

ONLINE FIRST | HEALTH CARE REFORM

Forced Smoking Abstinence

Not Enough for Smoking Cessation

Jennifer G. Clarke, MD, MPH; L. A. R. Stein, PhD; Rosemarie A. Martin, PhD; Stephen A. Martin, MD; Donna Parker, ScD; Cheryl E. Lopes, PhD; Arthur R. McGovern, PhD; Rachel Simon, BS; Mary Roberts, MS; Peter Friedman, MD, MPH; Beth Bock, PhD

Importance: Millions of Americans are forced to quit smoking as they enter tobacco-free prisons and jails, but most return to smoking within days of release. Interventions are needed to sustain tobacco abstinence after release from incarceration.

Objective: To evaluate the extent to which the WISE intervention (Working Inside for Smoking Elimination), based on motivational interviewing (MI) and cognitive behavioral therapy (CBT), decreases relapse to smoking after release from a smoke-free prison.

Design: Participants were recruited approximately 8 weeks prior to their release from a smoke-free prison and randomized to 6 weekly sessions of either education videos (control) or the WISE intervention.

Setting: A tobacco-free prison in the United States.

Participants: A total of 262 inmates (35% female).

Main Outcome Measure: Continued smoking abstinence was defined as 7-day point-prevalence abstinence validated by urine cotinine measurement.

Results: At the 3-week follow-up, 25% of participants in the WISE intervention (31 of 122) and 7% of the control participants (9 of 125) continued to be tobacco ab-

stinent (odds ratio [OR], 4.4; 95% CI, 2.0-9.7). In addition to the intervention, Hispanic ethnicity, a plan to remain abstinent, and being incarcerated for more than 6 months were all associated with increased likelihood of remaining abstinent. In the logistic regression analysis, participants randomized to the WISE intervention were 6.6 times more likely to remain tobacco abstinent at the 3-week follow up than those randomized to the control condition (95% CI, 2.5-17.0). Nonsmokers at the 3-week follow-up had an additional follow-up 3 months after release, and overall 12% of the participants in the WISE intervention (14 of 122) and 2% of the control participants (3 of 125) were tobacco free at 3 months, as confirmed by urine cotinine measurement (OR, 5.3; 95% CI, 1.4-23.8).

Conclusions and Relevance: Forced tobacco abstinence alone during incarceration has little impact on postrelease smoking status. A behavioral intervention provided prior to release greatly improves cotinine-confirmed smoking cessation in the community.

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TOBACCO USE CONTRIBUTES to over 400 000 deaths annually.¹ It is a major contributor to cancer and heart disease risk and is the leading cause of preventable morbidity, mortality, and health expense in the United States resulting in an estimated \$157 billion in related annual health and economic costs.² Quitting smoking reduces the risk of developing smoking-related illnesses and the morbidity and mortality associated with these illnesses. In 2010, approximately 45.3 million American adults smoked, an overall prevalence of 19.3%.³

Author Affiliations are listed at the end of this article.

One in 8 American smokers pass through prisons and jails annually,⁴ and since the announcement of the negative health consequences of secondhand smoke, correctional facilities are increasingly becoming tobacco free: approximately 60% have complete smoking bans

See Invited Commentary

(no tobacco products allowed anywhere in the facility by inmates or staff).⁵ Despite this, 97% of inmates return to smoking as soon as they are released back into the community.^{4,6} Smoking among pris-

oners is approximately 3 times that of the general population,⁷ and minorities, poor, undereducated, and mentally ill individuals are all overrepresented in correctional facilities.⁸ Despite the scale of this problem, few studies have addressed the needs of incarcerated smokers.

Many successful interventions have been developed for smoking cessation, but the success of smoking relapse-prevention interventions is limited. Moreover, the available smoking-cessation and relapse-prevention treatments do not address the unique and specific needs of incarcerated men and women who have been tobacco free for months to years (forced-abstinent smokers), who have completed the physical withdrawal from nicotine, and who are returning to environments where tobacco is available.⁹ Effective smoking relapse-prevention interventions for this population will enhance our ability to attain the Healthy People 2020 goal of decreasing smoking rates to 12% among adults.¹⁰

Project WISE (Working Inside for Smoking Elimination)¹¹ is a randomized clinical trial of a smoking abstinence intervention based on motivational interviewing (MI) and cognitive behavioral therapy (CBT), which was developed to target the specific needs of inmates in a smoke-free prison about to be released to the community.

