

Brief Report

Efficacy of Cell Phone–Delivered Smoking Cessation Counseling for Persons Living With HIV/AIDS: 3-Month Outcomes

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Abstract

Introduction: Substantial evidence indicates that cigarette smoking among people living with HIV/AIDS (PLWHA) represents a significant public health concern. However, few efforts to assess smoking cessation interventions targeting this population have been reported. In this brief report, 3-month outcomes from an ongoing treatment trial for PLWHA who smoke are described.

Methods: Study participants were recruited from a large HIV care center serving a diverse population of PLWHA. A two-group randomized design was used to compare the efficacy of usual-care (UC) smoking cessation treatment versus a cell phone intervention (CPI). Follow-ups were conducted at the HIV clinic 3 months postenrollment. Using an intent-to-treat approach, a series of multiple regression models were used to compare smoking outcomes in the 2 groups.

Results: Four hundred and seventy-four participants were enrolled and randomized, UC ($n = 238$) and CPI ($n = 236$). Mean age in the sample was 44.8 ($SD = 8.1$) years, and the majority were male (70.0%), Black (76.6%), and had an education level of high school or less (77.5%). At follow-up, participants in the CPI group were 4.3 (95% $CI = 1.9, 9.8$) times more likely to be abstinent (7 day) compared with those in the UC group. Similarly, significant point estimates were observed for the other smoking outcomes of interest.

Conclusions: Findings from this preliminary report indicate that a smoking cessation intervention for PLWHA consisting of cell phone–delivered proactive counseling results in significantly higher abstinence rates compared with a standard care approach. Evaluation of the long-term (6-month and 12-month) efficacy of the CPI approach is ongoing.

Introduction

Cigarette smoking among people living with HIV/AIDS (PLWHA) represents a significant public health problem.

Numerous reports indicate that the prevalence of cigarette smoking among PLWHA is two to three times higher than that in the general population (Burkhalter, Springer, Chhabra, Ostroff, & Rapkin, 2005; Gritz, Vidrine, Lazev, Amick, & Arduino, 2004; Mamary, Bahrs, & Martinez, 2002; Webb, Venable, Carey, & Blair, 2007). Moreover, smoking is associated with a host of deleterious health outcomes for PLWHA, such as reduced antiretroviral treatment response and an increased risk of numerous AIDS- and non-AIDS-related diseases (Cockerham et al., 2010; Crothers et al., 2009; Feldman et al., 2006; Lifson et al., 2010). Therefore, smoking cessation treatment offers the potential to markedly improve HIV disease management. In fact, recent evidence to quantify the excess morbidity and mortality attributable to smoking indicates that smoking cessation among PLWHA could reduce the risk of overall mortality by almost 16%, reduce the risk of a major cardiovascular disease event by 20%, and reduce the risk of non-AIDS malignancy by 34% (Lifson et al., 2010).

Despite the high prevalence of current smoking and the substantial health benefits offered by smoking cessation treatment, surprisingly few efforts to deliver cessation treatment to PLWHA appear in the literature (Reynolds, 2009). The studies that have been published generally indicate that PLWHA are receptive to smoking cessation treatment and that cessation programs can be successfully implemented in the HIV clinic setting (Vidrine, 2009). Our group has previously reported the results from a pilot trial to deliver cell phone counseling to an economically disadvantaged population of PLWHA. The results of this trial, which compared the cell phone counseling condition to a usual-care (UC) condition, were encouraging. Specifically, participants in the cell phone group were significantly more likely to be abstinent at follow-up (Vidrine, Arduino, Lazev, & Gritz, 2006). Based on these promising findings, a well-powered randomized controlled trial (RCT) of the cell phone intervention (CPI) was initiated. In this brief report, 3-month smoking-related outcomes from this RCT are described.

