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Smoking Cessation Interventions in HIV-Infected Adults in North America: A Literature Review

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Abstract

Cigarette smoking is more prevalent in HIV-infected adults when compared to the general population (50–70%) and is linked to increased morbidity and mortality in this population. Of important clinical relevance, however, 40% of HIV-infected smokers express a willingness to attempt smoking cessation and two-thirds are interested in or considering quitting when asked. The purpose of this paper is to provide a state of the science review of the extant literature on smoking cessation interventions in HIV-infected adults. A comprehensive search of a computerized database for articles appearing in peer-reviewed journals was conducted. The integrative review included 10 articles from medical and nursing journals. Smoking cessation rates ranged from 6%-50% across studies employing pharmacologic and behavioral approaches. Samples sizes were frequently small and the effect was often not sustained over time. Emotional distress was related to smoking behaviors and may have been a barrier to successful smoking cessation. Adherence to pharmacologic therapy often declined over time and may have contributed to low cessation rates. Nicotine replacement therapy combined with a cell phone-delivered intensive counseling intervention showed promising results. Given the high prevalence of smoking among adults infected with HIV, this review supports the need for the development and implementation of innovative and effective interventions tailored to this population that will ultimately result in lower smoking prevalence and improved overall health.

Keywords

HIV; AIDS; Smoking; Smoking cessation; Tobacco dependence

Introduction

Advances in the medical treatment of persons infected with human immunodeficiency virus (HIV) over the past 25 years have led to an increased lifespan for HIV-infected individuals. In fact, recent studies show that mortality rates for HIV-infected persons now mirror that of the general population [1,2]. Over the past 10 years, however, cardiovascular disease (CVD) has emerged as a major cause of morbidity and mortality in adults with HIV-infection [3–6]. Cigarette smoking, a traditional risk factor for CVD, is more prevalent in this population and

contributes to the elevated rate of risk [3,7–9]. In addition, smoking in this population has been associated with increased rates of pulmonary diseases and infections, including bacterial pneumonias, lung cancers, and other malignancies [10,11]. Furthermore, HIV-infected smokers lost more years due to cigarette smoking than to HIV infection in a recently published study [12].

Smoking rates are substantially higher in HIV-infected individuals compared with the general population where the reported prevalence is approximately 19% [13]. Many studies in HIV-infected adults report current smoking rates of 50–70% [3,8–9,14–19]. A recent cross-sectional study of HIV-infected adults, however, found that fewer than 8% of current smokers were involved in smoking cessation efforts [17]. Of important clinical relevance is that 40% of HIV-infected smokers express a willingness to attempt smoking cessation [14] and two-thirds are interested in or considering quitting when asked [19]. Burkhalter and colleagues found that 42% of HIV-infected smokers were in the pre-contemplation stage of readiness, 40% were contemplating smoking cessation, and 18% were preparing to quit smoking [15]. Addressing smoking cessation with this group of individuals has important implications for the reduction of CVD risk and improved overall health.

The purpose of this paper is to provide a review of the extant literature on smoking cessation interventions in HIV-infected adults. This integrative review will summarize past research findings to provide a comprehensive understanding of the state of the science. Finally, gaps in the literature will be highlighted and directions for future research will be suggested.

Methods

Search Strategy and Data Sources. A comprehensive search of PubMed®, a computerized database, was conducted, searching for published articles in English that appeared in peer-reviewed journals between 2000 and 2013. Key search terms were *HIV*, *smoking cessation*, and *tobacco dependence*. A secondary search was conducted by reviewing the reference lists of gathered literature. Hand searching of relevant journals in the field of HIV medicine and nursing was performed to identify any articles that may have been missed in the computer search. This initial search yielded 208 articles.

Study inclusion criteria

Abstracts were thoroughly read and reviewed. Articles for the review were selected if they (1) reported original study data, (2) described findings from a smoking cessation clinical trial conducted in North America, in which the sample included HIV-infected smokers, and, (3) had a follow-up period of at least three months. Articles were omitted if they (1) only discussed the prevalence or clinical management of HIV-infected smokers, (2) did not present findings from a smoking cessation clinical trial, or, (3) were written in a language other than English. Abstracts, unpublished manuscripts and dissertations were excluded from the review.

Analyses and study selection

Manuscripts were reviewed to assess key information, such as size of the sample studied, length of follow-up, type of intervention, quit rate, correlates of cessation, and barriers to

success. These data were extracted and entered into a review matrix [20]. Two smoking cessation trials had a follow-up period of less than three months (2 weeks, 4 weeks) and were excluded. One article, published only in Spanish, and three studies conducted outside of North America were also excluded. The integrative review included 10 articles discussing original study data from medical and nursing journals (Table 1). Eight of the 10 studies were published within the last four years, possibly reflecting the more recent focus on primary prevention and health promotion in HIV-infected individuals.

