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A community-based tobacco cessation program for individuals experiencing homelessness

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A B S T R A C T

Background: Tobacco use is common among persons experiencing homelessness (PEH), and interventions are needed. We conducted a community-based, single-arm uncontrolled trial of a pharmacy-linked intervention for smoking cessation for PEH.
Methods: The intervention took place between September 2019 and June 2021 in homeless shelters in San Francisco, CA. We trained shelter staff on how to provide brief cessation counseling, then tested a program among PEH in two shelters that included one-time pharmacist-delivered cessation counseling and nicotine replacement therapy (NRT) for 3 months. We examined factors associated with cigarette consumption and quit attempts.
Results: We trained 69 staff from 8 shelters and selected 2 of those shelters as pilot sites for the program. Of the 52 participants, 71% were male and 49% were Black. The majority of participants reported making a quit attempt (70%) and using NRT (84%). Having an encounter with staff in the past week was associated with a 40% reduction in weekly consumption (Incidence rate ratio (IRR) 0.61, 95% CI 0.57–0.67) and using medications in the past week was associated with a 23% reduction in weekly consumption (IRR 0.78, 95% CI 0.75–0.81). Using medications in the past week increased the odds of a quit attempt 2.89 times compared to not using medications (Adjusted odds ratio (AOR), 2.89, 95% CI 1.45–5.77).
Conclusions: Our findings highlight a role for leveraging community-based pharmacists to expand smoking cessation services in homeless shelters to reduce tobacco use among PEH.

1. Introduction

Although tobacco use has declined in the general population it remains high among people experiencing homelessness (PEH); (Cornelius, Wang, Jamal, Loretan, & Neff, 2020) prevalence of tobacco use among PEH is five times that of the general population (70% versus 14%). (Baggett, Tobey, & Rigotti, 2013) Cancer and heart disease caused by smoking are the leading causes of death among PEH over age 50, and the incidence of these conditions among PEH under 50 is higher than in the age-matched general population. (Baggett et al., 2013)

Approximately 20% of PEH live with serious mental illness (SMI), nearly quadruple the rate in the general population. (Schroeder & Morris, 2010; Substance Abuse and Mental Health Services Administration. (2020), 2020; Vijayaraghavan, Elser, Frazer, Lindson, &

Apollonio, 2020) Smoking prevalence among individuals with SMI is 44%-64% compared to 13% in the general population. (Cornelius et al., 2020; Japuntich, Hammett, & Rogers, 2020) While population smoking prevalence has decreased, rates have not declined among individuals with SMI. (Japuntich et al., 2020) Smoking cessation is particularly challenging among persons living with SMI who may have high levels of nicotine dependence. (Campion, Checinski, & Nurse, 2018) Persons living with severe depression may experience an increase in depressive symptoms after cessation, increasing relapse to smoking. (Hughes, 2007) Nicotine mitigates the neurocognitive deficits associated with schizophrenia; smoking cessation worsens these deficits. (Dolan, Sacco, & Termine, 2004)

Environmental cues to smoking, including the presence of cigarette litter or smoke breaks can create a culture of tobacco use in homeless

service settings, (Businelle et al., 2015; Pratt et al., 2019; Sung & Apollonio, 2017; Vijayaraghavan & Pierce, 2015) negatively impacting quit attempts (Reitzel, Kendzor, & Nguyen, 2014). Partial smoke-free policies, meaning smoking is not permitted indoors but allowed outdoors on shelter grounds, are acceptable to residents and associated with increased interest in smoking cessation. (Vijayaraghavan & Pierce, 2015)

Tobacco product marketing to PEH and inadequate access to smoking cessation treatment may also contribute to tobacco use and lower quit rates. (Apollonio & Malone, 2005; Vijayaraghavan, Tieu, Ponath, Guzman, & Kushel, 2016) Although PEH make quit attempts at the same rate as housed populations (Baggett & Rigotti, 2010; Connor, Cook, Herbert, Neal, & Williams, 2002) they are less successful at achieving abstinence (quit ratio 9% versus 61% in the general population). (Baggett & Rigotti, 2010; Creamer et al., 2019)

