Quitline program utilization and cessation outcomes: A comparison of provider-referred clients by healthcare settings

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ABSTRACT

US Public Health Service guidelines recommend that healthcare providers assess patients for tobacco use and refer tobacco users to cessation services (e.g., quitlines). However, once referred, little is known on how program outcomes for referred tobacco users vary across healthcare settings. To examine differences in program enrollment, dropout at follow-up, utilization (number of coaching sessions and nicotine replacement therapy use), and quit outcomes among tobacco users referred across settings to a state quitline. In a retrospective analysis of clients referred to the quitline (January 2011–June 2016), referrals were categorized into six settings: general medical practice (reference group), acute care hospitals, behavioral health, federally qualified health centers (FQHCs), county health departments, and specialty clinics. Outcome variables included enrollment, dropout, program utilization, and 30-day tobacco abstinence at 7-month follow-up. Compared to medical practices, clients referred from behavioral health were less likely to enroll in services (OR = 0.81, 95%CI: 0.76, 0.87), less likely to report using NRT in-program (OR = 0.51, 95%CI: 0.42, 0.62), and along with clients referred from FQHCs (OR = 0.78, 95%CI: 0.64, 0.94) were less likely to be quit at follow-up (OR = 0.73, 95%CI: 0.59, 0.92). Clients referred from acute care hospitals were less likely to enroll in services (OR = 0.60, 95%CI: 0.56, 0.64) and were more likely to drop-out of cessation services (OR = 1.12; 95%CI: 1.00–1.26). Findings reflect the need for better tailoring of messages for tobacco assessment within specific healthcare settings while bolstering behavioral counseling that quitlines provide to increase enrollment, engagement, and retention in tobacco cessation services.

1. Introduction

The US Public Health Service (USPHS) clinical practice guidelines (CPG) for Treating Tobacco Use and Dependence: 2008 Update recommends implementing systems strategies that promote provider intervention, including consistent screening for tobacco use during every clinical encounter and offering, at minimum, a brief intervention to all patients who use tobacco regardless of their readiness to engage in behavior change (Fiore et al., 2008). The USPHS defines effective treatment as comprising of asking about tobacco use, advising smokers to quit, assessing readiness, assisting with provision of cessation services, and arranging for follow-up (5As) (Fiore et al., 2008). While rates of asking and advising are relatively high within healthcare settings, corresponding rates of assessing, assisting, and arranging continue to be

low among providers (Jamal et al., 2012). One recommended strategy to improve increased access to evidence-based tobacco services has been to replace the 5As with the truncated *AAR* (Ask, Advise, Refer) brief intervention model; a model that facilitates referrals and directly connects smokers to evidence-based resources including quitlines (Bentz et al., 2006). A referral process typically involves providers proactively submitting referrals (via fax or increasingly electronically) for patients to the quitline; the quitline staff then undertake a series of proactive outbound calls to the patients to assist with enrollment in services.

The clinical and real-world effectiveness of quitlines as evidence-based programs for tobacco cessation has been well-established (Anderson and Zhu, 2007; Fiore et al., 2008; Lichtenstein et al., 2010). With at least 70% of tobacco users visiting a healthcare provider

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annually and a majority of whom have contemplated quitting (Jamal et al., 2012); healthcare providers are uniquely positioned to leverage healthcare encounters as opportunities to assess for tobacco use and refer patients to quitline services. In an attempt to increase reach to disparate groups of smokers, quitlines support healthcare provider-referral programs as a complementary and cost-efficient model beyond traditional media marketing and self-referral models (Willett et al., 2009; Woods and Haskins, 2007).

A growing body of literature examining in-program differences (e.g., medication use, number of telephone counseling sessions, quit outcomes) for callers entering quitline services by varying sources (provider-referred vs. self-referred) has yielded mixed results. Smokers referred to quitlines by their healthcare provider may differ significantly from smokers who proactively call the quitline on sociodemographic and smoking-related characteristics. For instance, compared to self-referred smokers, healthcare provider-referred clients may be more racially diverse and have higher comorbidities, less motivation to quit, less education, and less health insurance coverage, factors that may influence quit rates (Song et al., 2014; Willett et al., 2009), although this has not been found to be true in all samples. Some studies have found that provider-referred clients were more likely to quit than self-referred clients (Guy et al., 2012) while our recent paper suggested that quit outcomes are more a results of service utilization (e.g., use of cessation medication) rather than mode of entry into the program (Nair et al., 2018a).

