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Quitting Smoking During Substance Use Disorders Treatment: Patient and Treatment-related Variables

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Abstract

Although individuals in substance use disorders (SUD) treatment continue to smoke at high rates, regulatory, policy and programming changes promoting tobacco cessation are being implemented and some patients quit successfully. We examined associations of smoking patterns, tobacco advertising receptivity, anti-tobacco message awareness, health risk perception, attitudes towards addressing smoking and availability of smoking cessation services with quitting smoking during SUD treatment. Surveys were completed by 1127 patients in 24 programs chosen randomly, stratified by program type (residential, methadone maintenance, outpatient), from among publicly funded, adult treatment programs within the National Drug Abuse Treatment Clinical Trials Network. Among respondents who had been in SUD treatment for at least one month, there were 631 current smokers and 52 former smokers who reported quitting smoking during treatment for at least one month prior to survey completion; these respondents comprised our sample (N=683). Results showed that participants who reported health concerns as a reason for quitting were 1.27 times more likely to have quit during treatment ($p=.015$) than those reporting health concerns affected quitting a little or not at all. Additionally, participants who reported that smoking cessation was part of their personal treatment plan during SUD treatment were 1.08 times more likely to have quit during treatment ($p<.001$). Participants in methadone treatment were 49% less likely to report successfully quitting during treatment than those in outpatient treatment (95%CI: 0.35-0.75, $p<.001$). Leveraging health concerns about smoking and including smoking cessation in an individualized treatment plan may help increase smoking cessation during SUD treatment.

Keywords

tobacco; smoking cessation; substance use disorders treatment

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1. Introduction

Smoking prevalence among adults has declined dramatically in the United States over the past 50 years, from approximately 40% in 1965 to 16.8% in 2014 (DHHS, 1989; Jamal et al., 2015). However, individuals with substance use disorders (SUDs) continue to smoke at high rates and die prematurely from smoking-related illnesses (Bandiera, Anteneh, Le, Delucchi, & Guldish, 2015.) The imperative to address smoking and nicotine dependence in treatment for SUDs has been widely discussed (e.g., Cookson et al., 2014; Fiore et al., 2008; Reid et al., 2006; Ziedonis, Guldish, Williams, Steinberg, & Foulds, 2006) and there has been a gradual cultural shift within the SUD treatment community in that direction (Baca & Yahne, 2009; Guldish et al., 2012; Reid et al., 2006). This has been supported by evidence that smokers in SUD treatment are willing to consider quitting smoking (Hughes & Kalman, 2006; McClure, Acquavita, Dunn, Stoller, & Stitzer, 2014) and that those who achieve nicotine abstinence may have better outcomes regarding their other drugs of abuse than those who continue smoking (Friend & Pagano, 2005; Prochaska, Delucchi, Hall, 2004; Tsoh, Chi, Mertens, & Weisner, 2011). Regulatory and policy changes that have promoted the shift include 34 state-required smoking bans within SUD treatment facilities (NASADAD, 2010) and 11 state mandates for the provision of tobacco cessation services within SUD treatment (Krauth & Apollonio, 2015). Regardless of state regulations, implementation of tobacco bans and cessation services has varied widely across programs (Guldish et al., 2012; Krauth & Apollonio, 2015). A nationally representative survey, conducted from 2006-2008, found that only 42% of SUD treatment programs reported tobacco cessation services (Knudsen et al., 2010), a percentage that had not changed by 2011 (Substance Abuse and Mental Health Services Administration, 2012).

Barriers at staff, programmatic and systems levels have slowed the implementation of cessation services in SUD treatment. Staff reluctance to address patient smoking (Knudsen & Studts, 2010; Knudsen, Muilenburg & Eby, 2013) and lack of skill to provide smoking cessation interventions (Laschober, Muilenburg, & Eby, 2014) have been associated with lower levels of cessation services. Staff smoking has also been identified as a barrier (Guldish, Passalacqua, Tajima, & Manser, 2007; Richter, Hunt, Cupertino, Garrett, & Friedmann, 2012). It has been associated with lower levels of provision of brief smoking cessation interventions (Knudsen & Studts, 2010), but not administrators' reports of programmatic adoption of cessation services (Knudsen, Studts, Boyd, & Roman, 2010), suggesting differences between administrative adoption and full implementation. Organizational and policy variables, such as limited access to medication and poor reimbursement for tobacco cessation services, have also impeded adoption (Knudsen et al., 2010; Muilenburg, Laschober, & Eby, 2014).