Ten randomized controlled trials (RCTs) of smoking cessation interventions for PEH have included behavioral counseling, pharmacotherapy, and adjunctive treatments like contingent reinforcements. ([27]; Baggett et al., 2018, 2019; Burling, Burling, & Latini, 2001; NCT0, 2013; Okuyemi et al., 2006, 2013; Rash, Petry, & Alessi, 2018; Spector, Alpert, & Karam-Hage, 2007) RCTs that used behavioral counseling and pharmacotherapy reported abstinence rates of 9%-17% at 6 months follow-up. (Okuyemi et al., 2006, 2013) Studies using contingent reinforcements for smoking cessation reported higher abstinence rates: 22% at 4 weeks follow-up (Rash et al., 2018) and 48% at 8 weeks follow-up. (Baggett et al., 2018) Although these studies established that engaging PEH in cessation trials is feasible, none were integrated with homeless service providers nor did they utilize ancillary staff, such as pharmacists, to provide access to medications or counseling.

A recent systematic review of 11 studies (10 based in the US and 1 in the UK) explored healthcare professional delivery interventions for PEH outside clinical settings. (Hanlon et al., 2018) Only two studies in the UK and Scotland involved pharmacists. In the Scotland PHOENIx study, hospitalized PEH were referred to a pharmacist upon discharge to receive medications, health checks, and referrals. (Lowrie et al., 2019, 2021) Pharmacist outreach was associated with increased prescribing of medications including anti-hypertensives, diabetes medications, anti-depressants, and wound dressings; however, no study involved pharmacists delivering smoking cessation services. In California and other US states, pharmacists can prescribe NRT; in some states pharmacists can also prescribe bupropion and varenicline. (Sections 4005, 4052(a)(10) and 4052.9, Business and Professions Code, Protocol for pharmacists furnishing nicotine replacement products. 16 CCR §, 2021) Care models for PEH that include pharmacists could increase access to cessation services and medications.

In this study, we developed and tested a community pharmacy-linked smoking cessation program integrated within two homeless shelters in San Francisco, California. The program included the provision of ad-hoc brief cessation counseling by shelter staff, a cessation counseling session with a pharmacist, and provision of a 3-month supply of NRT delivered on-site. We hypothesized that engagement in the pilot program would increase quit attempts and reduce daily cigarette consumption.

1.1. Methods

1.1.1. Study design

We conducted a single-arm, community-based, uncontrolled trial of a community-pharmacy linked intervention to increase access to smoking cessation services among PEH between September 2019 and June 2021. The UCSF Institutional Review Board approved all study procedures (#20–29856).

1.1.2. Setting and participants

This uncontrolled trial was divided into three phases that took place sequentially at each site: 1) training shelter staff how to provide

cessation counseling, 2) training shelter staff to become Cessation Champions, 3) and pilot testing medication assistance programs in two shelters in San Francisco, California. Shelter staff included anyone that interfaced with clientele, including case managers, program managers, peer counselors, eligibility workers, and mental health specialists.

Phase 1 took place between September 2019 and February 2020. We partnered with eight shelters in San Francisco that collectively housed nearly 1000 PEH nightly. Shelters that agreed to participate selected a time that worked for their staff to receive an in-person training session. At each site, we conducted a 1-hour training with shelter staff who interfaced with clients on how to provide smoking cessation counseling to PEH. The training for shelter staff was provided by a Masters-level Tobacco Treatment Specialist. The training for the shelter staff was developed by the PI and adapted from prior capacity building interventions to increase shelters' and permanent supportive housing's capacity to provide smoking cessation services. (Durazo et al., 2020; Vijayaraghavan, Guydish, & Pierce, 2016) The training focused on how to provide cessation counseling, relying on the clinical practice guidelines for smoking cessation. (Fiore, Baker, & Use, 2008, 2008) Topics included tobacco use among PEH, nicotine addiction, tobacco cessation counseling using the ask, advise, and refer model as well as the 5A's for smoking cessation, (Fiore and Baker, .2008, 2008) a brief introduction to tobacco cessation medications, local cessation resources and tobacco policy initiatives. Shelter staff were not compensated for attending the training.