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Methods

Participants

The study population consisted of PLWHA receiving care at the Thomas Street Health Center (TSHC). TSHC offers a wide range of HIV-related services and serves a diverse population of primarily economically disadvantaged PLWHA from the greater Houston metropolitan area. Patients were systematically screened at the time of primary care appointments. To be eligible, participants were required to be HIV positive, age ≥ 18 years, a current smoker (smoke ≥ 5 cigarettes/day and expired carbon monoxide [CO] level of ≥ 7 ppm), and willing to set a quit date within 7 days. Both English- and Spanish-speaking individuals were eligible. Clinic physicians could deem a patient ineligible due to medical or psychiatric concerns. Patients currently participating in other smoking cessation programs were also deemed ineligible.

Study Design and Procedures

After the informed consent process, participants were asked to complete an audio computer-assisted self-interview (ACASI) consisting of sociodemographic, smoking-related, health behavior, and psychosocial variables. Following this assessment, all participants received brief advice to quit smoking from a health care provider, self-help written materials, and instructions on how to obtain nicotine replacement therapy (NRT) patches at TSHC. These treatment elements were delivered in accordance with the Public Health Services guidelines (Fiore et al., 2008). Participants were then randomized into either a UC or a CPI treatment group. Adaptive randomization was used to ensure treatment group balance with respect to several important participant characteristics (i.e., depression history, number of cigarettes per day, and nicotine dependence; Friedman, Furburg, & DeMets, 1998; Taves, 1974). Participants were given \$20 gift cards as compensation for completing the baseline assessment.

Participants randomized to UC received no further treatment, while participants randomized to the CPI group were given a prepaid cell phone on which a series of 11 proactive counseling sessions were conducted. The phone calls spanned a 3-month period but were front loaded such that the frequency of the calls was highest near the time of scheduled quit attempt.

Counseling session content was primarily drawn from a cognitive-behavioral foundation. Problem solving and skills training techniques, which are empirically supported for smoking cessation, were emphasized (Fiore et al., 2008). Participants in the CPI group were also given access to a hotline to call if additional support was sought between sessions. Participants were allowed to keep the cell phones following the completion of the 3-month treatment period. See Table 1 for the call schedule, a description of the counseling session content for each call and the proportion of calls successfully completed.

All participants were asked to complete a follow-up assessment approximately 3 months post-study enrollment. The format of the follow-up closely mirrored the format of the baseline assessment. That is, follow-ups were conducted at the time of routinely scheduled primary care clinic appointments, and an ACASI approach was used. Expired CO level was also measured to biochemically verify smoking status. Participants completing the 3-month follow-up were given another \$20 gift card. Preliminary findings from this RCT are limited to outcomes collected at the 3-month assessment. However, participants were also asked to complete 6-month and 12-month assessments in this ongoing trial. The study protocol 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.

Statistical Analyses

Descriptive statistics (i.e., means, SDs, and frequencies) were generated to characterize the sample. To identify potential baseline differences in the two treatment groups (UC vs. CPI), a series of chi-square and *t* tests were performed. The primary outcome of interest was self-reported 7-day point prevalence abstinence at the time of the 3-month follow-up. Other smoking status variables of interest included biochemically verified 24-hr abstinence, 30-day abstinence, and continuous abstinence. Self-reported quit attempt (yes/no—defined as quitting for at least a 24-hr period) and length of abstinence (defined as the number of consecutive days the participant was able to go without smoking) were also considered. An intent-to-treat approach was used in which participants who did not complete the 3-month follow-up were coded as smokers. A series of multiple logistic regression models were generated to compare the effect of the intervention on each of the dichotomous smoking

Table 1. Cell Phone Intervention: Timing, Content, and Completion Rate of the Proactive Phone Counseling Sessions