Despite variability in smoking cessation policies and services, some patients successfully quit smoking during SUD treatment. Categories of variables that have been associated with smoking cessation in the general population include demographics, (Hymowitz et al., 1997; Lee & Kahende, 2007; McCarthy, Ebssa, Witkiewitz, & Shiffman, 2015; Perkins & Scott, 2008; Reid, Hammond, Boudreau, Fong, & Siahpush, 2010), severity of nicotine dependence (Chandola, Head & Bartley, 2004; Ferguson et al., 2003; McCarthy et al., 2015), social environment (Dollar, Homish, Kozlowski, & Leonard, 2009; Hitchman, Fong, Zanna,

Thrasher, & Laux, 2014; Hymowitz et al., 1997; Lee & Kahende, 2007; Stewart et al., 2013), and perception of smoking risks (McKee, O'Malley, Salovey, Krishnan-Sarin, & Mazure, 2005; Borrelli, Hayes, Dunsiger, & Fava, 2010). Among these, nicotine dependence appears to be the most robust predictor (Vangeli et al., 2011). Media campaigns to prevent smoking initiation and increase quit rates have incorporated messages about smoking health risks and there is evidence that these campaigns do promote quitting in the general population (Durkin, Brennan & Wakefield, 2012), just as, conversely, tobacco advertising has been associated with smoking initiation and maintenance (Lovato, Watts & Stead, 2011; Robertson, McGee, Marsh & Hoek, 2015).

Minimal research has been conducted examining variables associated with quitting among smokers with additional SUDs. We identified one study of short-term quit attempts (i.e., at least 24-hours) among smokers in SUD treatment (Martínez, Guydish, Le, Tajima, & Passalacqua, 2014). The 45.6% of patients who made a quit attempt were more likely to be in contemplation or preparation stages of changes versus pre-contemplation, have more positive attitudes towards quitting, and report receiving more tobacco cessation services during treatment. A study of the Barriers to Quitting Smoking in Substance Abuse Treatment (BQS-SAT) scale conducted with smokers in residential SUD treatment who were participating in tobacco cessation treatment found that having a lower general barriers-to-quitting score (e.g. "If I quit smoking my urges to smoke will be so strong I won't be able to stand it.") was predictive of 7-day point prevalence abstinence at 1-month follow-up (Martin, Cassidy, Murphy & Rohsenow, 2016).

The current study sought to identify both individual and treatment services variables associated with successfully quitting smoking during SUD treatment. Identifying such variables can inform policy development and clinical programming to individualize and improve tobacco cessation services during SUD treatment. We analyzed information from a survey of adult patients in SUD treatment across the United States that assessed patterns of tobacco use, receptivity to tobacco advertising, anti-tobacco message awareness, knowledge and perceptions of smoking risks, attitudes towards addressing smoking while in SUD treatment, and smoking cessation services available during treatment. We examined relationships of these variables with respondents' quit status, comparing current smokers with former smokers who had successfully quit smoking during SUD treatment for a minimum of one month prior to completing the survey. We identified participants who had been abstinent from smoking for at least one month as a measure of quitting based on research indicating that very short term quit attempts predict future quit attempts, but not successful quitting (Ferguson et al., 2003; Zhou et al., 2009).

2. Methods

2.1. Program Selection and Participants

The survey was the second cross-sectional survey of a larger study (Guydish et al., 2016), administered from April 2015 through December 2015 to 1127 participants enrolled in 24 publicly funded, adult SUD treatment programs (10 residential/inpatient, 7 methadone maintenance, and 7 outpatient clinics) affiliated with the National Drug Abuse Treatment Clinical Trials Network (CTN), a network of 13 research centers and affiliated addiction

treatment programs across the United States conducting community-based research to improve the SUD treatment outcomes. Participating programs were randomly selected, stratified by program type (inpatient/residential, methadone maintenance, outpatient), from among 48 possible programs meeting selection criteria (i.e., publicly funded, at least 60 active patients and willing to assign a staff study-liaison). Each participating program received a \$2,000 program incentive following the survey site visit. All patients enrolled in treatment for at least 10 days and present the day the survey was conducted were eligible to participate. The number of participants recruited from each clinic ranged from 31-55. Participants provided informed consent, completed surveys, and received a \$20.00 gift card following survey completion. (See Gwydish et al., 2016, for additional procedural details). Current smokers in SUD treatment for one month or more and former smokers who quit during the current SUD treatment for at least one month prior to completing the survey were included in the current analysis. The Institutional Review Board of the University of California, San Francisco approved procedures.

