Curr HIV/AIDS Rep (2011) 8:269–276
DOI 10.1007/s11904-011-0092-6

Secondary HIV Prevention: Novel Intervention Approaches to Impact Populations Most at Risk

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Published online: 12 August 2011

Abstract This paper reviews recent secondary prevention interventions designed to reduce sexual risk behaviors among people living with HIV/AIDS (PLWHA). A summary of findings from previous meta-analyses and narrative reviews of interventions is provided. Next, novel HIV prevention approaches for PLWHA are reviewed. The review reports on the efficacy of interventions delivered in primary care settings or by technology-formats, interventions that also address mental health difficulties, and programs to address particular at-risk populations (eg, men who have sex with men). A critique of recent interventions for people living with HIV/AIDS is provided as well as suggestions for future research.

Keywords HIV/AIDS · Public health · Research synthesis · Review · Behavioral interventions · Secondary prevention · Sexual transmission of HIV

Introduction

The Centers for Disease Control and Prevention estimates that there are now more than 1 million people living with HIV/AIDS (PLWHA) in the United States (US) currently, with approximately 53,600 new HIV infections diagnosed annually [1, 2]. Highly active antiretroviral therapy (HAART) has improved the long-term health outlook of PLWHA and has markedly decreased HIV-related mortality [3, 4]. While an HIV diagnosis is initially accompanied by decreases in sexual risk behavior [5], improvements in PLWHA's health status are associated with increased risky sexual practices [6]. Indeed, one study noted that between 20% and 30% of PLWHA reported unprotected sexual encounters a year after being diagnosed with HIV [7]. Unprotected sexual encounters pose the risk of HIV transmission to uninfected partners and increased possibility of negative health consequences for PLWHA through acquisition of other sexually transmitted infections (STIs) or drug-resistant HIV strains [8–11]. Thus, the development of effective sexual risk reduction interventions for PLWHA is critical from a broader societal perspective, to reduce the risk of new infections among HIV-negative sex partners, and from an individual perspective, to reduce the adverse health consequences associated with exposure to STIs and drug-resistant strains of HIV.

Early in the HIV epidemic, prevention efforts focused primarily on *primary prevention* to decrease HIV risk behaviors among uninfected individuals. In contrast, *secondary prevention* refers to interventions designed to reduce sexual risk behaviors among PLWHA. Secondary prevention efforts are essential since only HIV-infected individuals can transmit HIV [12, 13]. Additionally, PLWHA who engage in unprotected sex may acquire syphilis, gonorrhea, chlamydia, or other STIs [8]. In addition to deleterious STI symptoms, comorbid STIs among PLWHA can increase HIV transmission [14, 15] and accelerate HIV disease progression [16]. PLWHA may also be exposed to more virulent multidrug-resistant strains of HIV [9] or HIV super-infection [10, 11]. Given the health risks posed by unprotected sex to PLWHA and their uninfected partners, the World Health Organization identified secondary prevention as an urgent public health priority [17]. Existing

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reviews of secondary prevention trials for PLWHA suggest promising intervention effects, with reductions in sexual risk practices similar to studies of uninfected populations [18•, 19•].

In this review, we provide a summary of key findings from previous narrative reviews and meta-analyses that have examined the efficacy of secondary prevention interventions for PLWHA [18•, 19•, 20•, 21]. Next, we update the existing reviews by highlighting novel secondary prevention interventions designed to reduce sexual risk behaviors among PLWHA. Specifically, we describe core components of recent intervention approaches, review intervention efficacy findings, summarize intervention strengths and weaknesses, and offer guidance for future research.

