



Brief report

Pilot Study of a Tailored Smoking Cessation Intervention for Individuals in Treatment for Opioid Dependence

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Abstract

Introduction: Over 85% of opioid-dependent individuals in methadone treatment smoke cigarettes; however, smoking cessation interventions are minimally effective in this population. To better help opioid-dependent individuals quit smoking, we developed and pilot-tested an intervention, based in the Information-Motivation-Behavioral Skills (IMB) model of behavior change, which could be tailored to address individual barriers to smoking cessation in this population.

Methods: We randomized participants ($n = 83$) in methadone treatment to the eight-session, IMB model-based, intervention plus nicotine replacement therapy (intervention, $n = 41$) or a facilitated referral to the state Quitline (control, $n = 42$). All participants completed assessments at baseline, 3 months, and 6 months.

Results: Intervention participants completed a median of five sessions (interquartile range [IQR] 3–8) and had significantly higher intervention satisfaction than control participants. Intervention participants reported smoking significantly fewer cigarettes per day at 3 months (median [IQR] = 6 [4–15]) and 6 months (median [IQR] = 8 [4–14]) as compared control participants at 3 months (median [IQR] = 10 [5–20]) and 6 months (median [IQR] = 10 [6–20]). Fifty-six percent of the intervention group and 41% of the control group made a quit attempt during the study ($p = .16$). At 3 months, 7% ($n = 3$) of intervention participants and none of the control participants were abstinent from smoking ($p = .23$). At 6 months, 2% of participants in both groups were abstinent. Twenty-four percent and 10% of the intervention and control group participants, respectively, reported 20 or more smoke-free days ($p = .43$).

Conclusions: An IMB model-based smoking cessation intervention for opioid-dependent smokers is feasible and acceptable in methadone treatment and may help methadone maintained smokers cut down on their smoking.

Implications: This is the first study of a tailored, IMB Model-based, smoking cessation intervention for opioid dependent smokers. Results showed that opioid dependent smokers are willing and able to participate in an IMB model-based smoking cessation intervention, and this intervention may help this population cut down on their smoking. Also, the Quitline seems less feasible and acceptable for this population than a face-to-face intervention. Further research is

needed to determine how to integrate smoking cessation treatment into methadone programs and how to improve interventions so that treatment gains can lead to long-term abstinence in this population.

Introduction

New approaches are needed to combat the tobacco use epidemic among people with opioid use disorders. Over 85% of individuals in methadone treatment for opioid dependence smoke¹⁻⁶; however, smoking cessation interventions have been minimally effective in this population.⁷ To date, the smoking cessation interventions investigated among people in methadone treatment have been based on interventions that are effective in the general population but do not address factors that are barriers to smoking cessation among individuals with substance use disorders.^{7,8} These barriers include a substance abuse treatment culture that supports smoking, social networks of other smokers, co-morbid psychiatric disorders, fear of relapse to drugs, chronic stress, and poor coping skills.⁹ Further, obstacles to quitting may vary by individual, and an intervention that addresses individual barriers to smoking cessation among people in methadone treatment may be more effective than existing interventions for helping this population to quit smoking.⁹

To inform the development of a new smoking cessation intervention, based on the Information-Motivation-Behavioral Skills (IMB) model of behavior change, we conducted a qualitative study to identify IMB factors that are barriers or facilitators to smoking abstinence among individuals in methadone treatment.⁹ According to the IMB model, information, motivation, and behavioral skills are all necessary, in combination, but not enough, individually, for an individual to make a behavior change.¹⁰ We identified many information, motivation, and behavioral skills factors that could impact smoking cessation success and that are strengths for some and deficits for other opioid-dependent smokers.⁹

Based on the IMB Model and our qualitative findings,⁹ we developed and pilot-tested an intervention which could be tailored to address individual barriers and facilitators to smoking cessation in methadone maintained smokers. We compared feasibility, acceptability, and preliminary outcomes between the IMB intervention and a facilitated referral to the state Quitline. We hypothesized that (1) the IMB intervention will be feasible and acceptable, (2) at follow-up, a higher percentage of those in the IMB intervention condition will have made a quit attempt and be abstinent from smoking as compared to the control condition, and (3) at follow-up, those in the IMB intervention condition will be smoking fewer cigarettes per day and have had a greater number of smoke-free days in the past 3 or 6 months than those in the control condition.

Methods

Procedures and Measures

Participants were recruited from two urban methadone clinics. Eligible participants were: (1) English speaking; (2) on methadone for at least 3 months; (3) not currently engaged in any smoking cessation intervention; (4) smokers of at least 100 cigarettes during their lifetime and currently smoking every day or most days¹¹; (5) not currently, or planning to become during the study period, pregnant or breastfeeding; (6) able to access to a working telephone; and (7) interested in quitting smoking.