2.2. Procedure and Measures

Participants used iPads linked to a secure university server to complete self-administered surveys. Items used for the current analysis included demographic questions assessing age, gender, race/ethnicity, marital status, employment status, and education. Type of SUD treatment was categorized as outpatient, residential or methadone maintenance. Participants were asked to identify their primary drug and how many weeks they had been in treatment.

2.2.1. Smoking-Related Questions—Current smoking status was defined as reporting current smoking and lifetime smoking of at least 100 cigarettes. Quitting smoking was defined as reporting quitting smoking one month or more ago while in the current SUD treatment program. Participants were asked to report the age they began smoking. Participants were also asked whether they had a smoking partner and were categorized as having a smoking partner versus non-smoking partner/no partner. Reasons affecting smoking/quitting were asked and included in the current analysis (i.e., program requirement, cost of a pack, health concerns, family pressure/encouragement/being a good role model, warning labels on packs). Possible responses (not at all, a little, somewhat, a lot) were dichotomized into “not at all/a little” and “somewhat/a lot” for analyses. Finally, participants were asked whether they had ever used any products to try to help them quit (nicotine patch, gum, lozenge/spray/inhaler, bupropion [Zyban], varenicline [Chantix], e-cigarettes/vape pens). We categorized cessation product use as follows: use of nicotine replacement therapy (NRT; yes/no), use of oral medication (yes/no) and use of e-cigarette/vape pens (yes/no).

2.2.2. Advertising Receptivity—Receptivity to tobacco advertising was measured using the Pierce Advertising Scale, a 4-item measure shown to be predictive of progression to smoking among adolescents (Pierce, Choi, Gilpin, Farkas & Berry, 1998; Gilpin, White, Messer, & Pierce, 2007). Questions ask about receipt of tobacco promotional items (e.g., cap or t-shirt), willingness to use an item, naming a favorite brand advertisement, and the cigarette brand the respondent has seen the most. In Gilpin et al.'s (2007) classification system, respondents who have received or are willing to use a promotional item are classified as highly receptive to tobacco advertising those giving affirmative responses to

naming a favorite brand are classified as moderately receptive and those only naming a brand seen are categorized as having low receptivity. In our study, only 5.9% of respondents fell in the low receptivity category; we combined low and moderate into one category.

2.2.3. Anti-tobacco Message Awareness—Participants were shown screen shots from television commercials of the FDA Real Cost campaign and asked whether and how often they had seen them in the past 30 days (daily, weekly, less than once a week, not at all). The campaign, launched in 2014, focused on educating adolescents about the negative costs of smoking, including loss of control due to addiction, the mix of dangerous chemicals in cigarette smoke and negative health consequences (Duke et al., 2015).

2.2.4. Health Risk Perception—Participants were asked to estimate health risks associated with smoking using a standard scenario (i.e., “Tom is a current smoker. He has smoked 1 pack of cigarettes per day for the last 15 years. As a current smoker what is the chance (0-100%) he will ...?”). Risk perception items have been shown to discriminate perceived risks for casual, regular and addicted smokers (Rubinstein, Halpern-Felsher, Thompson, & Millstein, 2003) and perceived risks/benefits to self for adolescent non-smokers and smokers (Halpern-Felsher, Biehl, Kropp, & Rubinstein, 2004). Three negative health outcomes were assessed (i.e., get lung cancer, have trouble catching breath, have heart attack,) the mean of which was calculated for each participant to obtain a perceived health risk score. This 3-item scale demonstrated a high internal consistency (Cronbach's $\alpha = .80$).