While research has examined quit outcomes by referrals from the healthcare system at large (Bentz et al., 2006; Guy et al., 2012; Jamal et al., 2012; Lichtenstein et al., 2010; Song et al., 2014; Willett et al., 2009; Woods and Haskins, 2007), there has been a dearth of research on variability in quit outcomes among provider-referred clients across various healthcare settings (e.g., pediatric clinics, behavioral health, primary care). The only study, thus far, to examine outcomes by settings was conducted in 2012 and found differences in quit outcomes across settings (Guy et al., 2012). This study, however, used a relatively limited range of healthcare facilities (primary service, hospital, and community health) and only examined enrollment and quit outcomes. The purpose of our study is to gain a comprehensive understanding of how clients referred from larger variety of healthcare settings differ in program enrollment and quit outcomes, as well as retention and program utilization (e.g., number of coaching sessions and cessation medication use). This study uses a contemporary sample of tobacco users (2011–2016) and expands the breadth of healthcare settings to include Federally Qualified Health Centers (FQHCs), acute care hospitals, behavioral health, medical, and specialty clinics. An understanding of differences in quit outcomes by healthcare setting can shed light on how providers within these settings may change messaging around tobacco use with their patients. Quitlines can further use this information to better tailor services for patients referred from specific healthcare settings to maximize tobacco cessation efforts.

2. Methods

This was a retrospective analysis of data collected at the Arizona Smoker's Helpline (ASHLine), Arizona's state quitline, between January 2011 and June 2016. The sample for this study was restricted to clients who were proactively referred by their healthcare provider to the quitline (approximately 21% of the quitline's enrolled clients). All proactive referrals were received from healthcare providers across Arizona either via fax or secure electronic portal. On receipt of the referral, the quitline staff engaged in a series of proactive outbound calls (within 24–48 h following receipt of the referral with daily calls for a 7-day period) to the referred client to enroll them into quitline services. Once enrolled, clients received evidence-based counseling based on elements of cognitive behavioral therapy and motivational interviewing. Counseling included up to 90 days of weekly telephone coaching sessions focusing on urge management strategies, quit smoking tips, preparation for setting a quit day, and relapse prevention strategies. In addition to behavioral counseling, eligible clients received up to four weeks of nicotine replacement therapy (e.g., patch, gum, or lozenge) at no cost. Eligibility for receiving NRT at the ASHLine is based on state residency and insurance status. Specifically, due to an existing comprehensive benefit available through the state's Medicaid program (12-week coverage of FDA approved tobacco cessation medications), Medicaid beneficiaries receive the same telephone-based support, but are navigated to their health plan for NRT provision. Follow-up was completed at 7-month post-enrollment (7-month follow-up) and assessed information on tobacco behavior change outcomes and quit tobacco medication use. Assessments were conducted via telephone by trained survey staff (not quitlines coaches) using standardized protocols, including seven call attempts over a one-week period. To increase response rates, starting in 2015, the quitline also introduced retention reminders that informed clients of their upcoming follow-up survey. The study used de-identified data and was deemed exempt by the University of Arizona's Institutional Review Board.

2.1. Measures

2.1.1. Healthcare settings

Referrals were categorized into one of the six healthcare settings, primarily based on provider and/or organizational similarities: These included (a) general medical practice (e.g. primary care providers, internists), (b) acute care hospitals (settings where patients are treated for a brief period for an acute illness/disease such as recovery from surgery, intensive care), (c) behavioral health (e.g., psychiatric clinics, substance abuse treatment centers), (d) county health departments, and (e) federally qualified health centers (FQHCs) and (f) specialty clinics. FQHCs are clinics that provide comprehensive health services to economically disadvantaged populations in rural and urban communities. Specialty clinics comprised of referrals from medical specialists (e.g., dental, obstetrics/gynecology, pediatric/adolescent).