Results

Smoking cessation rates in the 10 published trials ranged broadly (6%-50%) and periods of follow-up were generally 3–12 months, with most studies including three months of follow-up post-intervention. Of the 10 studies selected for review, six were designed as randomized clinical trials, and eight were published since 2009. Consistent with federal guidelines [21], most studies combined a behavioral component along with adjuvant pharmacologic treatment in the intervention.

Nonrandomized trials

A 24-week open-label pilot study of varenicline, a nicotinic receptor agonist, found that 28% of participants (N=36) reported abstinence from smoking at the end of treatment [22]. Self-reported abstinence was confirmed by serum cotinine levels at week 12. The sample was 97% male, 92% White, 86% taking antiretroviral therapy, and 81% had undetectable HIV viral loads. Mean FTND score was 5.4. All participants received self-help reading materials and were counseled by a physician or trained smoking cessation counselor, per the U.S. federal guidelines [21]. Self-reported 7-day point prevalence abstinence was 50% at week 12 and 42% at week 24. Forty-seven percent of participants never quit, but reduced the number of cigarettes smoked daily. Tolerability was a major issue for all participants, and study dropout, attributed to treatment-related nausea and abnormal dreams, was high (28%) [22].

A 12-week nonrandomized clinical trial (N=228) compared varenicline to NRT [23]. Participants in both arms received smoking cessation counseling per the federal guidelines for 12 weeks delivered by a trained advanced practice nurse. The initial session was face-to-face followed by 11 telephone sessions. Saliva cotinine and expired carbon monoxide confirmed abstinence. Quit rates were 11.8% and 25.6% for NRT and varenicline, respectively, and the odds of abstinence for the varenicline group was 2.75 (95% CI 1.57–4.84) compared to the NRT arm. The study limitations included nonrandomization and significant dropout (14.4%) in the varenicline arm [23].

A culturally tailored smoking cessation intervention (N=31) aimed at African-American HIV-infected men who have sex with men (MSM) tested the feasibility of a six session group-based treatment combined with 4 weeks of NRT [24]. Adherence to NRT (39%) and quit rates at one month (24%) and three months (6%) were low. Retention in the study however was high (87% at 3-months) indicating the feasibility and acceptability of a culturally tailored smoking cessation intervention. Treatment completion was associated with fewer daily cigarettes smoked ($p<.05$) and lower depression scores ($p=.05$) at 3-months compared to baseline.

One study examined the effectiveness of nurse-delivered smoking cessation interventions among HIV-infected smokers. This study (N=15) examined an 8-week pilot of a nurse-managed, peer-led intervention utilizing NRT for 6 weeks with weekly counseling and skills training compared to mailed written self-help materials [25]. Participants in the active intervention arm received in-person 30 minute counseling sessions at weeks 1, 3, and 8, and 10–15 minute phone sessions on alternate weeks. At study end, 62.5% were abstinent in the intervention arm compared with 0% in the control arm. At an 8-month assessment, 50% of participants who received the active intervention remained abstinent compared with 0% in the control group. Self-reported abstinence was confirmed by expired air carbon monoxide analysis. Limitations of this study included the small sample size and lack of randomization.

Randomized clinical trials

Six randomized clinical trials in HIV-infected adult smokers have been reported in the literature. Three trials found that there was no difference between groups using different forms of behavioral therapies combined with NRT [26–28]. Motivational interviewing [26], motivational enhancement therapy [27], and intensive counseling [28] were compared to standard or usual care along with nicotine replacement patches. Over the 12–24 weeks of follow-up in each study, using 7-day point prevalence and carbon monoxide levels as the outcome measures, no group differences were found in any of the studies. Additionally, abstinence rates tended to be low (9%) overall [27] and psychosocial factors, such as loneliness, were inversely related to abstinence [28]. Smoking cessation self-efficacy and attendance at more than seven sessions were associated with higher quit rates [28].