METHODS

Complete details of the methods for this study have been described elsewhere.¹¹ Approvals from the institutional review board and the office for human research protections were obtained prior to any study activities. To further protect study participants, a certificate of confidentiality was obtained.

PARTICIPANTS

Participants were recruited by research assistants (RAs) from a large state correctional facility in the northeastern United States (**Figure 1**) in which no tobacco products are allowed on site by inmates or staff, and no pharmacotherapy or behavioral therapy is routinely offered for smoking cessation. Sentenced men and women were eligible for screening if they were to be released within the next 8 weeks. In a confidential setting, RAs explained the study and that participation was completely voluntary. Potential participants were eligible if they were 18 years or older, smoked 10 or more cigarettes per day prior to incarceration, and spoke English. Once a potential participant was determined to be eligible and willing to participate in the study, the informed consent process was completed. All participants received an American Heart Association smoking-cessation pamphlet, a list of community resources, and study contact information.

SAMPLE SIZE AND ATTRITION

Of the 312 people screened for the study, 2 did not speak English, 30 did not smoke ≥ 10 cigarettes/d prior to incarceration, 7 had more than 8 weeks until release, 2 were homeless and could not provide any contact information for follow-up, and 1 was not going to live in the follow-up area). Of the 273 eligible persons, 262 (96.0%) agreed to participate and completed the consent procedure. Of the 262 enrolled and randomized at baseline, 15 were excluded (from this report), 9 because of a computer error that did not save data from the base-

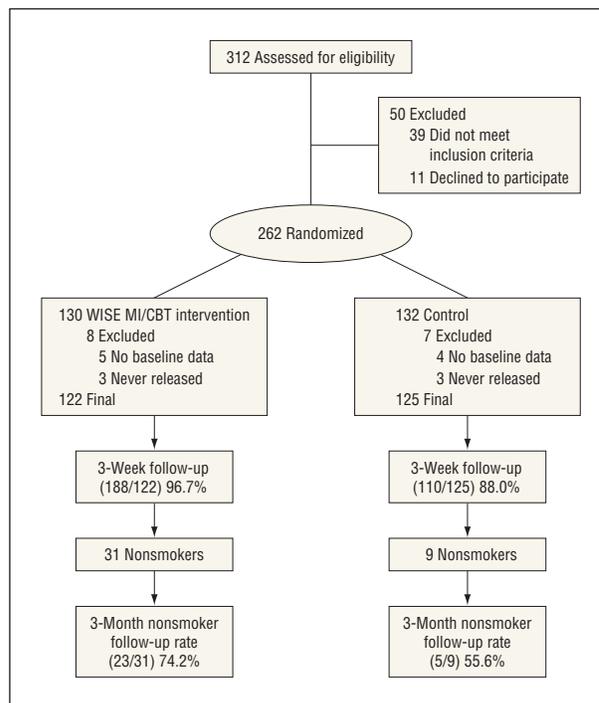


Figure 1. Participant flowchart. CBT indicates cognitive behavioral therapy; MI, motivational interviewing; WISE, Working Inside for Smoking Elimination.¹¹

line questionnaire and 6 because they were still incarcerated at the end of the study and hence could not be assessed for smoking after release. Of the remaining 247 participants, 228 (92.3%) completed the 3-week postrelease follow-up assessment. Nonsmokers at the 3-week follow-up were invited to return for a 3-month follow-up and 70% completed this assessment (28 of 40). Participants lost to follow-up were analyzed as smokers.

PROCEDURES

Following baseline assessment, participants were randomly assigned to either receive the WISE intervention or watch control videos. Randomization was stratified by sex, number of cigarettes smoked in the 30 days prior to incarceration (< 20 cigarettes/d vs ≥ 20 cigarettes/d), and postrelease smoking plans, as previously described.¹¹ Each study condition comprised 6 sessions that took place over approximately 6 weeks prior to release. A 3-week postrelease follow-up, assessment included taking a urine sample for cotinine evaluation, a computerized assessment, and a timeline followback (TLFB) procedure^{12,13} to determine smoking behaviors on each day following release from prison. Participants who were confirmed tobacco abstinent at 3-week follow-up were asked to return for a 3-month postrelease assessment.