From the eight sites in Phase 1, we identified two shelters willing to participate in Phase 2. Phase 2 took place between February 2020 and January 2021 and involved training a case manager to be a Cessation Champion at each of the two shelter sites. The Cessation Champion at the first site attended the training during Phase 1 and 2; however, in the second site, the Champion was a newer employee who attended the training only in Phase 2. The Cessation Champion training was provided by the study's co-investigator, a Doctor of Pharmacy pharmacist (PharmD) with expertise in smoking cessation. The 1.5-hour training included a refresher on smoking cessation counseling and included in-depth information on cessation medication options, how to use each product, and potential side effects. Cessation Champions provided on-site support for clients, including referring potential interested clients to our study, and liaised with the study staff on behalf of clientele. They received a $50 gift card after completing the training and a $75 gift card upon study completion.

The Phase 3 medication assistance program took place at the two pilot shelters between August 2020 and June 2021; intervention roll-out at the two sites was staggered by 6 months. At each site, Cessation Champions completed training prior to the roll-out. We partnered with a community pharmacy that had pharmacists who could counsel for smoking cessation, prescribe NRT, and deliver medications on-site to the shelters. We recruited participants via word of mouth, flyers, and targeted outreach to known smokers by the Cessation Champion at that site. Participants were eligible if they were 1) at least 18 years old, 2) residents at one of the sites, 3) currently smoking at least 5 cigarettes per day, 4) interested in quitting within the next month, and 5) willing to use medications for smoking cessation.

Upon enrollment, study staff placed a referral to the pharmacy using a secure online portal. Once the pharmacy received the referral, study staff facilitated an interaction between the pharmacist and the participant in which the pharmacist assessed smoking history, provided counseling, and determined appropriate NRT dosing. In most cases, pharmacists offered combination NRT with the long-acting patch and short-acting gum/lozenge, unless the participants requested a specific form of NRT. Pharmacists then prescribed the NRT, and arranged for delivery of NRT to the site within one week. The majority of participants had Medicaid coverage for NRT without a copay. Pharmacists had follow-up phone calls with some participants who wanted their prescription NRT dose tapered.

1.1.3. Data collection

We evaluated Phase 1 using process measures including number of shelters participating and number of staff trained. In Phase 2, we evaluated the number of Cessation Champions trained. We did not ask shelter staff to complete questionnaires after their trainings in Phase 1 or Phase 2. In Phase 3, study staff administered an online questionnaire to resident participants at baseline, during 11 weekly follow-up visits, and at 3-months follow-up. Additionally, study staff kept informal notes during the implementation process in Phase 3 on barriers to and facilitators of obtaining medications; we report these as process measures. 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 questionnaire at 3-months follow-up.

1.1.4. Baseline measures

1.1.4.1. Tobacco use and other substance use behaviors.
At each assessment, 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, which we used to calculate average daily cigarette consumption. We asked participants about the time to their first cigarette upon waking (within 5 min, 6–30 min, 31–60 min, or after 60 min) and 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"). Participants reported whether they had attempted to quit in the past year, and those who had described the methods they used (cold turkey, gradually cutting down, smoking cessation class, NRT or non-NRT medications). We asked participants to report past 30 days use of e-cigarettes, cigars or little cigars, roll-your-own tobacco, and blunts and past 30 days use of alcohol, cannabis, cocaine or crack, amphetamines, and opioids.