2.1.2. Outcome variables

2.1.2.1. Enrollment and dropout. Enrollment was calculated as the percentage of clients who converted to enrollment after the referral was received by the quitline. Dropout was calculated as the percent of enrolled clients who consented to receive a follow-up and were not reached for the 7-month follow-up.

2.1.2.2. Program utilization. Program utilization consisted of self-reported use of nicotine replacement therapy (NRT) during time in-program (0 = no; 1 = yes) ascertained at the time of 7-month follow-up, and number of behavioral coaching sessions completed which was collected by the quitline system when clients were enrolled in the program (dichotomized at 5 or less, or > 5) (North American Quitline Consortium, 2016).

2.1.2.3. Quit status. Clients reporting no tobacco use in the past 30 days at the time of the 7-month follow-up were identified as being quit. Quit rates were calculated based on guidelines by the North American Quitline Consortium (number of survey respondents abstinent from tobacco divided by the total number of survey respondents) (North American Quitline Consortium, 2009).

2.1.3. Covariates

Informed by previous research (Hyland et al., 2004; Hymowitz et al., 1997; Nair et al., 2018b) and background knowledge, potential confounding variables included age, gender (male, female), race/ethnicity (non-Hispanic white, Hispanic, Black, and other), education

(high school diploma or more versus no high school diploma), a history or current diagnosis of chronic health condition (cancer, heart disease, hypertension, asthma or diabetes), mental health condition (yes/no), nicotine dependence (measured by the Fagerström test of nicotine dependence, possible range 0–10) (Heatherton et al., 1991), other smokers in the home (smokers present [yes]/no smokers in the home [no]), and confidence to quit (not/somewhat confident vs very/extremely confident). Covariates were collected at the time of client enrollment as part of the standard intake process.

2.1.4. Statistical analysis

Descriptive statistics were used to summarize client baseline characteristics. Unadjusted rates of enrollment and 30-day cessation were graphed, with 95% confidence intervals (CI). Unadjusted logistic regression was used to model enrollment following referral to compare enrollment rates by health care setting (no adjusted models could be fit, as individuals who do not enroll have no measured covariates). The type "general medical practice" was used as the reference category, as it was the largest group. Adjusted logistic regression was used to model nicotine replacement therapy following enrollment; 30-day quit rates at the seven-month follow-up; and dropout at seven-month follow-up. Adjusted odds ratios (OR) are reported for all outcomes, except for enrollment, where only unadjusted models could be fit. The number of coaching calls before follow-up was modelled using Poisson regression with incidence rate ratios (IRR) estimated. Because of missing covariate data rates were up to 25%, we used multiple imputation with chained equations for adjusted models, which accommodates categorical and continuous data (Azur et al., 2011). The imputation models included the outcomes and the covariates from the analytical model. The base dataset for the outcomes of cessation was made up of those individuals who had follow-up data ($n = 4480$). The base dataset for the outcomes of NRT use, dropout at follow-up and number of coaching calls was comprised of those individuals who had enrolled ($n = 10,355$). Fifty imputations were used. All analyses were performed in SAS version 9.4 (Cary, North Carolina). Statistical significance was set at 0.05 and all tests were two-sided.

3. Results

3.1. Sample characteristics

Client flow is provided in Fig. 1. ASHLine received 59,776 referrals of which, 59,214 had a known referral location. Of these, 10,355 enrolled in quitline services, and 4480 had seven-month follow-up data. Characteristics of ASHLine clients are provided in Table 1. At baseline (i.e., program enrollment), clients had a mean age of 49.1 ± 14.3 years, were mostly female (58.8%) and non-Hispanic white (61.6%), with an average nicotine dependence score of 4.5 ± 2.3. A majority of clients had completed some college or more (78.9%) and had health insurance either through Medicaid (44.5%), or private insurance (20.3%). In addition, a majority of clients self-reported having a chronic health condition (63.7%), rated their social support as good, very good, or excellent (56.9%), reported very or extremely high confidence to quit for at least 24 h (84.4%), and 93.8% had an intention to quit within the next 30 days. The median number of coaching sessions completed was 2, with interquartile range of 1 to 5, and 68.11% reported using nicotine replacement therapy.