Call	Time of call	Content of call	Calls completed (%)
1	1 day prior to quit date	Quit preparation and motivation—the significance of quitting for HIV+ smokers	83.9
2	Scheduled quit date	Quitting smoking—getting through the first day	86.9
3	2 days postquit date	Surviving withdrawal—withdrawal facts and coping skills	87.3
4	4 days postquit date	Managing high risk situations	83.9
5	7 days postquit date	Stress, negative affect and smoking	83.5
6	10 days postquit date	Improving social support and asserting yourself	77.5
7	2 weeks postquit date	Reviewing problem solving and dealing with smoking lapses	78.8
8	4 weeks postquit date	Reinforcing benefits of being an HIV+ nonsmoker	74.2
9	6 weeks postquit date	Maintaining commitment and motivation	73.3
10	9 weeks postquit date	Successes and challenges in smoking cessation	69.1
11	12 weeks postquit date	Long-term relapse prevention	64.0

outcomes while controlling for potential confounders. Multiple linear regression analysis was used to compare the length of smoking abstinence between the two groups. Odds ratios (ORs) along with corresponding 95% CIs were generated to estimate strength of the association.

Results

Nine hundred and thirteen smokers were asked to enroll of whom 582 (63.7%) consented. Of these, 108 were excluded prior to randomization. The most common reason for exclusion was an expired CO level below the inclusion criterion defined minimum. Four hundred and seventy-four participants were enrolled and randomized, UC ($n = 238$) and CPI ($n = 236$). Mean (SD) age of the participants at the time of study enrollment was 44.8 (8.1) years. The majority of participants were male (70.0%) and were not currently married or living with a significant other (82.3%). Education level in the sample was relatively low, with only 23.6% of participants having attained more than a high school diploma/equivalent. Approximately three fourths of participants (76.6%) were Black. Self-reported

mode of HIV infection was diverse, with 25.2% of participants infected by male homosexual contact, 45.6% infected by heterosexual contact, and 17.2% infected by infection drug use. On average, participants smoked 19.2 cigarettes/day. Also, 59.5% of participants reported making a previous quit attempt, and 51.9% reported living in a household with another smoker. Baseline demographic and smoking characteristics of the participants are summarized by treatment group in Table 2. Results from the chi-square and t tests indicated that the two groups were well balanced in terms of sociodemographic and smoking-related variables. The only significant difference observed between the two groups was age, 45.7 versus 43.9. Participants in the UC group were significantly older than those in the CPI group, $t(472) = 2.39$, $p = .017$. Therefore, age was included in the regression models assessing smoking outcomes.

Results from the multiple regression models of the various smoking status variables at the 3-month follow-up are presented in Table 3. For the primary outcome of interest, 7-day abstinence, participants in the CPI group were 4.33 (95% CI = 1.92, 9.82) times more likely to be abstinent compared with those in the UC group. Similar point estimates, with ORs ranging

Table 2. Baseline Demographic and Smoking-Related Characteristics

Characteristic	Usual care($n = 238$)	Cell phone intervention($n = 236$)
Mean age in years (SD)*	45.70 (7.79)	43.94 (8.26)
Male, % (n)	68.90 (164)	71.19 (168)
Married/living with significant other, % (n)	18.91 (45)	16.53 (39)
Race/ethnicity, % (n)		
White	12.18 (29)	12.71 (30)
African American/Black	78.57 (187)	74.58 (176)
Hispanic/Latino	7.98 (19)	10.17 (24)
Other	1.26 (3)	2.54 (6)
Mean years of formal education (SD)	10.82 (2.53)	10.88 (2.68)
Education level, % (n)		
Less than high school	36.97 (88)	39.83 (94)
High school or equivalent	38.14 (91)	37.71 (89)
More than high school	24.79 (89)	22.46 (53)
Current work status, % (n)		
Working full or part time	19.75 (47)	22.46 (53)
Not working due to health	65.97 (157)	60.59 (143)
Cannot find work	6.72 (16)	8.47 (20)
Not working for other reasons	7.56 (18)	8.47 (20)
HIV transmission, % (n)		
MSM	24.05 (57)	26.38 (62)
Heterosexual contact	45.15 (107)	45.96 (108)
Injection drug use	19.83 (47)	14.47 (34)
Other	10.97 (26)	13.19 (31)
Mean number of cigarettes per day (SD)	19.67 (11.79)	18.63 (11.29)
Mean years smoked (SD)	21.24 (10.66)	20.70 (10.88)
Mean age at smoking initiation (SD)	17.43 (6.78)	18.20 (9.01)
Past quit attempts		
Ever made a 24-hr quit attempt, % (n)	60.92 (145)	58.05 (137)
Mean number of lifetime quit attempts (SD)	2.87 (6.38)	2.30 (4.40)
Another smoker in home, % (n)	47.48 (113)	56.34 (133)
Nicotine dependence		
Mean Fagerström Test for Nicotine Dependence score, (SD)	5.82 (2.26)	5.73 (2.26)

Note. MSM = men who have sex with men.