Literature Search Method and Criteria for Inclusion

Database searches of PsycINFO, PsycARTICLES, Medline, and PubMed were conducted to identify published articles in peer-reviewed journals that evaluated sexual risk reduction interventions for PLWHA. Combinations of the following search terms were used to identify relevant articles: HIV prevention, behavioral intervention, secondary prevention, sexual risk reduction, intervention, HIV, HIV-positive, HIV-infected, and AIDS. A search of references cited in relevant studies was conducted to identify additional articles. English language articles published in peer-reviewed journals were screened for inclusion. Studies were included if they met all of the following criteria: 1) the intervention included content to reduce sexual risk behaviors (eg, increase condom use, decrease number of sexual partners); 2) the study's sample was composed of only PLWHA; and 3) the intervention did not focus exclusively on perinatal HIV transmission. For this review, we excluded studies that were not conducted with US samples. Studies included in previous reviews were not separately reviewed; instead a summary of previous meta-analyses and review papers is provided.

Summary of Previous Secondary Prevention Reviews

To date, two meta-analyses [18•, 19•] and two narrative reviews [20•, 21] have reviewed the secondary prevention literature. In what follows, we provide a succinct summary of findings from each of the reviews. For the meta-analyses, we summarize the format of the interventions, describe study sample characteristics, report on the efficacy of reviewed interventions, and note intervention characteristics associated with differential intervention efficacy.

Gordon and colleagues [21] first summarized the state of secondary prevention interventions in 2005. This review provided an overview of 13 initial secondary prevention interventions that were either completed or currently in progress. Among the six completed trials [22–27], five were rigorous randomized controlled trials (RCTs) that demonstrated efficacy in modifying sexual risk behaviors. Additionally, of trials currently underway as this review was published, there was preliminary evidence for intervention feasibility and efficacy for programs targeting particular populations at increased HIV risk (eg, serodiscordant couples). This review noted that existing interventions were conducted with individuals or among small groups using variations of social-cognitive theory to guide the intervention framework.

Crepaz and colleagues [18•] conducted a meta-analysis of 12 secondary prevention interventions implemented between 1998 and 2004 [22–33]. The majority of interventions (67%) utilized a small group intervention format led by health care workers (75%) or peers (41%). Most studies recruited primarily males, with only one intervention trial conducted with women. Four of the 12 studies had samples comprised of more than two-thirds men who have sex with men (MSM); three studies enrolled injecting drug users (IDU) or other PLWHA who abuse other substances. Across studies, the interventions were efficacious in reducing the frequency of unprotected sex and STIs. However, no significant effects for reduced needle sharing were observed. Interventions that were based on a behavior change theory and incorporated content to change specific HIV risk behaviors by fostering skill development were most efficacious. In addition, intensive interventions that were delivered by health care workers where PLWHA receive medical or related services demonstrated increased efficacy. Lastly, interventions that also addressed related concerns of PLWHA including mental health problems or difficulty maintaining medication adherence showed particular promise.

In a second meta-analysis, Johnson and colleagues [19•] reviewed 15 secondary prevention interventions published between 1993 and 2004 [22–24, 26–29, 32–41]. Eleven studies were conducted with only HIV-infected individuals, while four studies also included at-risk HIV-uninfected participants. Most studies recruited primarily male (64%) and African American (49%) individuals. Results indicated that the reviewed interventions increased condom use, but there were no differences in the reported number of sexual partners between the intervention and control conditions. Interventions demonstrated increased efficacy when content included both motivational and behavioral skills training. When examining sample characteristics associated with differential efficacy, increased efficacy was noted among younger PLWHA, with interventions conducted with MSM

demonstrating limited efficacy in reducing sexual risk behaviors.

In 2009, Fisher and colleagues [20•] reviewed 11 secondary prevention studies conducted with US and international PLWHA [42–52]. Unlike earlier interventions for PLWHA that typically utilized a small group format, studies chronicled in this review utilized a diverse range of intervention approaches to reduce sexual risk behavior. For example, three studies utilized Motivational Interviewing delivered by health care workers [42, 43] or via computer [44]. Other intervention approaches focused on addressing co-occurring challenges including mental health difficulties (eg, trauma) [48], substance use [49–51], and initiation of antiretroviral medication [45]. Across studies, interventions were successful in reducing sexual risk behaviors, including fewer unprotected sexual encounters and sexual partners.