3.2. Client enrollment and dropout at 7 month follow-up

Compared to clients referred from general medical practices (Table 2), those referred from acute care hospitals (OR = 0.60, 95%CI: 0.56, 0.64), behavioral health (OR = 0.81, 95%CI: 0.76, 0.87), county health departments (OR = 0.79, 95%CI: 0.74, 0.84), and FQHCs (OR = 0.91, 95%CI: 0.85, 0.97) were less likely to enroll in quitline services. Once enrolled, clients referred through acute care hospitals were more likely to drop out at follow-up (OR = 1.12, 95%CI: 1.00–1.26). Absolute enrollment rates are shown in Fig. 2 and ranged from 15.4% (acute hospitals) to 23.3% (general medical practice).

3.3. Program utilization by healthcare setting

Compared to clients referred from general medical practices, clients referred from behavioral health (OR = 0.51, 95% CI: 0.42, 0.62) were
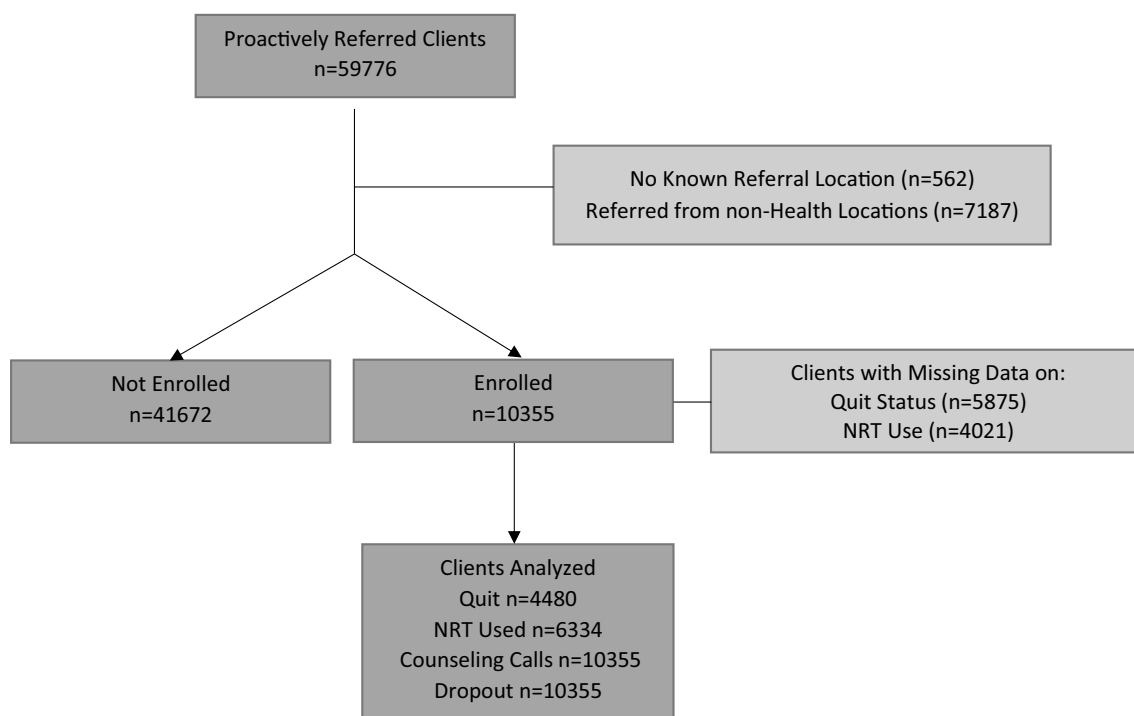

Fig. 1. Flow of clients referred to the ASHLine from January 1, 2011 to June 26, 2016.

Table 1

Characteristics of enrolled ASHLine clients (*n* = 10,355), from January 1, 2011 to June 26, 2016. Categorical variables display N (%)[a] and continuous variables display mean (SD).