* $p < .05$

Table 3. Smoking Outcomes At 3-Month Follow-up Using Intent-to-Treat Analysis^a, *n* = 474

Smoking outcome	Usual care	Cell phone intervention	OR (95% CI)	<i>p</i> Value
Smoking abstinence outcome, % (<i>n</i>)				
24 hr ^b	5.04 (12)	16.95 (40)	4.23 (2.14, 8.36)	<.0001
7 day	3.36 (8)	11.86 (28)	4.33 (1.92, 9.82)	<.0001
30 day	2.94 (7)	8.90 (21)	3.56 (1.47, 8.60)	.005
Continuous abstinence	2.1 (5)	8.90 (21)	5.21 (1.91, 14.20)	.001
Quit attempt, % (<i>n</i>)	65.97 (157)	69.07 (163)	1.19 (0.81, 1.76)	.37
			Regression coefficient (95% CI)	
Longest period of abstinence, <i>M</i> days (<i>SD</i>)	6.61 (13.81)	14.71 (22.12)	8.39 (5.05, 11.72)	<.0001

Note. OR = odds ratio.

^aMultiple regression models (logistic and linear) adjusted for age.

^bExpired carbon monoxide level <7 ppm.

between 3.56 and 5.21, were observed for the other smoking abstinence variables of interest (i.e., 24-hr abstinence, 30-day abstinence, and continuous abstinence). Mean length of longest period of abstinence during the 3-month follow-up period was 14.71 days in the CPI group versus 6.61 days in the UC group (β coefficient = 8.39, 95% CI = 5.05, 11.72, $p < .0001$). However, the proportion of participants who made a quit attempt was not significantly different in the two groups, 69.07% in the CPI group versus 65.97% in the UC group ($p = .37$).

Discussion

Findings from this preliminary report indicate that a smoking cessation intervention for PLWHA consisting of cell phone–delivered proactive counseling results in significantly higher abstinence rates compared with a standard care approach. Similar to the findings from our pilot trial of the cell phone approach, participants randomized to the cell phone treatment were significantly more likely to be biochemically confirmed 24-hr abstinent at the time of 3-month follow-up (Vidrine et al., 2006). In addition to higher 24-hr abstinence, the current study was properly powered to consider other abstinence definitions (i.e., 7-day, 30-day, and continuous abstinence), and in every case, findings supported the efficacy of the CPI. In fact, the magnitude of effect for the CPI was quite robust ranging from an OR of 3.56 for 30-day abstinence to 5.21 for continuous abstinence.

While the magnitude of the point estimates of the cell phone treatment is encouraging, the actual proportion of patients who quit smoking in this study was somewhat smaller than the proportions reported in our earlier pilot. In the current study, approximately 12% of CPI and 3% of UC participants quit smoking (7-day abstinent) at 3 months compared with the 17% of CPI and 6% of control group participants who were 7-day abstinent in our pilot trial (Vidrine et al., 2006). A potential explanation for the differences in observed quit rates involves the use of NRT. Participants in the earlier pilot trial were provided a prescription for nicotine patches at the time of study enrollment, which they were able to fill at the TSHC pharmacy. Due to the implementation of new administrative rules at the clinic, participants in the current study were required to make additional clinic visits and attend a group information session prior to the provision of NRT. These additional steps may have resulted in lower NRT usage and consequently lower abstinence

rates. While careful consideration of the effects of NRT use on abstinence was beyond the scope of the current preliminary report, NRT will be examined at the time of long-term outcome assessment.

