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Smoking cessation interventions with female smokers living with HIV/AIDS: A randomized pilot study of motivational interviewing

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Smoking among people living with HIV, particularly women living with HIV, is associated with higher morbidity and mortality rates when compared to nonsmoking individuals with HIV. Despite patients' higher risk of adverse health outcomes, in particular preventable smoking-related diseases for smokers living with HIV, few smoking cessation interventions have been examined with this population. The aim of the current study was to test the potential efficacy of a brief motivational intervention for smoking cessation with HIV-infected women smokers. Participants ($N = 30$) were randomly assigned to receive a single session of motivational interviewing (MI) or prescribed advice (PA). The primary outcome was seven-day point prevalence abstinence at the one-month follow-up interview. Secondary outcome measures included mean cigarettes smoked per day, desire to quit smoking, perceived difficulty in quitting smoking, and expectation of success. We detected no significant differences between intervention and control groups in self-reported seven-day point prevalence abstinence at the one-month follow-up. However, participants in the MI condition reported a significant decrease in the mean cigarettes smoked per day when compared to the PA condition. There were no significant between-group differences in participants' desire to quit, perceived difficulty, and expectation of success. The results of this pilot study indicate that MI may be an effective smoking cessation intervention for HIV-positive women smokers and should be studied further in a larger clinical trial.

Keywords: smoking; motivational interviewing; psychosocial interventions

Introduction

Overall rates of smoking have decreased in recent years (Schiller, Lucas, Ward, & Peregoy, 2012). Smoking rates among the general population are estimated to have dropped to about 20% (Centers for Disease Control and Prevention, 2011) and are much lower than the estimated 50–70% smoking rates among individuals living with HIV (Collins et al., 2001; Gritz, Vidrine, Lazev, Amick, & Arduino, 2004; Neumann et al., 2010). Despite the high rates of smoking among people living with HIV/AIDS, there is a paucity of studies examining the efficacy of smoking cessation interventions targeting HIV-infected populations.

The lack of evidence-based smoking cessation interventions among HIV populations is particularly concerning given the higher risk for adverse health consequences. While AIDS-related causes of death have decreased as a result of effective antiretroviral therapy (ART), non-AIDS related causes of death have increased (Palella et al., 2006). In a study of 867 HIV-infected patients enrolled in Veterans Affairs Medical Centers (Crothers et al., 2005) mortality was higher among smokers when compared to nonsmokers, even after controlling for age, CD4 count, and viral load. Moreover, current smokers with HIV/AIDS have an increased risk for bacterial pneumonia (Gordin et al., 2008; Lifson et al., 2010), oral candidiasis (Chattopadhyay et al., 2007), oral lesions (Sroussi, Villines, Epstein, Alves, & Alves, 2007), non-AIDS related cancers, and cardiovascular disease, when compared to nonsmokers (Lifson et al., 2010).

Women smokers living with HIV/AIDS seem to be particularly susceptible to the negative consequences of smoking. Women smokers living with HIV/AIDS have a 36% higher risk for developing AIDS and 53% higher mortality when compared to nonsmokers with HIV/AIDS (Feldman et al., 2006). Women smokers on ART display a poorer viral response, poorer immunologic response, and have a greater risk of viral or immunologic failure when compared to nonsmokers living with HIV/AIDS. These increased health risks may be attributed to the poorer rates of ART adherence among smokers or ART may be less effective in smokers (Feldman et al., 2006). Finally, research studies in non-HIV samples indicate that women have less favorable smoking cessation treatment outcomes when

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compared to men (Bohadana, Nilsson, Rasmussen, & Martinet, 2003; Wetter et al., 1999). Smoking cessation interventions are needed among HIV-affected women; however, few studies have addressed smoking in HIV+ populations and none were specific to HIV+ women.