Baseline variables	
Referral setting	
Medical practice	2923 (28.2)
Acute care hospital	1924 (18.6)
Behavioral health	1674 (16.2)
County health departments	1659 (16.0)
Federally qualified health centers (FQHCs)	1907 (18.4)
Other medical[b]	268 (2.6)
Age	49.1 (14.3)
Female gender	6030 (58.8)
Race/ethnicity	
Non-Hispanic White	6380 (61.6)
African-American	813 (7.9)
Hispanic	2298 (22.2)
Other	864 (7.9)
Education	
High school or less	2100 (21.1)
Some college or more	7869 (78.9)
Insurance type	
Uninsured	3633 (35.2)
Medicaid	4585 (44.5)
Private insurance	2092 (20.3)
Mental health condition	4664 (43.3)
Chronic health condition	6413 (63.7)
Social support	
Poor, fair	1597 (43.1)
Good, very good, excellent	2106 (56.9)
Missing	6652 (64.2)
Confidence to quit for 24 h	
Somewhat, not	1263 (15.6)
Very, extremely	6861 (84.4)
Missing	2231 (21.5)
Intention to quit (in next 30 days)	
No, don't know	522 (6.2)
Yes, I have already quit	7862 (93.8)
Missing	1971 (19.0)
Fagerström test for nicotine dependence (possible range 0–10)	4.5 (2.3)
Missing	2656 (25.6)
Cigarettes per day	15.7 (9.7)
Missing	2533 (24.5)
Other smokers in the home	4220 (52.1)
Missing	2259 (21.8)

Post-baseline variables	
30-day cessation (7-month follow-up)	1623 (36.3)
Missing	5884 (56.8)
Number of coaching calls before 7-month follow-up	
0–4	7706 (74.4)
5+	2649 (25.6)
Number of coaching calls before 7-month follow-up; median (inter-quartile range)	2 (1, 5)
Medication use while in-program	4226 (66.7)
Missing	4021 (38.8)
Days in program	62.4 (53.7)

[a] Percentages use the number of non-missing values as the denominator; missing rates are shown when rate is > 5%.
[b] Dental, obstetrics/gynecology, pediatric/adolescent, specialist.

less likely to report having used tobacco cessation medications as part of their quit attempt. In contrast, clients referred from specialty care clinics (OR = 1.60, 95% CI: 1.09, 2.36) were more likely to report having used tobacco cessation medications as part of their quit attempt. There were fewer in-program phone sessions completed for enrolled clients who were referred from acute care hospitals (IRR = 0.88, 95%CI: 0.85, 0.90), county health departments (IRR = 0.93, 95%CI: 0.89, 0.96) and FQHCs (IRR = 0.94, 95%CI: 0.91, 0.97) compared to those referred from medical practices (Table 2).

3.4. Quit outcomes by healthcare settings

Compared to clients referred from general medical practices, clients referred from behavioral health (OR = 0.73, 95%CI: 0.59, 0.92), and FQHCs (OR = 0.78, 95%CI: 0.64, 0.94), were less likely to report being quit for 30 days at the seven-month follow-up. Absolute quit rates are shown in Fig. 2, and ranged from 27.0% (behavioral health) to 46.7% (specialty clinics) (see Table 2).

4. Discussion

The purpose of the study was to examine how tobacco users referred to a state quitline differed by healthcare settings in pertinent program characteristics. Results indicate that while clients are assessed for tobacco use and referred to the quitline, there is wide variability in enrollment, retention, program utilization, and quit outcomes. To our knowledge, this is one of the first studies to examine client outcomes across a wide variety of healthcare settings.

4.1. Behavioral health

Compared to those referred from general medical practice, clients referred from behavioral health setting were less likely to enroll, use cessation medication, and quit tobacco at follow-up, while there was no difference in the number of calls completed or drop-out rate. While smoking rates nationally have been on the decline, smokers with mental health condition have not benefited from these efforts with tobacco use rates within this population exceeding the national averages (McClave et al., 2010). System- and individual-level factors play a role in explaining this health disparity. Despite recommendations that they treat tobacco, behavioral health professionals have been slow to change and there has been a lack of knowledge about evidence-based treatment for tobacco dependence and advocacy among consumers and mental health advocates.(Williams et al., 2011) Psychiatric hospital staff may believe that continued tobacco use is beneficial to patients and may resist policies to make facilities smoke-free (Johnson et al., 2010). System-level factors such as these can play a role in the messaging that behavioral health clients receive advice around quitting smoking which could related to lower levels of client enrollment in a cessation program (e.g., quitlines). On an individual-level, individuals with behavioral health conditions have an increased vulnerability to tobacco use, are heavier smokers, and face difficulty quitting tobacco (Hagman et al., 2008; Nair et al., 2018b) and once enrolled into services may warrant a specialized treatment approach (e.g., extended use of pharmacotherapy, increased number of phone sessions) (Tedeschi et al., 2016). Based on our observations, those who are referred from behavioral health clinics may benefit from additional outreach and assistance with enrollment and access to cessation medication; however, these ideas have not yet been tested.