Other smoking cessation treatment trials targeting PLWHA have documented the importance of NRT use. Specifically, Lloyd-Richardson et al. compared the efficacy of a health education–based intervention to a motivational enhancement intervention in a RCT, with both groups also receiving NRT. While significance differences were not observed between the two groups, NRT adherence was predictive of abstinence (Lloyd-Richardson et al., 2009). Similarly, several smaller pilot and demonstration trials conducted with HIV-positive smokers also suggest that interventions combining some type of supportive counseling with NRT are appropriate for PLWHA (Cummins, Trotter, Moussa, & Turham, 2005; Elzi et al., 2006; Wewers, Neidig, & Kihm, 2000). However, additional efforts to ensure adequate NRT adherence among PLWHA who smoke may be warranted (Ingersoll, Cropsey, & Heckman, 2009).

A potential limitation of the current study is the imbalance in contact time between the CPI and UC treatment groups. That is, it is possible that the higher smoking cessation rates observed in the CPI group could be explained by the greater contact time between study staff and participants in that condition (vs. UC) rather than the cell phone modality or the counseling content. Thus, any intervention that increased contact time may have had a similar effect on cessation. While future efforts will need to address this issue, the CPI utilized in the current study was designed with several considerations in mind. First, substantial empirical evidence supports the efficacy of quit lines for smoking cessation (Fiore et al., 2008). Thus, the provision of cell phones allowed us to follow the quit line treatment model. Second, cell phone–delivered smoking cessation treatment overcomes many common participation barriers (i.e., lack of consistent phone service, lack of transportation, and high number of household moves) confronted by PLWHA (Lazev, Vidrine, Arduino, & Gritz, 2004). By conducting the counseling sessions over the cell phone, we were able to greatly increase our ability to consistently contact participants and deliver a relatively intensive intervention. Finally, we were able to conduct the sessions at times that were most convenient to the participants, thus further reducing burden. While the preliminary results from the current study are encouraging, 6- and 12-month

outcome analyses will be needed to better evaluate the efficacy of the cell phone treatment approach. These future analyses will also more fully explore the relationship between treatment group, smoking outcomes, and the various medical and psychiatric comorbidities frequently observed among PLWHA. In addition, the effects of motivation, self-efficacy, stress, and other psychosocial variables will be explored.

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Declaration of Interests

None declared.