INTERVENTIONS

WISE Intervention

Sessions 1 and 6 of the WISE intervention involved MI, and in sessions 2 through 5, participants received CBT.

Three RAs (with bachelor's or equivalent degrees) received approximately 24 hours of training, including didactic instruction, role playing, and working with pilot participants. The RAs were matched with sex-concordant participants. Two PhD-level supervisors rated sessions to criteria using the Motiva-

tional Interviewing Treatment Integrity system, version 3.1.1,¹⁴ and a key elements checklist for CBT sessions prior to RA contact with participants. Supervision was conducted twice per month and when treatment fidelity fell below criteria. Additional coaching was provided until sessions met standard. Sessions were 30 to 60 minutes long, and all were recorded. A random 10% of sessions were coded for fidelity by supervisors, and 10% of those were double coded. There was over 90% agreement in the coding in terms of proficient vs nonproficient, and 85% were proficient.

The research counselors' therapeutic style and protocol were based on the principles of MI, with a focus on empathy, not arguing, developing discrepancy, self-efficacy, and personal choice.¹⁵ The CBT sessions taught participants to recognize specific environmental and affective events (*triggers*) that occur prior to smoking and to identify behavioral and cognitive strategies to cope with these triggers. Additional brief telephone sessions were conducted at approximately 24 hours and 7 days after the individual's release. These sessions included elements of both MI and CBT in an effort to maintain and enhance motivation and use of skills after release.

Control Condition

The control videos included a variety of health-related topics (eg, managing chronic pain) but did not target smoking cessation and were matched with the WISE intervention for frequency and duration of contact. To maintain frequency and duration of contact, telephone calls were scheduled for approximately 24 hours and 7 days after release; these calls verified contact information and assessed smoking status.

MEASURES

Full assessments, each taking about 60 minutes, occurred at baseline and at 3 weeks following release. The RAs phoned participants at 24 hours and 7 days after release for brief discussion, and prior to discussion, smoking status was assessed. Assessments at baseline and 3-week follow-up were conducted using audio computer-assisted self-interviews. Assessments included demographics, smoking history and dependence (Fagerström Test for Nicotine Dependence [FTND] modified to reflect time prior to incarceration),¹⁶ subjective stress (Perceived Stress Scale),¹⁷ presence or absence of smoking-related illnesses (asthma, diabetes, hypertension, stroke, or heart attack), and depressive symptoms (Center for Epidemiologic Studies Depression Scale [CES-D]).¹⁸ Participation in a prison drug treatment program was assessed with the question "have you participated in a drug treatment program?" Many prison drug treatment programs use CBT and MI (similar to the WISE intervention).

Intention to remain tobacco free was measured using a 6-point scale and dichotomized: responses of "I plan to smoke when I get out of here and never plan to quit" to "I will probably smoke when I get out of here" were classified as "plans to smoke upon release." Responses of "I probably won't smoke when I get out of here" to "I have made plans to not smoke when I get out. and I will never smoke again" were classified as "plans to not smoke upon release." At the 3-week follow-up, a urine sample was obtained to test for cotinine and other substance use, and a detailed TLFB^{12,13} was administered to assess tobacco use. An additional urine cotinine measurement was obtained 3 months after release from participants who tested negative for cotinine at the 3-week follow-up. *Continued smoking abstinence* was defined as testing negative for cotinine (urinary cotinine level, <200 ng/mL) and reporting no smoking in the previous 7 days; all others were considered *smokers*.¹⁹

ANALYSES

We examined baseline differences between conditions on demographic and smoking variables using χ^2 tests of proportions for categorical variables and *t* tests for continuous variables. To be considered having completed the study, a participant had to complete a 3-week follow-up interview and provide a urine sample. We examined other variables that might predict outcome in this sample by comparing those with sustained abstinence to those who smoked. These included sex, age, years of education, race/ethnicity, measures of affective symptoms and vulnerability (CES-D, Perceived Stress Scale), prison drug treatment, and smoking-related variables including FTND score, cigarettes smoked per day prior to incarceration, time since smoked daily, age started smoking daily, number of years of daily smoking, smoking plans after release, presence of smoking-related medical condition, and presence of a spouse/partner who smokes.