4.2. Federally qualified health centers (FQHCs)

Similarly, clients referred from FQHCs were less likely to enroll, complete fewer phone sessions while in program, and were less likely to quit tobacco, but did not differ in terms of NRT use or drop-out. FQHCs provide comprehensive health services to economically disadvantaged populations in rural and urban communities across the nation and a recent study showed that tobacco prevalence rates among FQHC populations was considerably higher than the US national average (Flocke et al., 2017). However, in our study, FQHC referrals comprised of only 14.9% of the referrals suggesting that implementing clinical interventions and decision support tools to assess and address tobacco use is the first step to reduce tobacco-related health disparities in this population. In terms of enrolling into services and tobacco cessation outcomes, our results mirror findings from other studies. Low-income populations

Table 2

Comparison of outcomes by healthcare settings. Values shown are unadjusted and adjusted odds ratios (OR$_{unadj}$, OR$_{adj}$) or incidence rate ratios (IRR), and 95% confidence intervals (CI).

|	Enrolled following referral (n = 52,027)	30-day cessation at 7-month follow-up (n = 4480)	NRT use (n = 6334)	Number of calls (n = 10,355)	Dropout (no 7-month follow-up) (n = 10,355)
	OR$_{unadj}$ (95% CI)[a]	OR$_{unadj}$ (95% CI) OR$_{adj}$ (95% CI)	OR$_{unadj}$ (95% CI) OR$_{adj}$ (95% CI)	IRR$_{unadj}$ (95% CI) IRR$_{adj}$ (95% CI)	OR$_{unadj}$ (95% CI) OR$_{adj}$ (95% CI)
General medical practice	1.00	1.00	1.00	1.00	1.00
Acute care hospital	0.60 (0.56, 0.64)	1.04 (0.88, 1.25) 1.01 (0.85, 1.21)	0.94 (0.80, 1.10) 0.93 (0.79, 1.09)	0.87 (0.85, 0.90) 0.88 (0.85, 0.90)	1.12 (1.00, 1.26) 1.12 (1.00, 1.26)
Behavioral health	0.81 (0.76, 0.87)	0.60 (0.49, 0.73) 0.73 (0.59, 0.92)	0.35 (0.30, 0.42) 0.51 (0.42, 0.62)	0.88 (0.85, 0.91) 1.02 (0.98, 1.06)	1.42 (1.26, 1.60) 1.04 (0.91, 1.19)
County health departments	0.79 (0.74, 0.84)	1.02 (0.84, 1.24) 0.95 (0.77, 1.16)	1.01 (0.85, 1.19) 1.11 (0.94, 1.31)	0.77 (0.75, 0.80) 0.93 (0.89, 0.97)	1.36 (1.20, 1.53) 0.97 (0.85, 1.11)
Federally qualified health centers (FQHCs)	0.91 (0.85, 0.97)	0.82 (0.69, 0.98) 0.78 (0.64, 0.94)	0.77 (0.66, 0.90) 0.84 (0.71, 0.99)	0.86 (0.84, 0.89) 0.94 (0.91, 0.97)	1.10 (0.98, 1.24) 0.95 (0.84, 1.08)
Specialty care[b]	1.00 (0.86, 1.15)	1.31 (0.96, 1.79) 1.35 (0.92, 1.99)	1.55 (1.08, 2.24) 1.60 (1.09, 2.36)	0.93 (0.87, 1.00) 1.04 (0.97, 1.12)	1.05 (0.82, 1.35) 0.86 (0.66, 1.11)

[a] Only unadjusted model was fit since no covariates were available for those who did not enroll.