2.2.5. Smoking-related Knowledge, Attitudes, and Services—Knowledge of smoking risks, attitudes towards addressing smoking during SUD treatment and participants' report of smoking cessation services available to them while in treatment were assessed using items from the Smoking-related Knowledge, Attitudes, and Services (S-KAS) self-report questionnaire (Guydish, Tajima, Chan, Delucchi, & Ziedonis, 2011). Designed to assess conditions that support smoking cessation within SUD treatment, the S-KAS has been shown to identify positive attitude changes and increases in smoking cessation services received following an organizational change intervention (Guydish et al., 2012) and has been associated with quit attempts during SUD treatment (Martínez et al., 2015). S-KAS items scores range from 1 to 5, with higher scores indicating greater tobacco-related knowledge, more positive attitudes toward smoking cessation, and greater access to smoking cessation services. Some questions in the S-KAS scales are asked only of current smokers, thus were not asked of the whole sample in the current study. We used responses to individual S-KAS items for which we had data from both smokers and quitters in our analyses as follows: 3 knowledge items (second hand smoke hazards, awareness of clinician smoking cessation skills, awareness of smoking cessation resources), 5 attitude items (quitting important part of program, believing clients want to quit, quitting as a personal decision not concerning clinician [disagree rates higher score], best time to stop [sooner rates higher score], want help with quitting), and 9 smoking cessation program services items (benefits/risks discussed, given advice on quitting, given cessation referral, given educational material, attended education group, attended support group, quitting part of personal treatment plan, quitting a program requirement, received medication).

2.3. Analyses

Standard descriptive statistics (mean, standard deviation) were used to summarize continuous variables. Categorical variables were summarized using frequencies and percentages. The outcome variable was respondents' quit status, dichotomized as current smokers and former smokers who had successfully quit smoking during SUD treatment for a minimum of one month prior to completing the survey. Of the total survey sample (N=1127), respondents who had never smoked (n =297) or reported having quit less than one month ago (n=67) or quit outside of the current SUD treatment program (n =80) were not included in this analysis. Our sample (N=683) of smokers and quitters was compared on demographic variables, SUD treatment variables (primary drug, program type, number of weeks in treatment), and smoking related measures (age at first smoking, having a smoking partner, reasons affecting smoking/quitting, lifetime use of cessation products, advertising receptivity, anti-tobacco message awareness, health risk perception, and S-KAS). Statistical comparisons were computed using t-test for continuous variables and chi-square test for categorical variables.

Variables that were statistically significant at a p-value ≤ 0.10 were entered into a multivariable logistic regression model to assess associations between these variables and successfully quitting smoking during SUD treatment. The model also controlled for demographic variables (age, gender, race/ethnicity, education, marital status, and employment status), primary drug, and treatment program type regardless of their p-values in the univariate analyses. The correlation and condition indices were used to assess multicollinearity. Because the data was collected from 24 clinics and data from within each clinic may have been correlated, the model also accounted for nesting clients within clinic. Missing data was low (less than 3%); the multivariable model used complete case analysis in which 664 of 683 cases were included. All analyses were conducted using SAS version 9.3.

3. Results

3.1. Demographic, Smoking and Treatment-related Characteristics

There were 683 participants with an average age of 38.2 (s.d. = 11.77), of whom 54.3% (n=371) identified as male, and 59.7% (n=408) as non-Hispanic white. See Table 1 for additional demographic information. Regarding smoking status, 92.4% (n=631) reported currently smoking, and 7.6% (n=52) identified as former smokers who had quit during treatment one month or more ago. Opioids were reported as primary drug by 54.0% (n=369) and 42.6% (n=291) of participants were in methadone treatment. Smokers averaged 121.1 (s.d. = 183.9) weeks in treatment, as did quitters (s.d. = 181.1). Table 1 shows additional information about primary drug and treatment program type for smokers and quitters.

3.2. Variables associated with smoking cessation

Table 2 shows results of univariate analyses of independent variables considered for inclusion in the multivariable model. Variables significant at the .10 level were smoking partner, health concerns, and perceived health risks. Table 3 shows univariate analyses of S-KAS items considered for inclusion in the multivariable model. S-KAS items significant at

the .10 level were best time to stop smoking in treatment (higher scores reflect sooner), wanting help with quitting, benefits/risks of smoking discussed, advice given on quitting, quitting as part of a personal treatment plan, and received medication.

