Drug and Alcohol Dependence 147 (2015) 76–80

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Mediators of a smoking cessation intervention for persons living with HIV/AIDS

Damon J. Vidrine[a,*], George Kypriotakis[a], Liang Li[b], Roberto C. Arduino[c], Faith E. Fletcher[d], Irene Tamí-Maury[a], Ellen R. Gritz[a]

[a] Department of Behavioral Science, The University of Texas MD Anderson Cancer Center, Houston, TX, United States
[b] Department of Biostatistics, The University of Texas MD Anderson Cancer Center, Houston, TX, United States
[c] Division of Infectious Diseases, The University of Texas Health Science Center at Houston Medical School, Houston, TX, United States
[d] Community Health Sciences Division, University of Illinois at Chicago, School of Public Health, Chicago, IL, United States

ARTICLE INFO

Article history:
Received 8 August 2014
Received in revised form 5 December 2014
Accepted 5 December 2014
Available online 15 December 2014

Keywords:
HIV/AIDS
Smoking cessation
Cell phone intervention
Mediation
This trial has been registered at clinicaltrails.gov [NCT00502827].

ABSTRACT

Background: Cigarette smoking among persons living with HIV (PLWH) is a pressing public health concern, and efforts to evaluate cessation treatments are needed. The purpose of the present study was to assess potential mechanisms of a cell phone-delivered intervention for HIV-positive smokers.
Methods: Data from 350 PLWH enrolled in a randomized smoking cessation treatment trial were utilized. Participants were randomized to either usual care (UC) or a cell phone intervention (CPI) group. The independent variable of interest was treatment group membership, while the dependent variable of interest was smoking abstinence at a 3-month follow-up. The hypothesized treatment mechanisms were depression, anxiety, social support, quit motivation and self-efficacy change scores.
Results: Abstinence rates in the UC and CPI groups were 4.7% (8 of 172) and 15.7% (28 of 178), respectively. The CPI group (vs. UC) experienced a larger decline in depression between baseline and the 3-month follow-up, and a decline in anxiety. Self-efficacy increased for the CPI group and declined for the UC group. Quit motivation and social support change scores did not differ by treatment group. Only self-efficacy met the predefined criteria for mediation. The effect of the cell phone intervention on smoking abstinence through change in self-efficacy was statistically significant ($p < 0.001$) and accounted for 17% of the total effect of the intervention on abstinence.
Conclusions: The findings further emphasize the important mechanistic function of self-efficacy in promoting smoking cessation for PLWH. Additional efforts are required to disentangle the relationships between emotional, distress motivation, and efficacious smoking cessation treatment.

1. Introduction

Cigarette smoking among persons living with HIV (PLWH) is a profound cause of morbidity and mortality (Lifson and Lando, 2012). Compared to the general population, PLWH are far more likely to be current smokers (Browning et al., 2013) and, subsequently, are confronted with numerous tobacco- and HIV-related health risks (Feldman and Anderson, 2013; Palella and Phair, 2011; Smith et al., 2010). In fact, PLWH who smoke cigarettes are at higher risk for acute bronchitis, bacterial pneumonia, pulmonary disease, non-AIDS and AIDS-defining cancers, and overall mortality (Burke et al., 2004; Crothers et al., 2005; Engels et al., 2006; Lifson et al., 2010). Smoking may also weaken the virological response to antiretroviral therapies (Feldman et al., 2006) by as much as 40% (Miguez-Burbano et al., 2003). In fact, recent evidence from a large cohort study indicates that >60% of deaths among PLWH can be attributed to smoking (Helleberg et al., 2013). Therefore, smoking cessation interventions are critical for improving medical management and maximizing survival for PLWH.