1.1.4.2. Demographics and other covariates.
Participants reported their age, gender (female, male, or transgender), and race/ethnicity (American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander, Black/African American, Hispanic/Latinx, White, other/more than one race).

1.1.4.3. Follow-up measures.
At each weekly follow-up and at 3 months-follow-up, we asked participants about any quit attempts in the past week and methods they had used to quit smoking. Participants reported the number of encounters they had with shelter staff about their smoking and whether they had received NRT from the pharmacy in the past week. Among those who received NRT, we asked whether they had used it, the type of medications they had used (nicotine 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.

1.1.5. Statistical analyses

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, encounters with study staff on smoking, use of NRT, type 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 = 405 observations) and quit attempts (N = 387 observations), respectively. We adjusted for age, gender, baseline time to first cigarette after waking, baseline cigarette consumption as fixed effects in the model, and cigarette consumption, encounters with shelters 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 analyses in Stata 16.

1.2. Results

1.2.1. Process measures in Phase 1 and Phase 2

In Phase 1, we trained 69 staff from eight shelters and selected two shelters as pilot intervention sites. In Phase 2, we trained one Cessation Champion from each site.

1.2.2. Sample characteristics and tobacco use behaviors at baseline among participants in the Phase 3 medication assistance program

Of the 52 resident participants enrolled in Phase 3, 63.5% (n = 33) attended all 13 visits, 78.9% attended 12 out of 13 visits, and 21% were lost to follow-up (n = 11) (Fig. 1. On average, participants attended 6 (SD 1.9) visits. The median age of the group was 50 (IQR 14.5), 69.2% were male, 49% were Black/African American, and 17.7% were Hispanic/Latinx (Table 1). Over half the sample reported alcohol, cannabis, or amphetamine use in the past 30 days. At baseline, the median cigarettes smoked per day was 8.5 (IQR 8), and almost all participants were daily smokers (90.4%). The majority of participants smoked within 30 min of waking (Table 2). Half (53.9%) reported making a quit attempt in the past year, and most were unassisted (67.9%).

1.2.3. Weekly consumption, quit attempts and medication use during the study

Over the study period, average daily cigarette consumption dropped 50%, from 10 cigarettes per day (cpd) (SD 6.9) at baseline to 5.0 cpd (SD 4.3) at 3-months follow-up (Fig. 2a. Weekly quit attempts increased from 27.5% of participants at visit 2 to 47.2% at 3-months follow-up (Fig. 2b. Over 70% tried to quit at least once during the study, and the average quit attempt rate during the study was 37%. Eighty-four percent (N = 42) of participants reported using cessation medications during the study period and 44% (N = 22) reported talking with shelter staff about their smoking. Among participants who used medications, 42% reported using nicotine patches, 58% reported using nicotine gum, and 30% reported using nicotine lozenges. These participants used medications on average 4 days per week (SD 1.9). Half (22 of 42) of participants used medications 7 days per week during at least one week. The main reasons given for not using NRT were: delays with obtaining medications from the pharmacy (44%), side effects (18%), bad taste (8%), did not feel medications worked (8%), stolen medications (4%), and insurance coverage (2%).

1.2.4. Process measures for Phase 3

Informally, study staff obtained information from participants that influenced their receipt of medications for cessation. Of the 52 participants, 84% had a cell phone at study onset, and two-thirds had consistent access to their phones during the study. Despite our efforts to minimize barriers to medication access, about half of the participants experienced delays in receiving NRT on enrollment.

1.2.5. Factors associated with weekly consumption and quit attempts

In adjusted Poisson regression, having an encounter with staff in the past week was associated with a 40% reduction in weekly consumption (Incidence rate ratio (IRR) 0.61, 95% CI 0.57–0.67) and using medications in the past week was associated with a 23% reduction in weekly consumption (IRR 0.78, 95% CI 0.75–0.81). Weekly consumption decreased by 1% each week during the study (IRR 0.99, 95% CI 0.98–0.99). Adjusted weekly consumption was 26 cigarettes among those who had staff encounters (95% CI 20.75–31.47) and 42 cigarettes among those who had none (95% CI 34.34–50.67). Adjusted weekly consumption was 35 cigarettes for those who had used medications in the past week (95% CI 28.51–42.41) and 46 cigarettes among those who had not (95% CI 36.83–54.68).