[b] Dental, obstetrics/gynecology, pediatric/adolescent.

often face unique barriers to program engagement and retention (e.g., low social support, low coping skills, increased life stress) (Businelle et al., 2013; Cohen et al., 2006; Reitzel et al., 2013) and are also less likely to utilize quitline services (Kaufman et al., 2010; Sheffer et al., 2015; Varghese et al., 2014). Given this, further research is warranted to identify targeted strategies to increase the reach and impact of evidence-based tobacco cessation services to assess, engage, retain smokers referred from FQHC settings to reduce overall prevalence of smoking among low SES populations.

4.3. Acute care hospitals

Compared to clients referred from medical practice, those referred from acute care hospitals were less likely to enroll and were more likely to drop out at follow-up; however, once enrolled, there were no differences in quit outcomes or medication use utilization between the two groups. Hospitalization is often an opportune time to counsel smokers to quit and hospitalized patients feel a heightened sense of vulnerability to their illness (Emmons and Goldstein, 1992) in turn prompting an impetus to change their behaviors, including quitting smoking. On the other hand, it is possible that the motivation to quit while undergoing
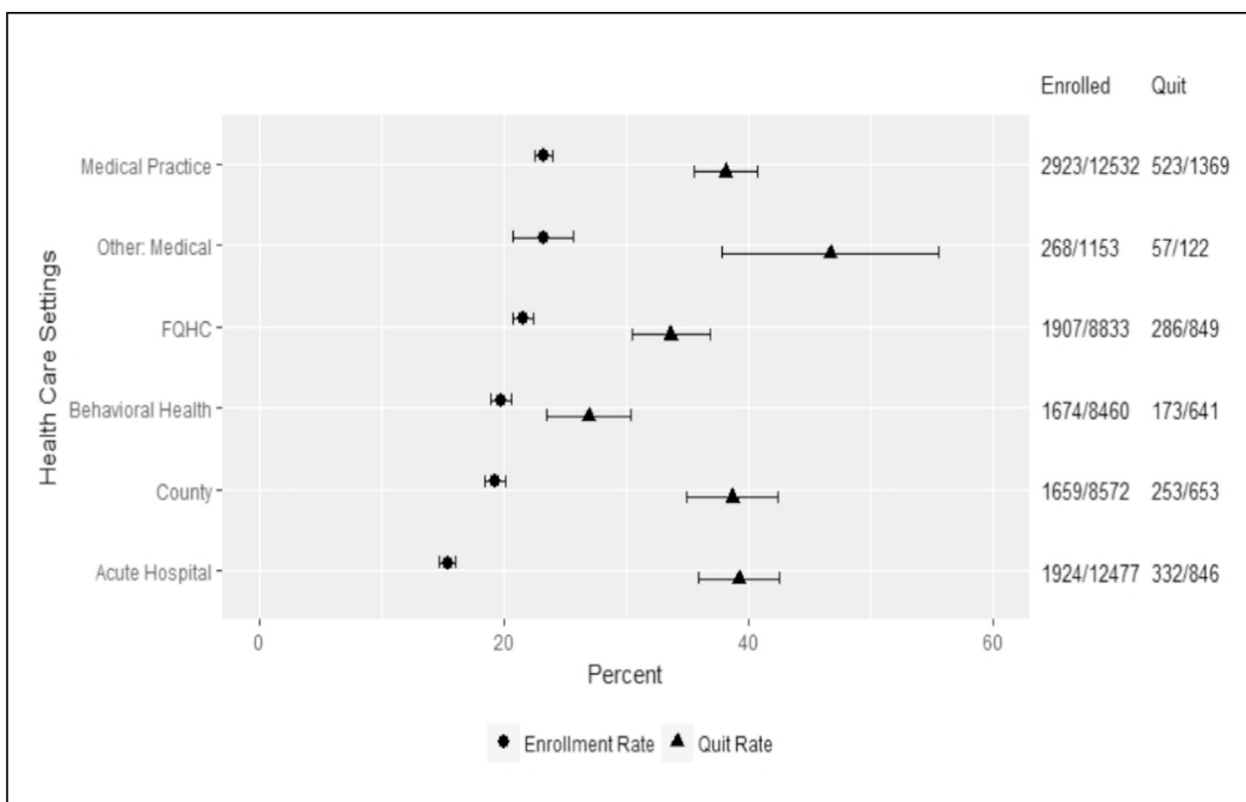
Fig. 2. Unadjusted rates of enrollment and 30 days quit at 7-month follow-up, with 95% confidence intervals. Values in the right columns are number enrolled/number referred and number quit/number with 7-month follow-up.