The multivariable analysis included control variables age, gender, race/ethnicity, education, marital status, employment, treatment program and primary drug, as well as the variables significant at .10 in the univariate analyses. Multi-collinearity was evaluated using correlations and condition indices. For the variables in the model, the correlations between any two variables were less than 0.50 and the condition indices were small (< 2.30). These indicators suggested that multi-collinearity was not a concern. Results of the multivariable analysis are presented in Table 4. Participants who reported health concerns affected their choice of smoking/quitting “somewhat/a lot” were 1.27 times more likely to have quit during treatment than those reporting health concerns affected their smoking/quitting a little or not at all (95% CI: 1.05-1.53, $p = 0.015$). Participants reporting that smoking cessation was part of their personal treatment plan during SUD treatment were 1.08 times more likely to have quit during treatment (95%CI: 1.03-1.13, $p < 0.001$). Race/ethnicity, primary drug of use and treatment program were also significantly associated with quit status. Both non-Hispanic black (OR = 0.76, 95% CI: 0.60-0.98, $p = .036$) and Hispanic participants (OR = 0.66, 95% CI: 0.49- 0.88, $p = .005$) were less likely to have quit smoking than non-Hispanic white participants. Those reporting opioids were more likely to have quit than alcohol users (OR=1.54, 95%CI: 1.19- 1.99, $p = 0.001$). Finally, treatment program was significantly associated with quit status. Those in methadone treatment were less likely to report successfully quitting during treatment than those in outpatient treatment (OR= .51, 95%CI: 0. 35-0.75, $p < .001$).

4. Discussion

A small number of participants in the current study ($n = 52$; 7.6 % of study sample) reported that they had not smoked for at least one month and had quit smoking during their SUD treatment. This compares to a quit attempt rate of approximately 35% and a successful quit rate (cessation of approximately 8-10 months) of 25% in a general population sample from the International Tobacco Control four country survey (Hyland et al., 2006). We found that higher ratings of health concerns as a reason for quitting were significantly associated with smoking cessation during SUD treatment, a result that corresponds with findings among those who quit in the general population (Crittenden, Manfredi, Cho, & Dolecek, 2007; Curry, Grothaus, & McBride, 1997). We also found that reporting quitting smoking as part of a personal treatment plan in current SUD treatment was significantly associated with smoking cessation, although the small effect size of an 8% increase in successfully quitting should be noted. These findings may have implications for the development of effective smoking cessation interventions in SUD treatment. For example, Baker et al.'s (2016) phase-based model of smoking cessation identifies five treatment phases (motivation, preparation, cessation, maintenance and relapse recovery) within a chronic care approach to smoking cessation treatment. Focus on health concerns related to smoking and addressing smoking cessation in a treatment plan may be useful across phases of cessation treatment, although interventions that increase the salience of health concerns may have the greatest impact during the motivation phase, and individualized, smoking cessation treatment planning may

be most effective during the preparatory phase. These questions await empirical investigation. The lack of significant findings associated with other smoking cessation treatment services is of concern. Ratings of the availability of services in the total sample ranged from a low of 1.5 (possible 1 to 5) for cessation being a program requirement, to a high of 3.3 for benefits/risks discussed and given advice on quitting. There appear to be missed opportunities for higher offering of and participation in smoking cessation services during treatment.

Results of the current study also found that primary opioid users were more likely to report quitting smoking than alcohol users and that participants in outpatient treatment were more likely to have quit than those in methadone treatment. Although these findings may seem inconsistent, we observed that primary opioid users in outpatient treatment had a higher quit percentage (20.51%) than primary opioid users in methadone treatment (6.69%). Our finding of a very low rate of smoking cessation in methadone treatment supports research showing that, despite interest in quitting, methadone maintenance patients have very low rates of quit success (Okoli et al., 2010). Peak smoking rates have been shown to occur after methadone administration (Richter et al., 2007) and subjective ratings have indicated that nicotine enhances the effect of methadone on decreasing opiate withdrawal symptoms (Elkader, Brands, Selby, & Sproule, 2009). These findings point to both the challenge and importance of developing effective cessation interventions specific to methadone treatment. They also caution that generalizability of results in smoking cessation trials conducted in SUD treatment may be limited by program type.