Effective and brief interventions exist for smoking cessation in the general population. Motivational interviewing (MI), a directive, client-centered approach, is recommended in smoking cessation clinical practice guidelines (Fiore et al., 2008) and has been found to be effective with a variety of health behaviors including alcohol and drug use and diet/exercise adherence (Hettema, Steele, & Miller, 2005). MI's effectiveness with smoking cessation has been documented in three recent meta-analyses (Heckman, Egleston, & Hofmann, 2010; Hettema & Hendricks, 2010; Lai, Cahill, Qin, & Tang, 2010). MI focuses on eliciting a patient's reasons for and benefits of change, while understanding that patients may be ambivalent about the change process. Key MI skills include asking open questions, affirming the patient's strengths and attempts at change, emphasizing the patient's control, asking advice before providing information or advice, and using reflective listening.

Preliminary research indicates that motivational interventions combined with nicotine replacement therapy (NRT) have been effective in reducing cigarette smoking among HIV+ smokers but have not demonstrated a significant advantage over standardized control conditions (Ingersoll, Cropsey, & Heckman, 2009; Lloyd-Richardson et al., 2009). Prior studies have not focused exclusively on women, although research suggests that brief interventions, including MI, may be more effective in samples of women smokers (Davis et al., 2011). The aim of this study was to examine the potential efficacy of a brief motivational interview versus prescribed advice (PA) among 30 HIV+ female smokers.

Methods

Participants

Participants were 30 HIV+ female smokers recruited from an urban public hospital-based HIV primary care clinic serving patients living with HIV/AIDS in San Francisco, CA. Inclusion criteria were: (1) 18 years of age or older; (2) biologically female; (3) self-report of daily smoking at least five out of seven days in the previous week and interest in quitting smoking; (4) English speaking; and (5) HIV+. Exclusion criteria included: (1) being pregnant; (2) not able to give informed consent; and (3) cognitive impairment as assessed by the investigator. The Institutional Review Board at the University of California, San Francisco, approved this study.

Procedure

Participants were recruited via flyers and by referrals from clinic staff. Individuals were assessed for study eligibility either in-person at the clinic or over the phone. Eligible participants were invited to attend a baseline interview where they provided written informed consent. Individuals who were not eligible were referred to other local smoking cessation programs.

Assessment

Participants attended a baseline interview during which they were asked to complete measures related to their smoking behaviors. The Center for Epidemiological Studies Depression Scale (CESD) (Radloff, 1977) was used to detect major clinical depression. The Timeline Follow-back Interview for alcohol and drug use (Sobell & Sobell, 1992) was administered to assess the quantity and frequency of alcohol and illicit drug use in the previous month. The Smoking History Questionnaire (Hall et al., 2006) queried the age participants smoked their first cigarette, years of smoking, number of quit attempts, and number of cigarettes smoked in the previous day. The Fagerström Test of Nicotine Dependence (FTND) (Heatherton, Kozlowski, Frecker, & Fagerström, 1991) was used to measure nicotine dependence. Finally, the Smoking Stage of Change measure (Prochaska & DiClemente, 1983) was used to categorize participants into one of the Stages of Change (Precontemplation, Contemplation, Preparation, or Action) and the Thoughts about Abstinence questionnaire (Hall, Havassy, & Wasserman, 1990) was used to assesses the participants' desire to quit smoking, abstinence self-efficacy, and perceived difficulty of quitting smoking. Participants were paid $25 for their participation in the baseline interview.

Randomization

Allocation assignment was determined prior to the start of the study using permuted block randomization (Matts & Lachin, 1988). After the participant completed the baseline interview, the interviewer opened a sealed envelope indicating which condition the participant had been randomized to receive. The intervention took place immediately after the baseline interview.

Interventions

Participants in both the MI and PA conditions met with a therapist (JKM) for a single session. Both conditions were designed to reduce smoking and encourage use of NRT and other tobacco cessation treatment options. At the end of the session, participants in both conditions were referred to NRT programs within the hospital and other community resources if they indicated that they were willing to receive these resources and/or referrals.

Brief motivational interview (MI)

The MI session was patient-centered, directive and intended to evoke the participants' potential reasons for and benefits of change (Miller & Rollnick, 2002).