A pilot study compared NRT combined with either usual care or a cell phone-delivered intensive (CPI) counseling intervention [29]. Ninety-five participants from a large, inner city HIV clinic were enrolled. The usual care group received brief advice, self-help smoking cessation materials, and NRT. The intensive (CPI) group received eight cell-phone delivered counseling sessions in addition to the usual care components. Study retention was high with 81% of participants completing the 3-month follow-up. Biochemically-verified 7 day point prevalence was the primary outcome. At 12 weeks, the participants in the CPI arm were 3.6 times more likely to be abstinent from tobacco with quit rates of 36.8% compared with 10.3% in the usual care arm ($p = .0059$). The investigators concluded that cell phone delivered smoking cessation counseling is acceptable and feasible in HIV-infected smokers.

The largest RCT to date in HIV-infected smokers (N=474) reported preliminary data indicating that at 12 weeks, the CPI group was 4.3 times more likely to be abstinent compared to the usual care group. This study is ongoing and will examine treatment effect at both six and twelve months [30].

Finally, a recent randomized trial compared individual face-to-face counseling (based on cognitive behavioral therapy techniques), computer-based counseling, and a “self help” standard care condition. Participants (N=209) in all three treatment conditions received NRT for 10 weeks [31]. At 52 weeks, there were no differences in the smoking cessation rates in the three groups and quit rates ranged from 15% to 29% ($p > .05$). Current employment, desire to quit, and lower mood disturbance scores were associated with successful smoking cessation ($p < .01$).

Discussion

HIV-infected adults are at significant risk for cardiovascular disease compared to their uninfected counterparts. While the etiology of this heightened risk is multi-factorial, the high prevalence of cigarette smoking is likely a contributor to the increased rate of risk. Cigarette smoking also contributes to heightened risk for pulmonary disease and malignancies in this population. Determining how best to affect smoking cessation outcomes in HIV-infected adults is imperative.

A review of the clinical trials published to date reveals that HIV-infected patients may benefit from smoking cessation interventions, but the samples and effect sizes are frequently small and behavior change is often not sustained over time. The protocols often target highly motivated smokers who are engaged in medical care. Many of the studies have nonrandomized samples with self-reported abstinence as the outcome measure, not confirmed by biochemical markers such as salivary cotinine or expired air carbon monoxide. Hence, the findings may be difficult to interpret and may not be generalizable to the general population of HIV-infected smokers. The most recent trials seem to be more rigorous and have addressed some of these limitations [27–31] by enrolling larger samples, employing randomization, and examining biochemical markers as well as 7-day point prevalence as their outcome measures. Duration of follow-up, however, remains limited at 12- and 24-weeks in many studies [27–30].

Similar to non-infected individuals [32], emotional distress is often reported to be related to smoking behaviors and may act as a barrier to successful smoking cessation in HIV-infected adults [15,31,33,34]. HIV-infected smokers reported that smoking improved their sense of wellbeing and helped them cope with emotional distress, anxiety and depressive symptoms [34]. A small, prospective study in Europe (N=21) reported that bupropion, an antidepressant approved for smoking cessation, was effective in maintaining abstinence among HIV-infected smokers (38% at one year) and, despite its hepatic metabolism, tolerability and drug-drug interactions were not found to be an issue [35]. Designing interventions that address negative affect and stressors related to relapse, or that increase positive affect may improve smoking cessation outcomes in this population.

Adherence to pharmacologic therapy, including NRT, was often low or declined over time [22,24,26,33] and may have contributed to low cessation rates. In the general population, studies have consistently demonstrated that the use of NRT more than doubles one's chances of quitting successfully and positive outcomes are associated with adherence to therapy [36]. Adherence to antiretroviral therapy (ART) in HIV-infected adults has been extensively examined in both research and practice. Perhaps adapting or applying ART adherence protocols to pharmacologic-assisted smoking cessation efforts would improve adherence to pharmacologic-assisted smoking cessation clinical trials. Cell phone-delivered intensive counseling with NRT was shown to have a significant effect on outcomes when compared to usual care [29,30]. Adherence messages delivered via cell phone may also improve outcomes.

Smoking cessation outcomes varied by race and ethnicity with Blacks/African Americans responding less favorably to motivational interviewing interventions in the trials [27,28]. Minority populations are disproportionately affected by the HIV epidemic, and therefore determining which interventions are most effective for different ethnic and cultural groups are important considerations. Matthews et al. [24] designed and tested a culturally appropriate intervention for African-American MSM HIV-infected smokers. Although quit rates were not remarkable (6% at 3-months), feasibility and acceptability of the intervention were supported and study completion rates were impressive (87%).

Finally, the importance of understanding the beliefs, factors, and intentions that influence smoking behaviors in this population is theoretically supported. Individuals' perceptions or definitions of an illness threat may influence their health-related behaviors, their decisions, and their motivation to change [37–39]. Reynolds et al. (2004) found that HIV-infected male smokers believed that, although smoking had potential negative health consequences, they did not believe that they would live long enough for the smoking related consequences to affect their health status [40]. Education programs need to be developed to address misperceptions held by individuals living with HIV as a chronic illness.