Race/ethnicity was related to quit status in the current study; non-Hispanic white respondents were more likely to report quitting than non-Hispanic black and Hispanic participants. Although findings related to race/ethnicity in general population studies are inconsistent, our results correspond with some (Lee & Kahande, 2007; McCarthy et al., 2015) and support calls for addressing tobacco-related health disparities among people of color (Okuyemi, Reitzel, & Fagan, 2015). We did not find a relationship of smoking cessation with tobacco advertising receptivity or anti-tobacco message awareness, despite general findings suggesting these variables impact smoking behavior in intended ways (i.e., tobacco advertising increases smoking initiation and maintenance [Lovato et al., 2011] and anti-tobacco campaigns promote quitting [Durkin et al., 2011]). Nor did we find relationships of smoking cessation with age of first use or partner smoking status, as have been shown in some studies in the general population (Dollar et al., 2009; Hymowitz et al., 1997). Our study did not include a measure of nicotine dependence for those who had quit, thus we were unable to assess this variable, one that has been a robust predictor in the population at large (Vangeli et al., 2011).

There are several other study limitations to consider based on our cross-sectional, self-report, survey design. We are unable to infer causality regarding our findings. In addition, our survey did not include objective measures of smoking abstinence, including the “gold standard” of biochemical verification (West, Hajek, Stead & Stapleton, 2005). Our smoking cessation outcome measure (currently abstinent for at least one month) also did not provide information regarding longer term abstinence, which is known to have different predictors than shorter term abstinence (Vangeli et al., 2011). Finally, generalizability of our findings

regarding those who quit smoking during SUD treatment may be limited. We did not have information regarding demographic characteristics of all CTN-affiliated programs, thus cannot ascertain whether our sample was fully representative of this population. Moreover, we chose a sample of publicly funded programs within the CTN, which have more unemployed patients on Medicaid than non-CTN programs (Ducharme & Roman, 2009). Quit rates and variables associated with quitting in this population may differ from those in other programs who are more likely to include employed, insured patients. Indeed, some studies in the general population have found socioeconomic status to be associated with quitting (Vangeli et al., 2011).

4.1. Conclusions

This study was conducted with a large sample of patients in different types of SUD treatment programs across the United States. Results indicated that some smokers in SUD treatment successfully quit smoking during treatment, although their numbers were low. Participants' reports of health concerns as a reason for quitting and including smoking cessation in personal, SUD treatment plans may hold promise for inclusion in smoking cessation interventions. The challenge of developing cost-effective, easy to implement, and individualized smoking cessation interventions to increase quit rates among smokers in SUD treatment continues.

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Highlights

- Smokers in substance use disorders treatment were compared with successful quitters.
- Health concerns and smoking cessation in treatment plans were significantly related to quitting.
- Participants in methadone treatment reported quitting less than those in outpatient.
- Practical strategies are needed to improve smoking quit rates in addictions treatment.

Table 1
Demographic characteristics, primary drug, treatment program type, and number of weeks in treatment for smokers and quitters

	Smokers (N=631)	Quitters (N=52)	Total (N=683)	p-value
Gender				0.790
Male	341 (54.0%)	30 (57.7%)	371 (54.3%)	
Female	287 (45.5%)	22 (42.3%)	309 (45.2%)	
Other	3 (0.5%)		3 (0.4%)	
Age	38.1 (11.70)	39.5 (12.66)	38.2 (11.77)	0.399
Race/ethnicity				0.195
Hispanic	74 (11.7%)	3 (5.8%)	77 (11.3%)	
Non-Hispanic Black	101 (16.0%)	9 (17.3%)	110 (16.1%)	
Non-Hispanic White	379 (60.1%)	29 (55.8%)	408 (59.7%)	
Non-Hispanic Other	77 (12.2%)	11 (21.2%)	88 (12.9%)	
Education				0.444
<HS	144 (22.9%)	9 (17.3%)	153 (22.4%)	
HS/GED	225 (35.7%)	17 (32.7%)	242 (35.5%)	
>HS	261 (41.4%)	26 (50.0%)	287 (42.1%)	
Employment status				0.266
Yes	173 (27.4%)	18 (34.6%)	191 (28.0%)	
No	458 (72.6%)	34 (65.4%)	492 (72.0%)	
Marital status				0.398
Married	74 (11.7%)	9 (17.3%)	83 (12.2%)	
Divorced/Separated/Widowed	168 (26.6%)	17 (32.7%)	185 (27.1%)	
Not married but in a long term relationship	137 (21.7%)	9 (17.3%)	146 (21.4%)	
Never married	252 (39.9%)	17 (32.7%)	269 (39.4%)	
Primary drug				0.700
Alcohol	112 (17.7%)	6 (11.5%)	118 (17.3%)	
Stimulants	116 (18.4%)	11 (21.2%)	127 (18.6%)	
Opioids	339 (53.7%)	30 (57.7%)	369 (54.0%)	
Other	64 (10.1%)	5 (9.6%)	69 (10.1%)	
Treatment program type				0.305
Residential	180 (28.5%)	13 (25.0%)	193 (28.3%)	
Methadone	272 (43.1%)	19 (36.5%)	291 (42.6%)	
Outpatient	179 (28.4%)	20 (38.5%)	199 (29.1%)	
Number of weeks in treatment	121.1 (183.9)	121.1 (181.)	121.1 (183.5)	0.998