Prescribed advice (PA)

The PA sessions were based on the pamphlet, "You Can Quit Smoking" developed by the National Cancer Institute (U.S. Department of Health and Human Services, 2000). Together, the therapist and participant reviewed the smoking cessation pamphlet and discussed the recommended smoking cessation strategies. This intervention focused on giving the participants advice and advocating for them to change, rather than eliciting as in the MI condition.

Follow-up

Participants were asked to complete a one-month follow-up interview. A trained research assistant (RA) conducted follow-up assessments. The RA was blind to the participants' treatment condition. Patients who indicated that they were abstinent from tobacco products at the follow-up interview were asked to provide a urine sample for confirmation of abstinence. Testing for nicotine and cotinine, biomarkers of nicotine exposure, was performed in the medical toxicology laboratory at San Francisco General Hospital using a qualitative liquid chromatography-tandem mass spectrometry method. Participants were paid $25 for the follow-up interview.

Treatment fidelity

All sessions were recorded and coded by a RA, trained to use the Motivational Interviewing Treatment Integrity (MITI) (Moyers, Martin, Manuel, Hendrickson, & Miller, 2005) coding system, a widely used measure of MI treatment fidelity (see the MITI coding manual for details on MITI training procedures). To our knowledge, there is not a standardized way of evaluating Prescribed Advice sessions; thus both the MI and PA sessions were coded using the MITI to evaluate if they significantly differed on key measures of MI treatment fidelity.

The MITI consists of five global ratings and seven behavior counts. Global ratings are measured on a 1–5 Likert scale and capture the general overview of the session. Behavior counts are a measure of the frequency of specific therapist behaviors. The MITI global behaviors include: evocation, collaboration, autonomy/support, direction, and empathy. Behavior counts include: (1) Giving information; (2) MI-Adherent statements (affirmations, statements that emphasize the patient's control, supportive statements, or asking permission before giving advice or information to the patient); (3) MI-Nonadherent statements (confrontational statements, directing the patient, or advising the patient without his/her prior permission); (4) simple reflections; (5) complex reflections; (6) closed questions; and (7) open questions.

Analysis approach

Data were analyzed using SPSS software. Means, standard deviations, and frequencies were utilized to characterize the demographic and smoking variables for the sample. Inter-rater reliability for the MITI coding was assessed for each global rating and behavior count using intra-class correlation coefficients (ICCs). Wilcoxon signed-rank tests were used to compare the MITI scores for the MI and PA condition. Mann-Whitney *U*-tests were conducted to determine if participants in the MI and PA conditions differed in their report of smoking behavior, desire to quit smoking, perceived difficulty, and expectation of success at the one-month follow-up.

Results

A total of 52 individuals contacted the study requesting to be screened, and 38 were eligible to participate. Of those meeting eligibility, 38 scheduled a baseline interview and 30 attended the baseline interview. See Figure 1 for details regarding reasons for ineligibility, participant recruitment, and follow-up rates.

Participants were all female, with a mean age of 49 years (SD = 5.78). Thirteen percent ($n = 4$) reported being of Hispanic ethnicity. Nearly half ($n = 14$) were African–American, 30% ($n = 9$) were Caucasian, and 23% ($n = 7$) were of other or more than one or other ethnicity. Of the sample, 40% ($n = 12$) were single, 30% ($n = 9$) divorced, 20% ($n = 6$) married, and 10% ($n = 3$) widowed. Most of the sample (67%, $n = 20$) reported their sexual orientation as heterosexual,

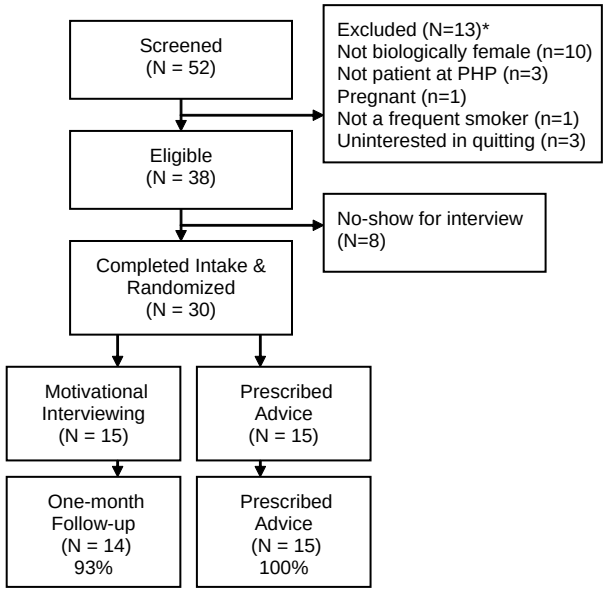

Figure 1. Participant enrollment and retention.

