past, either through forced quit attempts or with cessation aids. While most participants indicated that interaction with pharmacists was beneficial, there were challenges to implementing the program in a way that optimally connected the pharmacist with the participant when each were available. Findings from our study suggest that to sustain a community pharmacist-based intervention model, an appointment-based model would likely be more effective to accommodate longitudinal telephone coaching interactions to support tobacco cessation among people experiencing homelessness.

Most participants reported that a longitudinal program with ongoing pharmacist support would improve tobacco cessation and prevent relapse to tobacco use. The nature of tobacco use and cessation, which typically involves multiple quit attempts and relapses prior to quitting completely, led the US Public Health Service to designate tobacco dependence as a chronic disease (Fiore et al., 2000; Joseph et al., 2011). A longitudinal approach to providing cessation care would provide continuity of care, self-management tips, recommendations to increase self-efficacy, and recognize that tobacco reduction may be an intermediate goal prior to quitting (Hyland et al., 2005). Through this chronic disease approach, community pharmacists can interface with individuals along the continuum of quitting and provide opportunities to engage in long-term cessation behaviors. To sustain such a model, pharmacists who can prescribe smoking cessation medications should be more easily identified in a particular community or county; efforts for creation of registries of pharmacists engaged in prescribing of medications and services have been suggested (Quit Smoking Pharmacies, 2022). Additionally, payment for the smoking cessation service will need to be more readily provided by health insurance (e.g. Medicaid and Medicare) to see increased adoption by community pharmacies.

Our community pharmacist-linked cessation program has involved capacity building, where shelter staff are trained as tobacco cessation champions at their sites. The tobacco cessation champions acted as liaisons between study staff, participants, and pharmacists, and provided support to reinforce cessation behaviors. We did not require a pre-defined number of interactions between shelter staff and residents and encouraged interactions as they would take place in real time. While there was no association between encounters with shelter staff and tobacco cessation behaviors in this study, in a previous year of data collection (Hartman-Filson et al., 2022), encounters with shelter staff around tobacco use were associated with reduction in tobacco use and increased quit attempts. Due to deployment of shelter staff to COVID-19 related responsibilities, we were unable to train as many shelter staff as tobacco cessation champions as we did in the previous year. This may have explained the lack of association, as there were fewer interactions between participants and shelter staff as a result. Paradoxically, we found that residents who had encounters with shelter staff smoked more cigarettes per week than those who had no encounters. These findings may be more reflective of the heavier smoking residents that shelter staff interacted with than the quality of the interaction. Despite this limitation, there is a potential role for shelter staff to create an environment in shelters that is conducive to cessation. One suggestion for future iterations of the program may be to require interactions between staff and residents at a pre-defined frequency, and to track the number and quality of those interactions.

Our follow-up rates were lower than in the previous iteration of this study, in large part, due to the inclusion of an emergency shelter that had high losses to follow-up. We assumed that missed visits indicated current smoking, and therefore estimates of quit attempts are likely to be biased toward the null. Despite this assumption, we observed an association with quit attempts and use of medications. People who stay in emergency shelters face multiple competing demands, and obtaining housing is the primary goal. In the face of those competing priorities, engaging in tobacco cessation becomes less of a priority. Transitional shelters that offer a longer length of stay and a more supportive environment for health behavior change may be a more appropriate venue for tobacco cessation interventions (Arangua et al., 2007). Finally, the study was conducted in a single city with a large population of adults experiencing homelessness and may not be generalizable to other locales with different homeless and pharmacy services.

Conclusions

Despite these limitations, findings from our study highlight the potential benefit of co-locating pharmacist-linked interventions for tobacco use in transitional shelters for people experiencing homelessness. Community pharmacist-linked interventions that offer a longitudinal tobacco treatment including use of carbon monoxide monitoring to assess use, peer or shelter-staff based social support, and repeated interactions with pharmacists have the potential to reduce tobacco use among people experiencing homelessness. The success of such a program will depend on building strong partnerships between homeless services sites and community pharmacists to reduce barriers to access to cessation care for people experiencing homelessness.

Acknowledgments

We would like to include this acknowledgement which inadvertently got left out of the proofs but was included in the manuscript during the review process.

Disclosure statement

The authors have no conflicts of interest.

Funding

The work was supported by the UCSF San Francisco Cancer Initiative. We would like to thank Matthew Kraft for his assistance in reviewing the transcripts. We would like to thank our participants and our community partners for their participation in this study.