Table 2
Smoking-related measures, tobacco and anti-tobacco advertising for smokers and quitters

	Smokers (N=631)	Quitters (N=52)	Total (N=683)	p-value
Smoking-related measures				
Having a smoking partner	151 (24.0%)	7 (13.5%)	158 (23.2%)	0.084
Age began smoking	15.2 (4.48)	14.9 (4.04)	15.1 (4.44)	0.738
Reasons affecting smoking/quitting				
<i>Treatment program requirements</i>				0.550
Not at all/a little	516 (82.2%)	41 (78.9%)	557 (81.9%)	
Somewhat/a lot	112 (17.8%)	11 (21.2%)	123 (18.1%)	
<i>Cost of a pack of cigarettes</i>				0.490
Not at all/a little	369 (58.8%)	28 (53.9%)	397 (58.4%)	
Somewhat/a lot	259 (41.2%)	24 (46.2%)	283 (41.6%)	
<i>Health concerns</i>				<.001
Not at all/a little	293 (46.7%)	8 (15.4%)	301 (44.3%)	
Somewhat/a lot	335 (53.3%)	44 (84.6%)	379 (55.7%)	
<i>Family pressure/encouragement/being a good role model</i>				0.151
Not at all/a little	413 (65.7%)	29 (55.8%)	442 (64.9%)	
Somewhat/a lot	216 (34.3%)	23 (44.2%)	239 (35.1%)	
<i>Warning labels on cigarette packages</i>				0.561
Not at all/a little	511 (81.4%)	44 (84.6%)	555 (81.6%)	
Somewhat/a lot	117 (18.6%)	8 (15.5%)	125 (18.4%)	
Used cessation products				
<i>Used any NRT¹ product</i>	319 (51.0%)	25 (49.0%)	344 (50.9%)	0.781
<i>Used any oral medication</i>	74 (12.2%)	7 (13.7%)	81 (12.3%)	0.745
<i>Used e-cigarettes/vape pens</i>	282 (45.9%)	24 (47.1%)	306 (46.0%)	0.876
Advertising receptivity				0.485
High receptivity	394 (62.4%)	35 (67.3%)	429 (62.8%)	
Moderate/Low receptivity	237 (37.6%)	17 (32.7%)	254 (37.2%)	
Anti-tobacco message awareness				0.271
Daily	74 (11.7%)	7 (13.5%)	81 (11.9%)	
Weekly	123 (19.5%)	7 (13.5%)	130 (19.0%)	
Less than once a week	118 (18.7%)	15 (28.8%)	133 (19.5%)	
Not at all	316 (50.1%)	23 (44.2%)	339 (49.6%)	
Health risk perception	62.2 (20.44)	69.7 (21.10)	62.8 (20.57)	0.011

¹NRT refers to nicotine replacement therapy

Table 3
Smoking-related knowledge, attitudes, and services for smokers and quitters