30% ($n=9$) bisexual, and 3% ($n=1$) homosexual. Almost half (47%; $n=14$) of the sample lived in their own house or apartment while the remaining participants reported living with friends, in a therapeutic community, a single room occupancy hotel, or that they were homeless. Many (67%; $n=20$) of the participants reported an annual income of less than $10,000, while the remaining participants reported receiving $11,000–$20,000 annually. Most (90%, $n=27$) of the sample was unemployed with the remaining 10% ($n=3$) reporting student status. Participants in the PA condition reported higher scores of depression at the baseline interview (mean = 24.41; SD = 11.52) than participants in the MI condition (16.09, SD = 11.12), a difference that approached significance $F(1, 27)=3.91$, $p=0.058$.

Baseline tobacco use

At the baseline interview, participants reported smoking a mean of 16.13 (SD = 9.82, range 3–40) cigarettes per day. Of the sample, 43% ($n=13$) were light smokers (smoking 10 or less cigarettes per day or CPD), 3% ($n=1$) were moderate smokers (11–19 CPD), and 53% ($n=16$) were heavy smokers (20 or more CPD). Participants reportedly first tried smoking at 12.50 (SD = 5.37) years of age and began smoking regularly at 16.17 (SD = 6.50) years of age. Participants indicated they had smoked for a mean of 31.87 (SD = 10.22) years. Applying the Prochaska and Diclemente's (1983) stage of change model to baseline tobacco use, 3.3% ($n=1$) reported that they were in the Precontemplation phase, 60% ($n=18$) in the Contemplation phase, while and 36.7% ($n=11$) were in the Preparation phase.

A third (33% of the sample; $n=10$) indicated that a mental health professional had previously advised them to quit smoking and most (87%; $n=26$) said that a health professional had advised them to quit smoking. Fifty-seven percent ($n=17$) of the sample had previously tried to quit smoking. Of those who had attempted to quit, 33% ($n=10$) reported that they had tried to quit cold turkey, 20% ($n=6$) had used a nicotine patch, 7% ($n=2$) bupropion, 10% ($n=3$) nicotine gum, 13% ($n=4$) gradually cut down, 10% ($n=3$) took a free class, and 3% ($n=1$) took a fee-based class.

Treatment conditions did not differ on FTND scores of tobacco dependence, the mean number of cigarettes smoked per day, desire to quit smoking, expectation of success, or perceived difficulty of quitting smoking at the baseline interview. Descriptive statistics for these variables are shown in Table 1.

Treatment fidelity

A total of 28 sessions were examined for treatment fidelity by a trained coder who was blinded to the study hypotheses. One session was not recorded due to error with the digital recorder, and one session was deemed inaudible. Six sessions were randomly selected for double-coding, conducted by a trained coder at the University of New Mexico. Inter-reliability between the two coders was calculated using ICCs for each global score and behavior count. Reliability estimates ranged from poor to excellent

Table 1. Baseline and follow-up measures of smoking.

Variable	Motivational interviewing mean (SD)	Prescribed advice mean (SD)
Fagerström test of nicotine dependence		
Baseline	4.07 (2.52)	5.00 (2.07)
Follow-up	3.43 (2.85)	4.14 (1.75)
Cigarettes per day		
Baseline	15.53 (11.10)	16.73 (8.71)
Follow-up	7.00 (8.62)*	15.79 (14.02)*
Desire to quit smoking (1–10 range)		
Baseline	7.50 (1.70)	8.20 (2.15)
Follow-up	6.79 (3.62)	7.73 (3.01)
Expectation of success (1–10 range)		
Baseline	6.93 (2.17)	5.60 (2.38)
Follow-up	7.43 (3.50)	6.67 (2.61)
Perceived difficulty (1–10 range)		
Baseline	7.93 (2.09)	7.33 (2.55)
Follow-up	6.50 (2.82)	7.73 (1.91)

*$p<0.05$.