Analyses of sustained abstinence at 3 weeks after release used the full intention-to-treat sample and used logistic regression. In the first model, we entered treatment group only. The second model adjusted for other variables related to sustained abstinence with a level of significance set at $P < .10$. Time since smoked daily was dichotomized (≥ 6 months vs < 6 months) because it was highly skewed.

We next conducted discrete-time survival analysis using Cox proportional hazards regression models to test the hypothesis that the risk of returning to smoking was significantly higher for participants randomized to the control condition compared with participants in the WISE intervention. All analyses were conducted using SPSS statistical software, version 20 (IBM Corp).

RESULTS

PARTICIPANT CHARACTERISTICS

The sample ($N = 247$) comprised the following racial/ethnic background: 20.1% Hispanic, 17.6% black, 52.0% white, and 10.2% self-identified as other and did not differ by intervention group (**Table 1**). Most participants were men (65.2%); mean age was 35.6 years; and the mean time since the last cigarette was 1.5 years. Intervention groups did not differ significantly at baseline on depression, stress, demographic, or smoking variables (Table 1). All 6 WISE intervention sessions were completed by 83.3%, with 11.9% completing 3 or fewer sessions.

Analysis comparing WISE and control participants on confirmed smoking status 3 weeks after release found participants randomized to the WISE intervention were 4.4 (95% CI, 2.0-9.7) times more likely to remain tobacco abstinent than those randomized to the control condition (**Table 2**). Significant differences ($P < .10$) were found between smokers and nonsmokers: Those not smoking at the 3-week follow-up started smoking when they were older (age 17.3 vs 15.4 years) ($P = .02$), smoked for fewer years (16.6 vs 19.9 years) ($P = .06$), were more likely to have participated in prison drug treatment (63.2% vs 47.3%) ($P = .07$), had gone longer since smoking regularly (2.5 vs 1.4 years) ($P = .06$), were more likely to be Hispanic (33.3% vs 17.6%) ($P = .02$), and planned not to smoke after release from prison (62.5% vs 46.1%) ($P = .06$). We therefore controlled for these variables in our multivariate logistic regression.

Table 1. Participant Randomization and Baseline Characteristics^a

Characteristic	Total (n = 247)	WISE ^b (n = 122)	Control Video (n = 125)
Race/ethnicity			
White	127 (52.0)	63 (51.6)	64 (52.5)
Hispanic	49 (20.1)	26 (21.3)	23 (18.9)
Black, non-Hispanic	43 (17.6)	21 (17.2)	22 (18.0)
Other	25 (10.2)	12 (9.8)	13 (10.7)
Sex			
Male	161 (65.2)	80 (65.6)	81 (64.8)
Female	86 (34.8)	42 (34.4)	44 (35.2)
Smoking plans			
Plan to smoke after release	126 (51.2)	65 (53.3)	61 (49.2)
Plan to not smoke after release	120 (48.8)	57 (46.7)	63 (50.8)
Education level completed			
<High school	157 (64.6)	81 (66.4)	76 (62.8)
High school	49 (20.2)	21 (17.2)	28 (23.1)
>High school	37 (15.2)	20 (16.4)	17 (14.0)
Reported health status			
Poor-fair	75 (30.7)	41 (33.6)	34 (27.9)
Good-excellent	169 (69.3)	81 (66.4)	88 (72.1)
In-prison drug treatment	119 (49.8)	56 (47.1)	63 (52.5)
Smoking-related medical conditions	89 (36.0)	44 (36.1)	45 (36.0)
Age, y ^c	35.6 (9.2)	35.4 (9.4)	35.7 (9.0)
Age started smoking daily, y ^c	15.7 (4.5)	15.6 (4.7)	15.9 (4.3)
Years of smoking ^c	19.4 (10.0)	19.1 (10.0)	19.7 (10.0)
Time since smoked daily, y ^c	1.5 (3.4)	1.6 (3.4)	1.5 (3.5)
Cigarettes/d prior to prison, No. ^c	21.7 (11.7)	20.7 (10.6)	22.6 (12.8)
FTND ^c	5.1 (2.3)	5.2 (2.2)	5.1 (2.4)
PSS ^c	21.8 (6.3)	21.5 (7.0)	22.2 (5.6)
CES-D ^c	12.7 (5.4)	12.4 (5.6)	13.0 (5.3)

Abbreviations: CES-D, Center for Epidemiologic Studies Depression Scale¹⁸; FTND, Fagerström Test for Nicotine Dependence,¹⁶ modified to reflect time prior to incarceration; PSS, Perceived Stress Scale¹⁷; WISE, Working Inside for Smoking Elimination.¹¹

^aUnless otherwise indicated, data are reported as number (percentage) of participants.