ORCID

Dorie E. Apollonio http://orcid.org/0000-0003-4694-0826
Maya Vijayaraghavan http://orcid.org/0000-0002-3747-984X

References

Arangua, L., McCarthy, W. J., Moskowitz, R., Gelberg, L., & Kuo, T. (**2007**). Are homeless transitional shelters receptive to environmental tobacco control interventions? *Tobacco Control*, *16*(2), 143–144. https://doi.org/10.1136/tc.2006.018697

Baggett, T. P., Chang, Y., Singer, D. E., Porneala, B. C., Gaeta, J. M., O'Connell, J. J., & Rigotti, N. A. (**2015**). Tobacco-, alcohol-, and drug-attributable deaths and their contribution to mortality disparities in a cohort of homeless adults in Boston. *American Journal of Public Health*, *105*(6), 1189–1197. https://doi.org/10.2105/AJPH.2014.302248

Baggett, T. P., Chang, Y., Yaqubi, A., McGlave, C., Higgins, S. T., & Rigotti, N. A. (**2018**). Financial incentives for smoking abstinence in homeless smokers: A pilot randomized controlled trial. *Nicotine & Tobacco Research*, *20*(12), 1442–1450. https://doi.org/10.1093/ntr/ntx178

Baggett, T. P., McGlave, C., Kruse, G. R., Yaqubi, A., Chang, Y., & Rigotti, N. A. (**2019**). SmokefreeTXT for homeless smokers: Pilot randomized controlled trial. *JMIR Mhealth Uhealth*, *7*(6), e13162. https://doi.org/10.2196/13162

Baggett, T. P., Tobey, M. L., & Rigotti, N. A. (**2013**). Tobacco use among homeless people–addressing the neglected addiction. *New England Journal of Medicine*, *369*(3), 201–204. https://doi.org/10.1056/NEJMp1301935

Barclays Official California Code of Regulations. (**2022**). 2 Protocol for pharmacists furnishing nicotine replacement products. *16 CCR § 1746.2*. Retrieved December 1, 2022, from https://govt.westlaw.com/calregs/Document/IA2AB311C4AA2455887B1ADBBB7DDC21C?viewType=FullText&originationContext=documenttoc&transitionType=DocumentItem&contextData=(sc.Default).

Benowitz, N. L., Bernert, J. T., Foulds, J., Hecht, S. S., Jacob, P., Jarvis, M. J., Joseph, A., Oncken, C., & Piper, M. E. (**2020**). Biochemical verification of tobacco use and abstinence: 2019 update. *Nicotine & Tobacco Research*, *22*(7), 1086–1097. https://doi.org/10.1093/ntr/ntz132

Brown, H. A., Roberts, R. D., Chen, T. A., Businelle, M. S., Obasi, E. M., Kendzor, D. E., & Reitzel, L. R. (**2022**). Perceived disease risk of smoking, barriers to quitting, and cessation intervention preferences by sex amongst homeless adult concurrent tobacco product users and conventional cigarette-only users. *International Journal of Environmental Research and Public Health*, *19*(6), 3629. https://doi.org/10.3390/ijerph19063629

Burling, T. A., Burling, A. S., & Latini, D. (**2001**). A controlled smoking cessation trial for substance-dependent inpatients. *Journal of Consulting and Clinical Psychology*, *69*(2), 295–304. https://doi.org/10.1037//0022-006x.69.2.295

Carson-Chahhoud, K. V., Livingstone-Banks, J., Sharrad, K. J., Kopsaftis, Z., Brinn, M. P., To, A. N. R., & Bond, C. M. (**2019**). Community pharmacy personnel interventions for smoking cessation. *Cochrane Database of Systematic Reviews*, *2019*(10). https://doi.org/10.1002/14651858.CD003698.pub3

Creamer, M. R., Wang, T. W., Babb, S., Cullen, K. A., Day, H., Willis, G., Jamal, A., & Neff, L. (**2019**). Tobacco product use and cessation indicators among adults – United States, 2018. *MMWR. Morbidity and Mortality Weekly Report*, *68*(45), 1013–1019. https://doi.org/10.15585/mmwr.mm6845a2

Dawkins, L., Bauld, L., Ford, A., Robson, D., Hajek, P., Parrott, S., Best, C., Li, J., Tyler, A., Uny, I., & Cox, S. (**2020**). A cluster feasibility trial to explore the uptake and use of e-cigarettes versus usual care offered to smokers attending homeless centres in Great Britain. *Plos One*, *15*(10), e0240968. https://doi.org/10.1371/journal.pone.0240968

Fazel, S., Geddes, J. R., & Kushel, M. (**2014**). The health of homeless people in high-income countries: Descriptive epidemiology, health consequences, and clinical and policy recommendations. *Lancet*, *384*(9953), 1529–1540. https://doi.org/10.1016/S0140-6736(14)61132-6

Fiore, M. C., Bailey, W. C., & Cohen, S. J. (**2000**). *Treating tobacco use and dependence: Quick reference guide for clinicians*. US Department of Health and Human Services.

Green, L. W., & Kreuter, M. W. (**2005**). *Health program planning: An educational and ecological approach* (4th ed.). McGraw-Hill Higher Education.