To date, relatively few efforts to evaluate and/or implement smoking cessation interventions for PLWH appear in the literature (Moscou-Jackson et al., 2014). Moreover, published results from randomized clinical trials (RCT) generally indicate modest long-term smoking abstinence rates and small, or no treatment group differences (Gritz et al., 2013; Humfleet et al., 2013; Lloyd-Richardson et al., 2009). While the precise explanation for the higher than expected smoking relapse rates and lack of treatment effects among HIV-positive populations are unknown, variables

* Corresponding author. Tel.: +1 713 792 8270; fax: +1 713 794 4730.
E-mail address: dvidrine@mdanderson.org (D.J. Vidrine).

http://dx.doi.org/10.1016/j.drugalcdep.2014.12.003
0376-8716/

such as low socioeconomic status, sexual orientation, depression, anxiety, stress, alcohol abuse, and illicit drug use are likely contributing factors (AMA, 1996; Breslau and Johnson, 2000; Degenhardt and Hall, 2001; Diaz et al., 1994; Greenwood et al., 2005; Halkitis, 2010). Moreover, efforts to identify the actual mechanisms by which interventions facilitate smoking abstinence offer the potential to meaningfully inform the development of the next generation of interventions for PLWH.

In the current study, mediators of a cell phone-delivered intervention for HIV-positive smokers were evaluated. Several key considerations informed the development of this smoking cessation intervention. First, cell phones were chosen as the intervention delivery mode due to the many barriers (e.g., transportation, lack of landlines, housing instability) that reduce the feasibility of more traditional smoking cessation treatment options (e.g., in person individual or group counseling, quit line counseling, home computer delivered treatment) in the targeted low socioeconomic status HIV-positive population (Honjo et al., 2006; Lazev et al., 2004). Moreover, a growing literature suggests that cell phone-based smoking cessations interventions are feasible and effective for both PLWH and other populations (Vidrine et al., 2006a,b; Whittaker et al., 2012). Content for the intervention was based on cognitive behavioral therapy (CBT) and motivational interviewing (MI) principles, and designed to increase self-efficacy and social support, while maintaining quit motivation (Miller and Rollnick, 1991; O'Donahue et al., 2003). The intervention was also designed to address general feelings of emotional distress, which are often associated with smoking relapse (Vidrine et al., 2012). Therefore, an *a priori* hypothesis of this study was that the cell phone intervention's effect on abstinence would be mediated by quit motivation, self-efficacy, social support, and emotional distress.

2. Methods

2.1. Study site and participants

Data for this study are derived from a larger smoking cessation randomized controlled trial (RCT) for HIV-positive smokers (Gritz et al., 2013; Vidrine et al., 2012). All participants enrolled in the parent study ($n = 474$) were recruited from the Thomas Street Health Center (TSHC) of the Harris Health system in Houston, Texas between February, 2007 and December, 2009. TSHC is a county-administered HIV clinic serving a predominantly low-income, medically indigent, and minority patient population. To be eligible for the RCT, individuals were required to be: HIV-positive, age ≥18 years, current smokers, willing to set a quit date within 7 days, and English or Spanish speaking. Participants were excluded if they were enrolled in another smoking cessation program and/or physician-deemed ineligible based on medical or psychiatric conditions. The study was approved by the Institutional Review Boards of The University of Texas MD Anderson Cancer Center and The University of Texas Health Science Center at Houston.

2.2. Procedures

After informed consent was obtained, participants completed an audio computer—assisted self-interview (ACASI) consisting of demographic, behavioral, and psychosocial measures. Study participants then received brief provider advice to quit, and were subsequently randomized using a computerized minimization procedure to one of two treatment conditions [usual care (UC) or cell phone intervention (CPI)]. In addition to brief provider advice, participants in UC received self-help materials and instructions on how to obtain nicotine replacement therapy (NRT) at TSHC. CPI participants received a prepaid-cell phone and an 11-call proactive counseling regimen in addition to all of the UC components (i.e., brief advice, written materials, and instructions on how to obtain NRT). The content of the CPI counseling sessions and the call schedule can be found in Table 1. Both the UC and CPI treatments were informed by recommendations from the Treating Tobacco Use and Dependence Clinical Practice Guideline (Fiore et al., 2008). Further details about the procedures and the intervention have been previously published (Gritz et al., 2013; Vidrine et al., 2012).