In adjusted logistic regression, using medications in the past week increased the odds of a quit attempt 2.89 times compared to not using
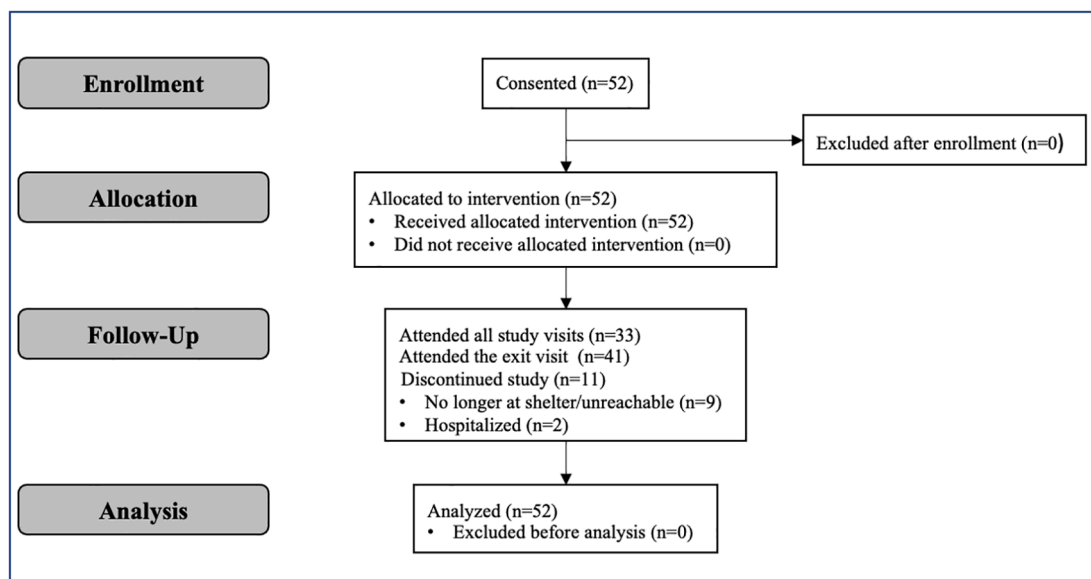
Fig. 1. Consort Diagram for the study.

Table 1
Sample characteristics at baseline (N = 52).

Age (Median, interquartile range [IQR])	50 (14.5)
Gender (N, %)	
Male	36 (69.2)
Female	13 (25.0)
Transgender	2 (3.9)
Race/Ethnicity (N, %)	
Black/African American	25 (49.0)
Hispanic/Latinx	9 (17.7)
Native Hawaiian/Pacific Islander	3 (5.9)
White	10 (19.6)
Other/More than one race	4 (7.84)
Substance use in the past 30 days (N, %)	
Alcohol	27 (52.9)
Cannabis	35 (72.9)
Cocaine or crack	11(28.2)
Amphetamines	24 (64.9)
Opioids	13 (46.4)

Table 2
Tobacco use at baseline (N = 52).