Hartman-Filson, M., Chen, J., Lee, P., Phan, M., Apollonio, D. E., Kroon, L., Donald, F., & Vijayaraghavan, M. (**2022**). A community-based tobacco cessation program for individuals experiencing homelessness. *Addictive Behaviors*. *129*, 107282. https://doi.org/10.1016/j.addbeh.2022.107282

Hsieh, H. F., & Shannon, S. E. (**2005**). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Hudmon, K. S., Prokhorov, A. V., & Corelli, R. L. (**2006**). Tobacco cessation counseling: Pharmacists' opinions and practices. *Patient Education and Counseling*, *61*(1), 152–160. https://doi.org/10.1016/j.pec.2005.03.009

Hyland, A., Levy, D. T., Rezaishiraz, H., Hughes, J. R., Bauer, J. E., Giovino, G. A., & Cummings, K. M. (**2005**). Reduction in amount smoked predicts future cessation. *Psychology of Addictive Behaviors*, *19*(2), 221–225. https://doi.org/10.1037/0893-164X.19.2.221

Joseph, A. M., Fu, S. S., Lindgren, B., Rothman, A. J., Kodl, M., Lando, H., Doyle, B., & Hatsukami, D. (**2011**). Chronic disease management for tobacco dependence: A randomized, controlled trial. *Archives of Internal Medicine*, *171*(21), 1894–1900. https://doi.org/10.1001/archinternmed.2011.500

NCT01932996. (**2013**). Enhancing smoking cessation in the homeless population. Retrieved August 30, 2022, from https://clinicaltrials.gov/ct2/show/NCT01932996?term=NCT01932996&draw=2&rank=1

NCT02245308. (**2019**). Abstinence reinforcement therapy for homeless veteran smokers. Retrieved October 13, 2022, from https://clinicaltrials.gov/ct2/show/NCT02245308?term=NCT02245308&draw=2&rank=1

Ojo-Fati, O., John, F., Thomas, J., Joseph, A. M., Raymond, N. C., Cooney, N. L., Pratt, R., Rogers, C. R., Everson-Rose, S. A., Luo, X., & Okuyemi, K. S. (**2015**). Integrating smoking cessation and alcohol use treatment in homeless populations: Study protocol for a randomized controlled trial. *Trials*, *16*(1), 385. https://doi.org/10.1186/s13063-015-0858-z

Okuyemi, K. S., Goldade, K., Whembolua, G.-L., Thomas, J. L., Eischen, S., Sewali, B., Guo, H., Connett, J. E., Grant, J., Ahluwalia, J. S., Resnicow, K., Owen, G., Gelberg, L., & Des Jarlais, D. (**2013**). Motivational interviewing to enhance nicotine patch treatment for smoking cessation among homeless smokers: A randomized controlled trial. *Addiction*, *108*(6), 1136–1144. https://doi.org/10.1111/add.12140

Okuyemi, K., Thomas, J., Hall, S., Nollen, N., Richter, K., Jeffries, S., Caldwell, A., & Ahluwalia, J. (**2006**). Smoking cessation in homeless populations: A pilot clinical trial. *Nicotine & Tobacco Research*. *8*(5), 689–699. https://doi.org/10.1080/14622200600789841

Quit Smoking Pharmacies. (**2022**). Retrieved November 18, 2022, from https://www.quitsmokingpharmacies.com

Rash, C. J., Petry, N. M., & Alessi, S. M. (**2018**). A randomized trial of contingency management for smoking cessation in the homeless. *Psychology of Addictive Behaviors*, *32*(2), 141–148. https://doi.org/10.1037/adb0000350

Vijayaraghavan, M., Elser, H., Frazer, K., Lindson, N., & Apollonio, D. (**2020**). Interventions to reduce tobacco use in people experiencing homelessness. *Cochrane Database of Systematic Reviews*, *12* CD013413. https://doi.org/10.1002/14651858.CD013413.pub2

Vijayaraghavan, M., Hurst, S., & Pierce, J. P. (**2017**). A qualitative examination of smoke-free policies and electronic cigarettes among sheltered homeless adults. *American Journal of Health Promotion*, *31*(3), 243–250. https://doi.org/10.4278/ajhp.150318-QUAL-781

Vijayaraghavan, M., Penko, J., Vittinghoff, E., Bangsberg, D. R., Miaskowski, C., & Kushel, M. B. (**2013**). Smoking behaviors in a community-based cohort of HIV-infected indigent adults. *AIDS and Behavior*, 18(3), 535–543. https://doi.org/10.1007/s10461-013-0576-z

Vijayaraghavan, M., Tieu, L., Ponath, C., Guzman, D., & Kushel, M. (**2016**). Tobacco cessation behaviors among older homeless adults: Results from the HOPE HOME study. *Nicotine & Tobacco Research*, *18*(8), 1733–1739. https://doi.org/10.1093/ntr/ntw040