^b $P > 0.2$ for all treatment group differences.

^cData reported as mean (SD) values.

In the multivariate logistic regression (**Table 3**), randomization to the intervention group remained a significant predictor of abstinence at 3 weeks (odds ratio [OR], 6.6; 95% CI, 2.5-17.0) compared with those randomized to the control condition. Hispanic ethnicity was also associated with greater tobacco abstinence at 3 weeks (OR, 3.2; 95% CI, 1.1-8.7), as was not smoking for 6 or more months (OR, 4.6; 95% CI, 1.7-12.4) and planning to not smoke (OR, 1.6; 95% CI, 1.2-2.3).

Participants who were abstinent at their 3-week follow-up (n = 40) were reevaluated at 3 months. In the control group, 2.4% (3 of 125) were cotinine-confirmed abstinent compared with 11.5% (14 of 122) in the intervention group (OR, 5.3; 95% CI, 1.4-23.8). However, follow-up data were obtained on only 28 (70%) of the 40 nonsmokers.

An adjusted survival curve using Cox proportional hazards model is depicted in **Figure 2** and includes days to first cigarette from the TLFB data. The first day in the community was the highest-risk day, when most participants relapsed to smoking. After day 1, the rate of re-

Table 2. Nonsmokers vs Smokers at 3-Week Follow-up^a

Characteristic	Nonsmoker (n = 40)	Smoker (n = 207)
Intervention condition		
WISE intervention	31 (25.4)	91 (74.6) ^c
Control video	9 (7.2)	116 (92.8) ^c
Female	14 (35.0)	72 (34.8)
Education level completed		
<High school	24 (61.5)	133 (65.2)
High school	9 (23.1)	40 (19.6)
>High school	6 (15.4)	31 (15.2)
Race/ethnicity		
White	17 (43.6)	110 (53.7)
Hispanic	13 (33.3)	36 (17.6) ^d
Black, non-Hispanic	5 (12.8)	38 (18.5)
Other	4 (10.3)	21 (10.2)
Smoking plans		
Plan to smoke upon release	15 (37.5)	111 (53.9) ^e
Plan to not smoke upon release	25 (62.5)	95 (46.1)
Smoking-related medical conditions	17 (42.5)	72 (34.8)
Spouse/partner smokes	18 (51.4)	102 (60.4)
Drug use prior to incarceration	35 (87.5)	194 (93.7)
In prison drug treatment	24 (63.2)	95 (47.3) ^e
Age, y ^b	35.2 (9.4)	35.7 (9.2)
Age started smoking daily, y ^b	17.3 (5.6)	15.4 (4.2) ^d
Years of smoking ^b	16.6 (9.1)	19.9 (10.1) ^e
Time since smoked daily, y ^b	2.5 (2.4)	1.4 (3.6) ^e
Cigarettes/d prior to prison, No. ^b	19.0 (9.5)	22.1 (12.1)
FTND ^b	4.9 (2.3)	5.2 (2.3)
PSS ^b	21.5 (6.1)	21.9 (6.3)
CES-D ^b	12.3 (4.9)	12.8 (5.5)

Abbreviations: CES-D, Center for Epidemiologic Studies Depression Scale¹⁸; FTND, Fagerström Test for Nicotine Dependence,¹⁶ modified to reflect time prior to incarceration; PSS, Perceived Stress Scale¹⁷; WISE, Working Inside for Smoking Elimination.¹¹

^aUnless otherwise indicated, data are reported as number (percentage) of participants.

^bData reported as mean (SD) values.

^c $P < .01$ for differences between smokers and nonsmokers.

^d $P < .05$ for differences between smokers and nonsmokers.

^e $P < .10$ for differences between smokers and nonsmokers.