(Cicchetti & Sparrow, 1981). Simple reflections were removed from further analyses due to poor reliability estimates (ICC = −0.006). The reliability estimates for global scores fell in the excellent range with estimates from 0.76 to 1.00. An ICC could not be calculated for the Direction global due to restricted range and the small sample of double-coded sessions. As an alternative, we calculated a difference score to examine coder reliability on the Direction variable as reported in a previous behavioral coding study with restricted range among variables (Miller, Moyers, Arcinega, Ernst, & Forcehimes, 2005). For the Direction variable, there was exact agreement on 83% ($n = 5$) of the double-coded sessions. The remaining session had a one-point discrepancy (on a 1–5 scale). See Table 2 for MITI means, standard deviations, and ICC calculations.

As expected, MI and PA sessions significantly differed from each other on four of five global measures, including therapist evocation, collaboration, autonomy/support, and empathy. The sessions did not differ significantly on the global measure of Direction, indicating that both the MI and PA sessions were focused on smoking cessation with minimal deviation to other unrelated topics. MI and PA sessions also significantly differed on the MITI behavior count codes. MI sessions had significantly more MI-Adherent statements, open questions, and complex reflections, whereas the PA sessions had significantly more MI non-adherent statements and closed questions. There was a significant difference in session length in the two conditions ($F[1, 26] = 17.78$, $p < 0.001$), with MI sessions averaging of 26.67 (SD = 8.43) minutes and the PA sessions averaging 15.09 (SD = 5.88) minutes. Due to the significant difference in session length, we calculated MI summary scores: the ratio of reflections to questions (total number of simple and complex reflections/total number of open and closed questions) and the Percent MI-Adherent statements (number of MI-Adherent statements/MI Adherent + MI Nonadherent statements), as detailed in the MITI coding manual (Moyers et al., 2005). Again, MI sessions contained a significantly higher ratio of reflections to questions and percent MI Adherent statements.

Outcome analyzes

Three participants in the MI condition reported seven-day point prevalence abstinence at the one-month follow-up; no participants in the PA condition reported abstinence. This difference was not significantly different ($\chi^2[1, N = 28] = 3.36$, $p = 0.067$). Urinalysis testing for nicotine and cotinine was performed on two urine screens. Of the two urine samples analyzed, only one screen confirmed nicotine and tobacco abstinence.

At the one-month follow-up, participants in the MI condition reported smoking significantly fewer cigarettes per day than participants in the PA condition $z = -2.49$, $p < 0.05$. Participants in the MI and PA conditions did not significantly differ in their total FTND score, desire to quit smoking, and expectation of success or perceived difficulty to quit

Table 2. Motivational interviewing treatment fidelity ratings.

MITI code	Motivational interviewing mean (SD)	Prescribed advice mean (SD)	ICC	Wilcoxon Signed Rank Test
Global rating (1–5 range)				
Evocation	4.79 (0.43)*	2.07 (0.48)*	1.00	$Z = -4.805$, $p = 0.000$
Collaboration	5.00 (0.00)*	2.00 (0.00)*	0.878	$Z = -5.196$, $p = 0.000$
Autonomy/support	4.86 (0.36)*	2.79 (0.58)*	0.762	$Z = -4.904$, $p = 0.000$
Direction	4.93 (0.27)	5.00 (0.00)	**	$Z = -1.00$, $p = 0.317$
Empathy	4.93 (0.27)*	1.43 (0.65)*	0.906	$Z = -4.842$, $p = 0.000$
Behavior counts (average frequency)				
Giving information	8.36 (5.84)	9.36 (2.74)	0.234	$Z = -1.572$, $p = 0.116$
MI adherent	9.43 (3.20)*	2.23 (1.69)*	0.645	$Z = -3.140$, $p = 0.002$
MI nonadherent	0.86 (0.69)*	6.93 (3.45)*	0.740	$Z = -3.199$, $p = 0.001$
Closed questions	5.93 (2.73)*	8.29 (3.41)*	0.320	$Z = -2.120$, $p = 0.034$
Open questions	10.86 (4.07)*	6.00 (3.16)*	0.909	$Z = -3.102$, $p = 0.002$
Complex reflections	23.64 (10.50)*	3.07 (2.65)*	0.910	$Z = -4.513$, $p = 0.000$
MITI summary scores				
Reflections/questions	1.72 (0.66)*	0.42 (0.32)*	0.672	$Z = -4.32$, $p = 0.000$
Percent MI adherent	0.90 (0.08)*	0.28 (0.25)*	0.560	$Z = -3.14$, $p = 0.002$