	Smokers (N=631)	Quitters (N=52)	Total (N=683)	p-value
KNOWLEDGE				
2nd-hand smoke hazards	3.5 (1.32)	3.7 (1.31)	3.5 (1.32)	0.384
Awareness of clinician smoking cessation skills	3.3 (1.10)	3.5 (1.14)	3.3 (1.10)	0.272
awareness of smoking cessation resources	3.6 (1.07)	3.8 (1.16)	3.7 (1.08)	0.299
ATTITUDES				
Quitting important part of program	3.3 (1.16)	3.4 (1.25)	3.3 (1.17)	0.404
Believing clients want to quit	3.0 (1.02)	3.1 (1.16)	3.0 (1.03)	0.798
Quitting as a personal decision not concerning clinician	2.6 (1.19)	2.8 (1.26)	2.6 (1.20)	0.120
Best time to stop	3.6 (1.54)	4.1 (1.32)	3.6 (1.53)	0.028
Want help with quitting	2.6 (1.95)	3.2 (2.01)	2.6 (1.96)	0.040
PROGRAM SERVICES				
Benefits/risks discussed	3.2 (1.99)	3.7 (1.89)	3.3 (1.99)	0.096
Given advice on quitting	3.2 (1.99)	4.0 (1.75)	3.3 (1.98)	0.006
Given cessation referral	2.4 (1.90)	2.5 (1.97)	2.4 (1.91)	0.575
Given educational material	2.9 (2.00)	3.3 (2.00)	2.9 (2.00)	0.173
Attended education group	2.2 (1.84)	2.5 (1.97)	2.2 (1.85)	0.223
Attended support group	1.9 (1.67)	2.2 (1.86)	1.9 (1.69)	0.177
Quitting part of personal treatment plan	2.4 (1.90)	3.5 (1.94)	2.5 (1.93)	<.001
Quitting a program requirement	1.5 (1.35)	1.7 (1.53)	1.5 (1.36)	0.385
Received medication	2.0 (1.75)	2.5 (1.97)	2.1 (1.77)	0.042

Table 4
Factors associated with quitting smoking during substance use disorders treatment

	Adjusted OR (95%CI)	p ^I
Age	1.01 (1.00- 1.02)	0.181
Gender		
Male (Ref)	1	
Female	0.97 (0.78- 1.21)	0.780
Race/Ethnicity		
Non-Hispanic White (Ref)	1	
Non-Hispanic Black	0.76 (0.60- 0.98)	0.036
Hispanic	0.66 (0.49- 0.88)	0.005
Non-Hispanic Other	0.81 (0.60- 1.11)	0.190
Education		
More than HS ² (Ref)	1	
Less than HS ²	0.83 (0.65- 1.04)	0.104
High school/GED ²	1.09 (0.90- 1.32)	0.375
Marital status		
Married (Ref)	1	
Long term relationship	0.81 (0.59- 1.11)	0.187
Divorced/Separated/Widowed	0.90 (0.59- 1.38)	0.635
Never married	0.80 (0.50- 1.26)	0.331
Currently employed		
Yes (Ref)	1	
No	1.01 (0.77- 1.32)	0.962
Primary drug of use		
Alcohol	1	
Opioids	1.54 (1.19- 1.99)	0.001
Stimulants	1.34 (0.90- 1.98)	0.149
Other	0.88 (0.66- 1.18)	0.403
Treatment program		
Outpatient (Ref)	1	
Methadone	0.51 (0.35- 0.75)	<0.001
Residential	0.51 (0.19- 1.41)	0.196
Having a smoking partner		
Non-smoking partner/no partner (Ref)	1	
Having a smoking partner	0.85 (0.61- 1.18)	0.317
Reasons affecting smoking/quitting Health concerns		
Not at all/a little (Ref)	1	
Somewhat/a lot	1.27 (1. 05- 1.53)	0.015
Health risk perception	1.00 (1.00- 1.00)	0.600
Best time to stop	1.03 (0.96- 1.10)	0.449

	Adjusted OR (95%CI)	p ¹
Want help with quitting	1.00 (0.94- 1.08)	0.896
Quitting part of personal treatment plan	1.08 (1.03- 1.13)	< 0.001
Benefits/risks discussed	1.01 (0.96- 1.05)	0.769
Given advice on quitting	0.99 (0.96- 1.03)	0.767
Received medication	1.03 (0.96- 1.10)	0.385

¹Logistic regression with clients nested within clinic

²HS refers to high school. GED refers to General Educational Development certificate

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