Table 3. Logistic Regression

Variable	β (SE)	P Value	OR (95% CI)
WISE intervention	1.9 (0.5)	<.01	6.6 (2.5-17.0)
In prison >6 mo	1.5 (0.5)	<.01	4.6 (1.7-12.4)
Hispanic	1.2 (0.5)	.03	3.2 (1.1-8.7)
Smoking plans	0.5 (0.2)	<.01	1.6 (1.2-2.3)
Cigarettes/d prior to prison, No.	-0.03 (0.02)	.10	1.0 (0.9-1.0)
In-prison drug treatment	0.6 (0.5)	.16	1.9 (0.8-4.6)

Abbreviations: OR, odds ratio; WISE, Working Inside for Smoking Elimination.¹¹

lapse declined sharply, with the intervention group maintaining significantly better survival ($P = .001$). In the survival model examining days to first smoking lapse, the main effect of treatment condition was significant, β (SE), 0.56 (0.16); hazard ratio, 1.75 ($P = .001$), indicating that the risk of smoking after release was over 1.75 times greater for those in the control condition than for those in the WISE intervention.

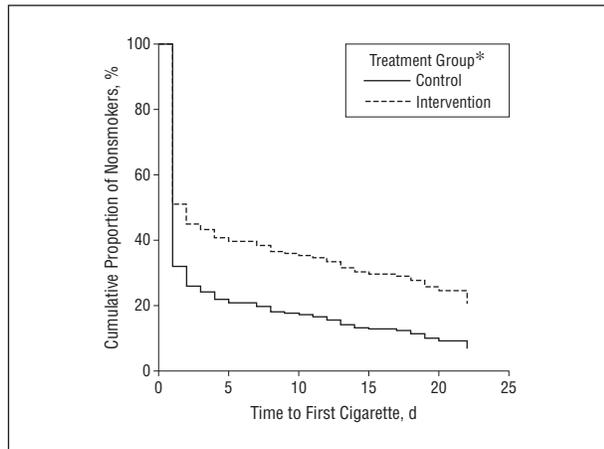


Figure 2. Tobacco abstinence at the 3-week follow-up by the study condition group (adjusted survival curves). *Effect seen in treatment group is significant ($P=.001$) (β [SE], 0.56 [0.16]; hazard ratio, 1.75), indicating that the risk of smoking after release was over 1.75 times greater for those in the control condition compared with those in the WISE (Working Inside for Smoking Elimination¹¹) intervention.

COMMENT

To our knowledge, this is the first study to demonstrate an effective intervention to prevent smoking relapse after release from a prison with a complete tobacco ban. The abstinence rates were 25.4% and 7.2% at 3 weeks and 11.5% and 2.4% at 3 months in the WISE intervention and control groups, respectively. The situation of forced tobacco abstinence during incarceration is unique in that incarcerated people have no choice about abstaining from tobacco; they have completed nicotine withdrawal; and they face reexposure to tobacco once released. Therefore, comparisons with other interventions are limited in their application and scope. Many smoking-cessation interventions focus on setting a quit date and remaining abstinent; however, in this setting the quit date is forced by someone other than the tobacco user. For those who had smoked prior to incarceration, there is no choice in quit date, and it is only on the date of release when there is a choice to be made about remaining abstinent or returning to smoking.

Results of the WISE intervention are better than those found in many other studies on behavioral intervention for smokers. On average, MI leads to an increase in smoking cessation with a risk reduction (RR) of 1.27.²⁰ Individual counseling is more effective than the control condition with an RR for smoking cessation of 1.39 (95% CI, 1.24-1.57).²¹ Our results may be greater because of the enforced abstinence prior to the intervention. In addition, participants who had not smoked for 6 months or longer at the time of the intervention were 4.6 times as likely to be abstinent at 3 weeks compared with those who smoked within the past 6 months. This suggests that prolonged forced abstinence can improve smoking outcomes. However, without intervention, only 2.4% of participants remained tobacco free at 3 months after release. Results may also be related to the relatively brief follow-up period; future research should examine this issue. Similar to other studies, our study found the early

postrelease period to be an extremely high-risk time,^{22,23} with more than 60% of control participants relapsing to smoking the first day out.