References

- Burkhalter, J. E., Springer, C. M., Chhabra, R., Ostroff, J. S., & Rapkin, B. D. (2005). Tobacco use and readiness to quit smoking in low-income HIV-infected persons. *Nicotine & Tobacco Research*, 7, 511–522. doi:10.1080/14622200500186064
- Cockerham, L., Scherzer, R., Zolopa, A., Rimland, D., Lewis, C. E., Bacchetti, P., et al. (2010). Association of HIV infection, demographic and cardiovascular risk factors with all-cause mortality in the recent HAART era. *Journal of Acquired Immune Deficiency Syndrome*, 53, 102–106. doi:10.1097/QAI.0b013e3181b79d22
- Crothers, K., Goulet, J. L., Rodriguez-Barradas, M. C., Gibert, C. L., Oursler, K. A., Goetz, M. B., et al. (2009). Impact of cigarette smoking on mortality in HIV-positive and HIV-negative veterans. *AIDS Education & Prevention*, 21, 40–53. doi:10.1521/aeap.2009.21.3_suppl.40
- Cummins, D., Trotter, G., Moussa, M., & Turham, G. (2005). Smoking cessation for clients who are HIV-positive. *Nursing Standard*, 20, 41–47.
- Elzi, L., Spoerl, D., Voggensperger, J., Nicca, D., Simcock, M., Bucher, H. C., et al. (2006). A smoking cessation programme in HIV-infected individuals: A pilot study. *Antiviral Therapy*, 11, 787–795.
- Feldman, J. G., Minkoff, H., Schneider, M. F., Gange, S. J., Cohen, M., Watts, D. H., et al. (2006). Association of cigarette smoking with HIV prognosis among women in the HAART era: A report from the women's interagency HIV study. *American Journal of Public Health*, 96, 1060–1065. doi:10.2105/AJPH.2005.062745
- Fiore, M. C., Jaén, C. R., Baker, T. B., Bailey, W. C., Benowitz, N. L., Curry, S. J., et al. (2008). *Treating tobacco use and dependence: 2008 update. Clinical practice guideline*. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service.
- Friedman, L. M., Furberg, C. D., & DeMets, D. L. (1998). *Fundamentals of clinical trials* (3rd ed.). New York, NY: Springer-Verlag.
- Gritz, E. R., Vidrine, D. J., Lazev, A. B., Amick, B. C., III, & Arduino, R. C. (2004). Smoking behavior in a low-income multiethnic HIV/AIDS population. *Nicotine & Tobacco Research*, 6, 71–77. doi:10.1080/14622200310001656885
- Ingersoll, K. S., Cropsey, K. L., & Heckman, C. J. (2009). A test of motivational plus nicotine replacement interventions for HIV positive smokers. *AIDS & Behavior*, 13, 545–554. doi:10.1007/s10461-007-9334-4
- Lazev, A., Vidrine, D., Arduino, R., & Gritz, E. (2004). Increasing access to smoking cessation treatment in a low-income, HIV-positive population: The feasibility of using cellular telephones. *Nicotine & Tobacco Research*, 6, 281–286. doi:10.1080/14622200410001676314
- Lifson, A. R., Neuhaus, J., Arribas, J. R., van den Berg-Wolf, M., Labriola, A. M., & Read, T. R. (2010). Smoking-related health risks among persons with HIV in the strategies for management of antiretroviral therapy clinical trial. *American Journal of Public Health*, 100, 1896–1903. doi:10.2105/AJPH.2009.188664
- Lloyd-Richardson, E. E., Stanton, C. A., Papandonatos, G. D., Shadel, W. G., Stein, M., Tashima, K., et al. (2009). Motivation and patch treatment for HIV+ smokers: A randomized controlled trial. *Addiction*, 104, 1891–1900. doi:10.1111/j.1360-0443.2009.02623.x
- Mamary, E. M., Bahrs, D., & Martinez, S. (2002). Cigarette smoking and the desire to quit among individuals living with HIV. *AIDS Patient Care & STDs*, 16, 39–42. doi:10.1089/108729102753429389
- Reynolds, N. R. (2009). Cigarette smoking and HIV: More evidence for action. *AIDS Education & Prevention*, 21, 106–121. doi:10.1521/aeap.2009.21.3_suppl.106
- Taves, D. R. (1974). Minimization: A new method of assigning patients to treatment and control groups. *Clinical Pharmacology & Therapeutics*, 15, 443–453.
- Vidrine, D. J. (2009). Cigarette smoking and HIV/AIDS: Health implications, smoker characteristics and cessation strategies. *AIDS Education & Prevention*, 21, 3–13. doi:10.1521/aeap.2009.21.3_suppl.3
- Vidrine, D. J., Arduino, R. C., Lazev, A. B., & Gritz, E. R. (2006). A randomized trial of a proactive cellular telephone intervention for smokers living with HIV/AIDS. *AIDS*, 20, 253–260. doi:10.1097/01.aids.0000198094.23691.58
- Webb, M. S., Venable, P. A., Carey, M. P., & Blair, D. C. (2007). Cigarette smoking among HIV+ men and women: Examining health, substance use, and psychosocial correlates across the smoking spectrum. *Journal of Behavioral Medicine*, 30, 371–383. doi:10.1007/s10865-007-9112-9
- Wewers, M. E., Neidig, J. L., & Kihm, K. E. (2000). The feasibility of a nurse-managed, peer-led tobacco cessation intervention among HIV-positive smokers. *Journal of the Association of Nurses in AIDS Care*, 11, 37–44.