Note: ICC, Intraclass correlation.
*Indicates a significant between-group difference.
**Due to the restricted range for this variable, an ICC could not be calculated.

and remain abstinent. Therefore, we collapsed across treatment conditions and used Wilcoxon Signed rank tests to determine if participants differed from baseline to the one-month follow-up. Participants' desire to quit smoking and perception of smoking cessation difficulty did not significantly differ from the baseline to the follow-up interview. Participants did report an increase in their expectation of success from the baseline to the follow-up interview $z = -2.04$, $p < 0.05$.

Discussion

This study compared two smoking cessation interventions for urban, low-income HIV+ women smokers, an underserved, and under-studied population. Participants in the MI condition demonstrated a greater reduction in the mean cigarettes smoked per day; however, abstinence rates did not vary at the one-month follow-up. Participants in both conditions reported a significant increase in their expected success with quitting smoking. Unexpectedly, participants in both conditions reported a decrease in the desire to quit smoking from the baseline to the follow-up interview.

MI has been found to be an effective smoking cessation intervention (Heckman et al., 2010; Hettema & Hendricks, 2010; Lai et al., 2010). While this is the first study, to our knowledge, to examine the efficacy of MI with women smokers living with HIV/AIDS, other research studies have investigated the efficacy of MI with samples of both men and women living with HIV (Ingersoll et al., 2009; Lloyd-Richardson et al., 2009). MI studies have demonstrated that MI was equally effectives as a standardized control condition although neither of these studies reported on standardized measures of MI treatment adherence (Ingersoll et al., 2009; Lloyd-Richardson et al., 2009). In the current study, MI demonstrated an advantage over PA in reducing the mean number of cigarettes smoked per day.

This study included an objective measure of MI treatment fidelity and the MITI coding system (Moyers et al., 2005). Coding data indicate that the MI sessions strongly adhered to the key MI principles and skills. Moreover, the content of the MI sessions was significantly different from the content of the PA sessions.

Limitations

The current study has several limitations, which deserve consideration. First, this was a small sample ($N = 30$), which may have been too small to detect significant differences between the two conditions. As a pilot study, the goal of this work was to examine the potential efficacy of MI when compared to a standardized control condition. Second, this study utilized a single therapist, who is a highly experienced MI clinician, in both treatment conditions. Thus, it is possible that the therapist inadvertently biased the treatment interventions. Third, the discrepancy between participants' self-report of abstinence and biochemical verification prevents a clear interpretation of the study results. While three participants (20%) in the MI condition reported seven-day point prevalence abstinence, only one participant's self-reported abstinence was verified by the absence of urine nicotine and cotinine. Taking a conservative approach and utilizing only abstinent rates that have been biochemically verified our abstinent rates decrease to 7% at the one-month follow-up. One potential explanation may be social desirability bias on the part of participants in the MI intervention, even though the interventionist did not conduct the follow-up interviews. Finally, the rates of inter-rater reliability were low for some measures of MITI behavior counts, possibly due to the small number of sessions ($n = 6$) coded for inter-rater reliability.

Future directions

This study examined the potential efficacy of MI with HIV+ female smokers. Future studies should examine smoking cessation interventions among a larger sample of HIV-infected individuals, include carbon monoxide monitors for more accurate biological confirmation of abstinence, and follow participants over a longer time period.

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