After written informed consent, we randomized participants ($n = 83$) to the IMB intervention (intervention group, $n = 41$) or to a facilitated referral to the state Quitline (control group, $n = 42$). All participants completed assessments and urine drug screen at baseline, 3 months (immediately after treatment), and 6 months (3 months after treatment). Baseline measures included demographics, urine drug screen for illicit drugs, smoking history, current smoking, quitting importance and confidence (from 1 [not at all] to 10 [highly]), nicotine dependence (from 0 [very low dependence] to 10 [very high dependence]), and exhaled carbon monoxide.^{12,13} The primary outcome was biochemically verified 7-day point prevalence of smoking abstinence. Additional outcomes were self-reported quit attempts, number of cigarettes smoked per day (CPD), and number of smoke-free days.¹⁴ Participants who used pharmacotherapy were asked about medication adherence. Number of intervention sessions attended was tracked for the intervention group. Contact with the state Quitline was assessed with Quitline reports (which reported whether the Quitline was able to contact the participant, and, if so, whether the participant accepted Quitline services) and self-report. All participants were asked whether they set a quit date and about intervention satisfaction, intervention helpfulness, and counselor satisfaction on a scale from 0 (not at all) to 4 (extremely). Participants received a \$20 gift card for completing each assessment visit (\$60 total). The Rutgers Health Sciences Institutional Review Board approved all study procedures and measures.

Interventions

The IMB model-based intervention consisted of eight, individual, approximately 45-minute, counseling sessions in the participants' clinics, over 3 months. The intervention included motivational interviewing, cognitive-behavioral skills training, education, and free nicotine replacement therapy (NRT). The intervention was tailored with modules that could be selected and used based upon the assessed IMB strengths and deficits of each individual. The modules were utilized as appropriate for each participant and fell into the three main categories of the IMB Model. Information modules included such topics as the interaction between smoking and drug use and the benefits of quitting. Motivation modules included exercises such as identifying the pros and cons of quitting and setting goals. Behavioral skills modules included such topics as dealing with side-effects of methadone and coping with cravings for tobacco and drugs.

Those randomized to the control condition received a facilitated referral to the state Quitline. Participants in the control condition did not receive free NRT.

The intervention was implemented by clinical psychology, social work, and counseling graduate students. All sessions were recorded and reviewed, with a treatment fidelity measure. Clinicians were given feedback during weekly supervision to ensure treatment fidelity.

Statistical Analyses

Baseline variables were compared between the intervention and control groups. We conducted intent-to-treat analyses, and analyses were adjusted for baseline differences ($p < .10$). Logistic regression

models were used for dichotomous outcomes. To analyze number of cigarettes per day, we used log linear Poisson regression analysis. Study acceptability analyses were conducted using quantile regression analyses. Our sample size was based on recommendations for early treatment development research.¹⁵

Results

Participants

Participants ($n = 83$) were, on average, 43 years-of-age ($SD = 10$; Table 1), and 58% were female. The majority was white (75%); and, 75% graduated high school. At baseline, participants smoked a median of 15 CPD (interquartile range [IQR] 10–20) and were moderately nicotine-dependent (median [IQR] = 5 [3–7]). Quitting smoking was very important to participants (median [IQR] = 9 [8–10]), and participants were moderately confident in their ability to quit (median [IQR] = 7 [6–8]). Most participants (77%) made a quit attempt during their lifetime. At baseline, 45% had a positive urine drug screen; and, the median methadone dose was 90 mg [IQR 70–110]. Baseline characteristics did not differ significantly between the intervention and control groups. However, high school

graduation was included in multivariate models because the difference approached significance ($p < .10$).

Feasibility and Acceptability of the Intervention

Among the intervention group participants, 24% ($n = 10$) completed all eight counseling sessions. The remainder completed one session (22%, $n = 9$), two to four sessions (24%, $n = 10$), and five to seven sessions (29%, $n = 12$). Among control group participants, 57% ($n = 24$) had at least one phone contact with the state Quitline, and, among those with Quitline contact, participants had a median of two phone calls (IQR 1–4). As compared to the control group, intervention participants were significantly more satisfied with the intervention (median [IQR] = 4 [3–4] vs. median [IQR] = 1 [0–3], $p < .0001$), found the intervention significantly more helpful (median [IQR] = 3 [2–4] vs. median [IQR] = 0 [0–3], $p < .0001$), and were significantly more satisfied with their counselor (median [IQR] = 4 [3–4] vs. median [IQR] = 1 [0–3], $p < .0001$).