One small study (N=34) in HIV-infected adults at risk for heart disease used cognitive behavioral therapy (CBT) combined with NRT, and reported quit rates of 38% compared to 7% in historical controls [41]. Framingham Risk Scores and advanced age were the only predictors of smoking cessation success at 12 months. A 24-month study based on the Transtheoretical Model of Change [42], trained immunology physicians in smoking cessation counseling techniques during a half-day course. Smoking prevalence data were then extracted from patient records over a two-year period, and a 17% decrease in smoking prevalence (60% to 43%) over the study period was reported. The odds ratio (OR) of quitting smoking was significant (OR 1.23; CI 1.07–1.42; P=0.004) when compared to study sites where physicians did not receive the training [43]. Perhaps HIV-infected smokers who receive CVD risk reduction counseling from their health care providers have increased motivation to quit smoking. A tailored smoking cessation intervention that provides personalized feedback messages could not only help to clarify illness beliefs and perceptions, but also may serve as an important motivator for behavior change.

Given the high prevalence of cigarette smoking among HIV-infected adults, the development of effective smoking cessation programs is critical to reduce tobacco use in this population. To date, research efforts demonstrate only small to modest effect sizes and further study is needed. This review supports the need for the development of innovative interventions tailored to this population. These interventions have the potential to result in increased motivation for smoking cessation, reduction of cardiovascular risk and improved overall health in HIV-infected adults.

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Table 1

Smoking cessation trials in HIV-infected adults.

Author	Design; (N)	Purpose/intervention/follow up	Outcomes
Humfleet [31]	RCT; (209)	To compare efficacy of 3 smoking cessation interventions: NRT with counseling, or Internet-based counseling, or self-help material; 52 weeks	Smoking abstinent rates 15–29%, $p>.05$, no difference among treatment groups. Lower mood disturbance scores associated with abstinence.
Matthews [24]	NR; (31)	Feasibility study of culturally tailored intervention for AA males; 7-session group treatment with NRT; 3 months	87% retention at 3 months; 52% attended all 6 sessions; 7-day PP at 3 months 6.4%; past year alcohol use 80%
Cui [22]	NR; (36)	12 week open-label varenicline pilot; 6 months	28% study drop out; 4-week CAR 42% through week 12 and 28% through week 24
Ferketich [23]	NR; (228)	12 weeks of telephone counseling with NRT or varenicline; 3 months	Confirmed abstinence at 3 months: 11.8% NRT, 25.6% varenicline, OR 2.75, 95% CI 1.57–4.84
Moadel [28]	RCT; (145)	Intensive group therapy (8 sessions) compared to standard care; all received NRT; 3 months	Biochemically confirmed 7-day PP: 19.2% vs. 9.7%, $p=0.11$; lower loneliness scores associated with abstinence; attendance of at least 7 sessions associated with higher quit rates
Vidrine [30]	RCT; (474)	UC compared to CPI, all received NRT; 3 months	7-day PP 3% in UC group vs. 12% in CPI; OR 4.3, 95% CI 1.9, 9.8, $p<.0001$
Ingersoll [26]	RCT; (40)	Self-guided reading plus NRT vs. MI plus NRT; 3 months	87.5% completed 3-month follow-up; no significant difference in biochemically confirmed abstinence between groups
Lloyd-Richardson [27]	RCT; (444)	UC (2 brief sessions) plus NRT vs. MET (4 sessions) plus NRT; 6 months	72% completed 6-month follow-up; Abstinence at 6-months: MET 9% vs. UC 10%; $p>0.76$
Vidrine [29]	RCT; (95)	UC vs. CPI; all received NRT; 3 months	Abstinence in 24-hours prior to assessment: 10.3% vs. 36.8%; OR 5.6, 95% CI 1.4–22.4, $p=0.016$
Wewers [25]	NR; (15)	NRT plus weekly face-to-face or telephone counseling vs. written self-help materials; 8 months	8 month biochemically confirmed abstinence: 50% vs. 0% ($\chi^2 = 7.41$, $p=0.006$, $df=1$)

Note: RCT: Randomized Clinical Trial; NR: Nonrandomized; CAR: Continuous Abstinence Rate; PP: Point Prevalence; UC: Usual Care; CPI: Cell Phone Intervention; MI: Motivational Interviewing; MET: Motivationally Enhanced Treatment