We chose not to include pharmacotherapy in this intervention because we could find no evidence supporting the use of medications after prolonged tobacco abstinence. Contraband tobacco products exist in prisons, but the majority of inmates will not use them because of the high costs (\$10 per cigarette, according to several inmates) and consequences.²⁴ The higher the level of security, the more difficult it is to access cigarettes. Medications have enhanced smoking cessation: varenicline showed an RR of 2.27 (95% CI, 2.02-2.55)²⁵; bupropion RR, 1.69 (95% CI, 1.53-1.85)²⁶; and nicotine replacement therapy RR, 1.58 (95% CI, 1.50-1.66).²⁷ While these studies all had longer follow-up periods, the effect of our behavioral intervention is comparable.

One of the national health objectives for 2020 is to reduce the prevalence of cigarette smoking to less than 12%.²⁸ Effective smoking-cessation programs targeting incarcerated people are necessary to reach this goal because approximately 9 million individuals (>5.4 million smokers) return to the community from correctional facilities annually.⁴ Tobacco use among prisoners is approximately 3 times that of the general population.⁷ Smoking-cessation interventions targeting this high-risk and underserved population are instrumental to decrease health disparities and decrease tobacco-related illnesses in this vulnerable population.

Further investigation is needed. Our study's strengths include a diverse population (52% non-Hispanic whites), inclusion of all smokers regardless of motivation to remain abstinent after release, cotinine verification of smoking status, and a follow-up rate over 90%. The study's limitations include follow-up after release from prison limited to 3 weeks for all participants; however, participants not smoking at the 3-week follow-up visit were invited to follow up at 3 months after release to assess for continuous abstinence. Because this is the first study of this population, and relapse rates are precipitously high immediately after release, we believed that a brief follow-up period for all participants was appropriate, with longer follow-up of the nonsmokers. Further investigation with longer postrelease follow-up is needed. Also, the study was limited to a sentenced population. Many of the 9 million people released from prisons and jails every year have been imprisoned there for less than 3 months and do not have specific release dates. Evaluations of smoking cessation interventions are needed for inmates at the time of entry to prisons and jails.

In summary, our study shows that an intervention based on MI and CBT can improve continued smoking abstinence after prison release by 6.6 times over that of the control condition. Behavioral intervention for drug use is common in prison settings,²⁹ and so this intervention may be easily integrated into and transported to existing programs in prison settings. Future studies may wish to dismantle the treatment to streamline into the most effective components. Additional work is also needed to examine methods for providing postrelease intervention to help sustain longer-term abstinence.

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Author Affiliations: Brown University Center for Primary Care and Prevention, Pawtucket, Rhode Island (Drs Clarke and Parker and Ms Roberts); Memorial Hospital of Rhode Island, Pawtucket (Drs Clarke and Parker and Ms Roberts); Department of Psychology, University of Rhode Island, Kingston (Dr Stein); Department of Behavioral and Social Sciences, Brown University, Providence, Rhode Island (Dr R. A. Martin); Department of Family Medicine and Community Health, University of Massachusetts Medical School, Worcester (Dr S. A. Martin); Rhode Island Department of Corrections, Cranston (Dr Lopes); Department of Psychology, Nichols College, Dudley, Massachusetts (Dr McGovern); Harvard Medical School, Boston, Massachusetts (Ms Simon); Division of General Internal Medicine, Rhode Island Hospital, Providence (Dr Friedman); and Centers for Behavioral and Preventive Medicine, The Miriam Hospital, Providence (Dr Bock).

Correspondence: Jennifer G. Clarke, MD, MPH, Memorial Hospital of Rhode Island, 111 Brewster St, Pawtucket, RI 02860 (Jennifer_Clarke@brown.edu).

Author Contributions: *Study concept and design:* Clarke, Stein, R. A. Martin, Parker, Lopes, McGovern, Friedman, and Bock. *Acquisition of data:* Clarke, Stein, and Simon. *Analysis and interpretation of data:* Clarke, Stein, R. A. Martin, S. A. Martin, and Roberts. *Drafting of the manuscript:* Clarke, Stein, R. A. Martin, S. A. Martin, Parker, Lopes, McGovern, Simon, and Bock. *Critical revision of the manuscript for important intellectual content:* Stein, R. A. Martin, S. A. Martin, Roberts, and Friedman. *Statistical analysis:* Clarke, R. A. Martin, and Roberts. *Obtained funding:* Clarke, Stein, R. A. Martin, and Bock. *Administrative, technical, and material support:* Stein, Lopes, McGovern, Simon, and Friedman. *Study supervision:* Stein.

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