Smoking

Intervention participants reported smoking significantly ($p < .05$) fewer CPD at 3 months (median [IQR] = 6 [4–15]) and 6 months

Table 1. Baseline Characteristics^a

	Total sample ($n = 83$)	Intervention group ($n = 41$)	Control group ($n = 42$)
Age, years, M (SD)	43 (10)	44 (11)	42 (10)
Gender, n (%)			
Female	48 (58)	24 (59)	24 (57)
Male	35 (42)	17 (42)	18 (43)
Marital status, n (%)			
Never married	50 (60)	23 (56)	27 (64)
Married	11 (13)	6 (15)	5 (12)
Separated	5 (6)	3 (7)	2 (5)
Divorced	15 (18)	9 (22)	6 (14)
Other	2 (2)	0 (0)	2 (5)
Race, n (%)			
White	62 (75)	31 (76)	31 (74)
Black	19 (23)	10 (24)	9 (21)
Other	1 (1)	0 (0)	1 (2)
Hispanic/Latino/Spanish, n (%)	18 (22)	9 (22)	9 (21)
Graduated high school, n (%)	62 (75)	27 (66)	35 (83)
Working, n (%)	13 (16)	5 (12)	8 (19)
Household income <\$20 000 per year, n (%)	77 (95)	40 (95)	39 (95)
Smoking variables			
# Cigarettes per day, median (IQR)	15 (10–20)	15 (7–20)	15 (10–20)
Nicotine dependence, ^b median (IQR)	5 (3–7)	5 (3–7)	5 (3–7)
Quitting importance, ^c median (IQR)	9 (8–10)	9 (8–10)	9 (8–10)
Quitting confidence, ^c median (IQR)	7 (6–8)	7 (5–8)	7 (6–8)
Ever quit attempt, n (%)	64 (77)	30 (73)	34 (81)
Illicit drug use and treatment			
Self-reported illicit drug use in past 6 months, ^d n (%)	63 (76)	31 (76)	32 (76)
Positive urine illicit drug screen, ^e n (%)	37 (45)	19 (45)	18 (44)
Positive urine screen for cannabis	4 (5)	2 (5)	2 (5)
Positive urine screen for amphetamines	1 (1)	1 (2)	0 (0)
Positive urine screen for opioids (other than methadone)	22 (27)	11 (27)	11 (26)
Positive urine screen for cocaine	21 (25)	9 (22)	12 (35)
Daily methadone dose, mg, median (IQR)	90 (70–110)	90 (60–100)	100 (75–120)

IQR = interquartile range.

^aNo statistically significant differences between intervention and control groups.

^bOn a scale from 0 (no or very low dependence) to 10 (very high dependence).

^cOn a scale from 1 (not at all) to 10 (highly).

^dIncluding heroin, other non-prescribed opioids, sedatives, amphetamines, cannabis, hallucinogens, inhalants.

^eIncluding cannabis, amphetamine, opioids (other than methadone), cocaine.

(median [IQR] = 8 [4–14]) as compared the control participants at 3 months (median [IQR] = 10 [5–20]) and 6 months (median [IQR] = 10 [6–20]; Table 2). Although the differences were not statistically significant (possibly due to lack of power), a greater percentage of the intervention group at 3 months (51% [$n = 21$]) and 6 months (56% [$n = 23$]) made a quit attempt (ie, were smoke-free for 24 hours or more), as compared to the control group (33% [$n = 14$] and 41% [$n = 17$]), respectively). At 3 months, 7% ($n = 3$) of participants in the intervention group and none of the participants in the control group achieved biochemically confirmed 7-day point prevalence abstinence ($p = .23$). At 6 months, 2% ($n = 1$) of participants in both the intervention and control groups were abstinent. However, although the differences between groups were not statistically significant, 22% ($n = 9$) and 24% ($n = 10$) of intervention participants reported 20 or more smoke-free days at 3 months and 6 months, respectively, while only 2% ($n = 1$) and 10% ($n = 4$) of the control participants reported 20 or more smoke-free days at 3 months and 6 months, respectively. During the 3-month intervention period, 59% ($n = 24$) of the intervention and 17% ($n = 7$) of the control participants set a quit date ($p < .0001$). Among those who set a quit date, 88% ($n = 21$) of the intervention and 29% ($n = 2$) of the control participants used NRT ($p < .01$). All control participants who used NRT, typically used it for 4 days or less per week; 60% ($n = 12$) of intervention participants who used NRT typically used it every day.