Tobacco and nicotine product use	
Cigarettes smoked per day (Median, IQR)	8.5 (8)
Daily use (N, %)	47 (90.4)
Non-daily use (N, %)	5 (9.6)
Time to first cigarette upon waking (N, %)	
Within first 5 min	18 (34.6)
6–30 min	21(40.4)
31–60 min	8 (15.4)
More than 60 min	5 (9.6)
Use of other tobacco products in the past 30 day (N, %)	
E-cigarettes	10 (27.8)
Cigars or little cigars	17 (40.5)
Roll-your-own tobacco	26 (61.9)
Blunts	26 (63.4)
Intention to quit smoking (N, %)	
Never expect to quit	1 (1.9)
May quit	10 (19.2)
Will quit in the next 6 months	19 (36.5)
Will quit in the next month	22 (42.3)
Past year quit attempt (N, %)	28 (53.9)
Products/methods used in previous attempts to quit (N, %)	
Cold turkey	19 (67.9)
Gradually cut down	2 (7)
Smoking cessation class	1 (3.5)
NRT or non-NRT smoking cessation medication	13 (46.5)

medications (Adjusted odds ratio (AOR), 2.89, 95% CI 1.45–5.77). Staff encounters were not significantly associated with a past week quit attempt (See Table 3).

1.3. Discussion

In this uncontrolled pilot study, we explored the feasibility of implementing a community pharmacy-linked smoking cessation program to improve access for PEH. We found that the program was feasible to implement and reduced cigarettes per day. Onsite access to medications and encounters with staff about smoking were the primary factors associated with reduction in tobacco use. These findings highlight a role for interventions that increase shelter capacity to offer cessation services linked with community pharmacist-delivered interventions.

Clinical practice guidelines for smoking cessation recommend behavioral counseling combined with pharmacotherapy (Fiore and Baker, .2008, 2008) given that NRT effectiveness without smoking cessation counseling is limited. (Apollonio & Glantz, 2017; Leas, Pierce, & Benmarhnia, 2018) More frequent counseling encounters, regardless of clinician type, are positively associated with cessation. (Fiore and Baker, .2008, 2008) Consistent with these guidelines, we used a phased approach of building capacity to provide cessation counseling among

shelter staff, followed by medication assistance for participants provided by pharmacists. In a previous capacity-building intervention for shelter staff, we found that training staff to provide cessation counseling was associated with fewer barriers and increased efficacy in delivering counseling. (Vijayaraghavan M, Olsen P, Weeks J, McKelvey K, Ponath C, Kushel M. Older African American Homeless-Experienced Smokers' Attitudes Toward Tobacco Control Policies-Results from the HOPE HOME Study. Am J Health Promot 2018;, 2018) About half of the participants reported conversations with staff about smoking, and interactions with staff were associated with a 40% reduction in consumption. These findings suggest that fostering shelter staff counseling support for clients interested in smoking cessation is feasible and effective. Future research will query staff on their experience with counseling clientele on smoking cessation, which may influence counseling quality.
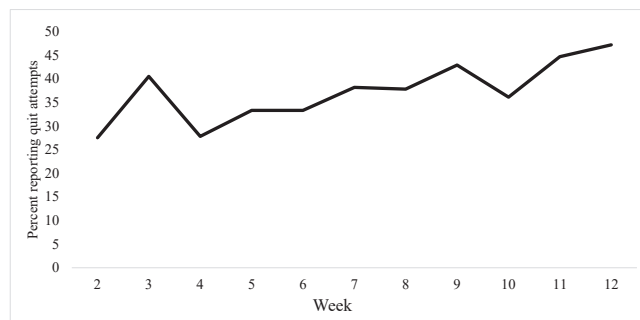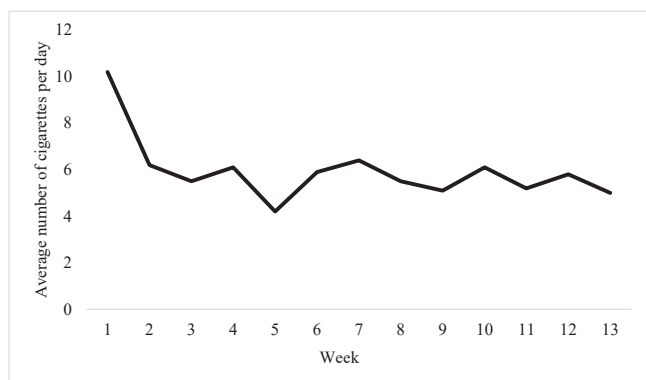
Fig. 2. a: Distribution of average weekly cigarette consumption during the study time period 2b. Proportion of participants reporting quit attempts in the past week *Past-week quit attempt data was collected at each weekly follow-up visit but not baseline or exit visits.