Follow-up demographic, health behavior (i.e., smoking, alcohol, and illicit drug use), and psychosocial assessments were conducted at 3, 6, and 12 months post-enrollment. These assessments consisted of an ACASI (mirroring the baseline assessment) and biological confirmation of smoking status using expired carbon monoxide (CO). Participants were given a $20 gift card after completing each assessment. The current analysis focuses on the 350 participants (172 in UC and 178 in CPI) who completed the 3-month follow-up.

Table 1
Schedule and content of proactive counseling calls.

Call	Time of call	Content of call
1	1 Day prior to quit date	Preparing to quit—why quit when you're HIV-positive? Making the commitment to quit
2	Quit day	Quitting smoking—getting through the first day
3	2 Days post quit date	Surviving withdrawal—withdrawal facts and coping skills
4	4 Days post quit date	Managing high risk situations
5	7 Days post quit date	Stress, negative affect & smoking
6	10 Days post quit date	Improving support and asserting yourself
7	2 Weeks post quit date	Reviewing problem solving & dealing with lapses
8	4 Weeks post quit date	Reinforcing benefits of being an HIV+ nonsmoker
9	6 Weeks post quit date	Maintaining commitment—keeping motivated
10	9 Weeks post quit date	Successes and challenges in smoking cessation
11	12 Weeks post quit date	Long-term relapse prevention

2.3. Measures

Treatment group membership, CPI vs. UC, was the independent variable of interest. The primary outcome variable was biochemically verified smoking abstinence at the 3-month follow-up. Smoking abstinence was operationally defined as self-reported abstinence within the past 7 days at the time of assessment and a CO level <7 ppm. The hypothesized treatment mediators included depressive symptoms, anxiety, social support, quit motivation, and self-efficacy. *Depressive symptoms* were assessed with the 20-item Centers for Epidemiologic Studies Depression (CES-D) scale (Radloff, 1977); *anxiety* was assessed with the state component of the State-Trait Anxiety Inventory (STAI-State) (Spielberger et al., 1970); *social support* was assessed with the 12-item Interpersonal Support Evaluation List (ISEL; Cohen et al., 1985; Cohen and Wills, 1985); *quit motivation* was assessed with the Reasons for Quitting Questionnaire (RFQ), which provides scores for both intrinsic and extrinsic motivation (Curry et al., 1990); and smoking abstinence *self-efficacy* was assessed with a 9-item scale developed and validated by Velicer et al. (1990). Each of these self-report measures is widely used and has solid psychometric properties. Following the guidelines suggested by Allison (1990), change scores between the 3-month follow-up and baseline assessment were calculated.

2.4. Statistical analysis

Mediation analysis for binary outcomes was employed (MacKinnon, 2008; MacKinnon et al., 2007). The predefined criteria for mediation were that both paths from predictor to mediator and from mediator to outcome should be significant in order to test for mediation effects. Thus, evidence of mediating effects is found when the intervention exerts a significant effect (**a** path) on a potential mediator (e.g., change in depression) which, in turn, exerts a significant effect (**b** path) on smoking abstinence. The indirect effect is the product of the **a** and **b** paths. In the estimation of direct effects **(b)** of the mediator on the outcome, the intervention effects (**c** path) were also estimated simultaneously with the indirect effect. Logit regression with rescaling was used for the analyses to estimate the mediation effects. The reason for rescaling in estimating mediation effects is that a binary mediator has a different scale when it is a predictor of an outcome and when it is the outcome (MacKinnon and Dwyer, 1993). Multiplication of each coefficient of the two equations by the standard deviation (SD) of the predictor variable and division by the SD of the outcome variable corrects for the differences in scales. Statistical significance of the point estimates for the indirect effects was assessed using bias corrected bootstrap confidence intervals with 5000 replicates. The proportion of the effect of treatment on the outcome mediated was estimated by dividing the mediation effect to the total effect. Analyses were conducted in R version 3.0.1 (www.r-project.org).

3. Results

Descriptive statistics, including smoking history, HIV exposure, and the socio-demographic profile of the entire sample ($n = 474$) have been previously described (Vidrine et al., 2012). The analytical sample for the current study included the 350 participants (172 in UC and 178 in CPI) who completed the 3-month follow-up.