Discussion

This study examined an intervention, based on the IMB model of behavior change and that could be tailored for individual smokers in methadone treatment, as compared to a control intervention. The IMB intervention demonstrated greater participant engagement than the Quitline. Unstable housing, lack of reliable phone service, distrust of a faceless provider, and low knowledge of issues specific to opioid-dependent smokers among Quitline counselors are known to impact Quitline utility for this population.¹⁶ Intervention group participants also reported significantly greater intervention acceptability as compared to control group participants. Possibly, the greater intervention intensity, the individual tailoring, the convenience of attending sessions at their clinic, and the intimacy of face-to-face

contact contributed to the higher intervention and counselor ratings among intervention group participants.

As compared to control and baseline, intervention participants reported smoking significantly fewer CPD at follow-up. Further, although the differences did not reach statistical significance, at follow-up, a greater percentage of intervention group participants had attempted to quit and had 20 or more smoke-free days. However, it is unclear whether the impact of the IMB intervention on number of CPD and smoke-free days was related to the intervention itself, access to free NRT, or biased self-reporting due to social desirability and a stronger relationship with study staff. Further research is needed to determine the mechanisms through which the IMB intervention impacts CPD and smoke-free days.

Few achieved smoking abstinence at follow-up. Ongoing illicit drug use could have had a negative impact on treatment engagement and the ability to apply learned smoking cessation skills; approximately 45%, had positive urine drug screens at baseline (45%), 3 months (45%), and 6 months (46%). A future study that excludes individuals who are actively using opioids or cocaine could better help elucidate the impact of the IMB intervention on the individuals in opioid-dependence treatment.

Some studies of smoking cessation interventions for methadone maintained smokers demonstrated a greater effect on smoking cessation than the IMB intervention had in this study. For example, in studies of contingency management, 32%–62% of participants were abstinent from smoking.^{17,18} However, once contingencies for abstinence were discontinued, most individuals went back to smoking.^{17,18} Perhaps, combining interventions like contingency management with the IMB-based intervention would optimize initial abstinence, enhance internal motivation for when contingencies are discontinued, and provide the information and skills needed for prolonged smoking abstinence.

This study had some limitations. First, this study was not fully powered, and analyses that approached statistical significance (ie, $p \leq .15$) may have reached significance in a larger sample. Second, the control intervention did not match the IMB intervention in intensity and access to pharmacotherapy. Third, secondary smoking outcomes were based on self-report. Finally, this study only included individuals in two methadone clinics and did not include non-English

Table 2. Smoking Outcomes at 3-Month and 6-Month Follow-up^a

	3-Month follow-up				6-Month follow-up			
	Intervention group ($n = 41$)	Control group ($n = 42$)	Odds ratio (95% CI)	p	Intervention group ($n = 41$)	Control group ($n = 42$)	Odds ratio (95% CI)	p
# Cigarettes per day, median (IQR)	6 (4–15)	10 (5–20)	0.86 (0.75, 0.98)	.03	8 (4–14)	10 (6–20)	0.60 (0.52, 0.68)	.00
7-day, biochemically verified, point prevalence abstinence, ^b n (%)	3 (7)	0 (0)	6.63 (0.35, 123.8)	.23	1 (2)	1 (2)	1.07 (0.06, 17.89)	.96
Quit attempt (24 h or more smoke-free), n (%)	21 (51)	14 (33)	2.12 (0.87, 5.16)	.10	23 (56)	17 (41)	1.87 (0.78, 4.48)	.16
≥20 smoke-free days, n (%)	9 (22)	1 (2)	11.47 (1.38, 95.3)	.15	10 (24)	4 (10)	3.04 (0.86, 10.70)	.43

CI = confidence interval; IQR = interquartile range.

^aAnalyses adjusted for graduated high school (ie, baseline difference between groups $p < .10$).

^bResults based on continuity adjusted odds ratio calculation and chi-square test (replacing count 0 with 0.5).

speakers, impacting generalizability. However, the study design for this study is appropriate for treatment development research.¹⁹

This study did show that the IMB intervention may help opioid-dependent individuals decrease their smoking; however, the mechanisms through which it could help needs further research. This study also showed that smokers in methadone treatment are interested in quitting, are willing and able to participate in an IMB model-based smoking cessation intervention, and are able to quit or cut down on their smoking for periods of time. Further, the state Quitline seems less feasible and acceptable for smokers in methadone treatment than an intervention in the individual's treatment clinic. Smoking cessation interventions that are located on-site may have greater participation than a Quitline due to unique barriers in this population. Further research is needed to determine how to integrate smoking cessation treatment into opioid dependence treatment programs and how to improve interventions so that treatment gains can lead to long-term smoking abstinence in this population.

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Declaration of Interests

None declared.

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