Table 3
Poisson and logistic regression models of factors associated with weekly cigarette consumption and quit attempts, respectively (N = 52)

	Weekly consumption Incidence rate ratio (95% Confidence Interval)	Quit attempts in the past week Adjusted odds ratio (95% Confidence Interval)
Week	0.99 (0.98–0.99) *	1.07 (0.99–1.18)
Age	0.99 (0.98–1.01)	1.02 (0.96–1.07)
Gender (Ref. Male)	0.74 (0.52–1.03)	3.77 (1.05–13.54) *
Baseline consumption	1.01 (1.00–1.01) ***	0.98 (0.97–0.99) *
Baseline time to first cigarette after waking (Ref. within 5 min of waking)		
6–30 min	0.64 (0.41–0.99)	11.7 (1.75–78.3) *
31–60 min	0.67 (0.45–1.01)	9.97 (1.90–52.3) *
After 60 min	0.77 (0.49–1.18)	12.2 (2.0–73.0) *
Encounters with staff on smoking	0.61 (0.57–0.67) ***	2.22 (0.82–6.04)
Medication use in the past week	0.78 (0.75–0.81) ***	2.89 (1.45–5.77) *

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

Medication use in the past week was significantly associated with both reduction in consumption and an increase in quit attempts. Most quit attempts among PEH are unassisted, (Raven et al., 2018; Vijayaraghavan et al., 2016) highlighting the need to improve medication access. On average, study participants used NRT four days per week, and over 50% reported using medications for greater than 7 days in at least one week. Consistent with previous studies, (Raven et al., 2018) the most common reasons for not using medications were concerns about access, side effects, and lack of efficacy. The primary barrier to receiving on-time delivery of medications for cessation was connecting community pharmacists with participants by phone. Despite study staff facilitating these interactions, pharmacists were often unable to provide point-of-care counseling or participants had competing priorities at the time of referral, leading to delays in initiating treatment. Over 70% of PEH report having cell phones, however inconsistent service limits their use. (Elser, Hartman-Filson, Alizaga, & Vijayaraghavan, 2019) Future studies could consider providing participants with cell phones to facilitate communication with members of their healthcare and social services teams.

Our study had limitations. The sample size was small and involved two shelters in a single city, limiting generalizability. Only one participant had quit at the end of the study, however, point prevalence abstinence was not a primary outcome in this study. We assessed tobacco use, quit attempts, staff encounters, and medication use using self-report. Future studies could verify these findings by assessing biochemically verified abstinence, as well as considering longer-term outcomes.

To our knowledge, this study is the first to explore a smoking cessation care model for PEH where community pharmacists partnered with shelters. The findings have implications for expanding access to cessation services at different service sites for PEH and suggest that community pharmacy-linked model of cessation care can increase access to services and medications. Expanding access to cessation services is the first step to reducing tobacco use among PEH, a population disproportionately impacted by tobacco use and that faces substantial structural barriers to receiving healthcare services.

CRediT authorship contribution statement

Marlena Hartman-Filson: Conceptualization, Methodology, Validation, Data curation, Writing – original draft, Writing – review & editing. **Jennifer Chen:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Visualization. **Priscella Lee:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Visualization. **Megan Phan:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Visualization. **Dorie E. Apollonio:** Conceptualization, Methodology, Formal analysis, Writing – review & editing, Supervision, Project administration. **Lisa Kroon:** Conceptualization, Project administration, Writing – review & editing. **Fiona Donald:** Conceptualization, Project administration, Writing – review & editing. **Maya Vijayaraghavan:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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