treatment may change post-discharge which may have contributed to the lower referral to enrollment conversion rate, suggesting that quitlines may need to utilize tailored strategies to engage and retain clients referred from acute care hospital settings. A systematic review that examined interventions for hospitalized smokers showed that high intensity interventions comprising of in-person behavioral counseling (with and without pharmacotherapy) that started during the hospital stay and continued a month post-discharge significantly increased the odds of quitting smoking (Rigotti et al., 2008). These results suggest that connecting hospitalized tobacco users to evidence-based services may require a combination of in-person counseling sessions initiated while in a hospital setting with a warm-hand off to remote services (e.g., quitlines) post-discharge.

Compared to clients referred from general medical practices, while those referred from county health departments were less likely to enroll into services and receive fewer phone sessions when in-program, there were no differences in quit rates between the two groups. This may suggest that quitlines may need to utilize varied enrollment strategies (e.g., use of multi-model strategies such as text messages) for clients referred through health departments. Finally, clients referred from specialty care clinics (dental, adolescent) were more likely to use NRT when enrolled compared to general medical practice.

Best practices to quit tobacco promote a combination of pharmacotherapy and use of evidence-based behavioral counseling (Fiore et al., 2008). Our results, however, indicate that service utilization alone (e.g., use of NRT, counseling sessions) may not account for all differences in cessation outcomes. This suggests a need for adjustments to provider trainings and quitline protocols (e.g., assessing client motivation, self-efficacy) to increase client engagement/retention/service utilization and outcomes. While randomized clinical trials have examined the synergistic effect of brief intervention trainings combined with behavioral counseling within specific health care settings (e.g., pediatrics (Collins et al., 2018), behavioral health (Hall and Prochaska, 2009; Prochaska, 2010)), future studies in this area are needed to compare standardized tailored trainings combined with specialized behavioral interventions across healthcare settings. Secondly, approximately 80% of the enrolled clients reported completing some college education. Since low education is a key barrier in accessing health care services (Lazar and Davenport, 2018), it is possible that a larger proportion of tobacco users with higher education visit their healthcare provider and thus are screened and referred for tobacco cessation. To reduce provider burden, referral forms do not capture demographic information thereby reducing our ability to assess if disproportionate number of clients with higher education levels were referred or if there were differences in enrollment rates by education.

4.4. Strengths and limitations

This is an observational study conducted in a real-world quitline setting. This is among the first studies to examine a breath of client outcomes (e.g., enrollment, engagement, retention, and quit outcomes) across a comprehensive category of healthcare settings. All clients had access to the program-based protocols for engagement in tobacco cessation services. However, the study design also limits our ability to control for a variety of factors. Firstly, while all clients in this study were referred to the quitline, it was not possible to measure and assess for standardization in how the healthcare providers asked or assessed for tobacco use. Second, variables such as organizational-level factors (e.g., support for the systematic delivery of tobacco interventions in clinical settings), and client-related psychosocial factors (e.g., motivation) were not assessed. Further, we did not obtain data on the length of nicotine replacement therapy use and reasons for not using or discontinuing use, which may have provided insights into the variability of use across settings. Similarly, as is standard practice among quitlines, we used a yes/no measure of NRT usage which does not capture data on length and amount of medication use or receiving pharmacotherapies

from other sources. Finally, smoking outcomes were not bio-verified; however, studies show high correlations between self-reported and bio-verified quit reports. Moreover, collecting data on self-reported abstinence is standard practice among quitlines.

5. Conclusions

There appears to be wide variability in enrollment and retention rates, program characteristics, and quit outcomes for clients referred by their healthcare providers across settings. These findings reiterate the need for tailored messaging around enrolling and availing of cessation services at the provider level. Quitlines could also benefit from use of specialized and multi-modal strategies for clients referred from specific settings (e.g., behavioral health and FQHCs) to increase enrollment and engagement in cessation services thereby improving quit outcomes. Future studies examining provider messaging, engagement in treatment services, and program outcomes across healthcare settings are warranted.

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Declarations

The authors have no conflicts of interest to declare.

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