In summary, secondary prevention interventions demonstrate great promise for reducing a range of sexual risk behaviors. However, there is less support for secondary prevention interventions to decrease needle sharing or the sexual risk behaviors of MSM and older adults. Efficacious interventions were guided by theory (eg, social-cognitive theory) and incorporated content to increase PLWHA's motivation and behavioral skills to reduce sexual risk behaviors. While the earliest secondary prevention interventions were typically delivered in a small group format with most content geared toward reducing sexual risk behaviors, more recent interventions have been implemented within HIV medical settings and address additional challenges faced by PLWHA.

Novel Secondary Prevention Intervention Approaches

The goal of this segment of the review is to highlight novel secondary prevention interventions that have either been published since Fisher and colleagues' review paper [20•] or were not included in previous reviews. Interventions fall into one of four categories: 1) interventions delivered in primary care settings; 2) technology-delivered interventions; 3) interventions that seek to reduce sexual risk behaviors and psychological distress; and 4) interventions that target specific at-risk populations including MSM, serodiscordant couples, older individuals, and women.

Secondary Prevention in Primary Care Settings

Given the complex medical and related health care needs of PLWHA there is an emphasis on providing comprehensive services through funding programs such as the Ryan White Act [53]. Such care centers offer the potential to provide sexual risk reduction interventions to PLWHA within the context of their routine medical care. To address this secondary prevention need, the Health Resources and Services Administration funded an initiative to develop and evaluate secondary prevention interventions delivered in the context of primary care settings [54]. While a number of papers have reported on the development and implementation of such intervention programs [55–58], two recent studies report outcomes from secondary prevention interventions delivered by medical providers in primary HIV care [59, 60].

In one study, Gardner and colleagues [60] gave medical providers a 4-hour training session intervention to improve their communication skills and ability to provide behavioral sexual risk reduction counseling. The study measured patients' behaviors over 12 months and observed that patients' frequency of unprotected sexual encounters decreased; more frequent discussions with providers about sexual risk reduction were associated with incremental decreases in sexual risk behavior [60]. In a second study, Rose and colleagues [59] randomized HIV medical care providers to either a 4-hour training to improve their ability to conduct sexual risk behavior assessments and deliver tailored, individualized risk reduction messages or a standard care condition. At a 6-month follow-up, patients whose providers completed the training reported increased discussions surrounding safer sex and more frequent assessment of risk behaviors by their providers; patients also reported having fewer sexual partners [59].

Technology-Delivered Secondary Prevention Programs

Secondary prevention interventions have typically been administered in a group format led by a health care provider or an experienced health educator. These treatment programs often involved multiple sessions and a significant time commitment. Although group-delivered training provides the added benefit of fostering social support, some PLWHA may be reticent to attend groups due to confidentiality concerns or dislike of group meetings. Thus, the usefulness of group sexual risk reduction interventions may be limited to the subset of patients who are willing to participate in a group-based program. Group interventions also require significant financial resources to implement and may not be feasible in some resource-limited clinic settings. To address these concerns, a promising approach is the use of technology-delivered approaches to secondary prevention.

One such intervention utilized a web-based sexual risk reduction intervention for adolescent PLWHA that was accessed by youth while waiting for their scheduled medical appointments [61]. In a pilot-test of this intervention, adolescents and clinic staff found the program to be acceptable and feasible within the constraints of usual clinic flow [61]. Additionally, the intervention demonstrated

efficacy for increasing antecedent constructs of sexual behavior, including condom use self-efficacy and increased desire to wait before having sex [61]. A second intervention utilized a computerized assessment within a primary care setting to conduct a sexual behavior risk assessment and measure an individual's readiness for changing their sexual behavior [62]. The results of this computerized assessment generated a provider advice sheet and a prescription to reduce the reported risk behaviors [62]. In turn, providers utilized the risk assessment and behavior change prescription to discuss sexual risk reduction with their patients [62]. In the initial process evaluation of the intervention, HIV medical service providers reported increased confidence in discussing sexual risk strategies with their patients [62]. However, this study also found that providers' attitudes toward HIV prevention did not improve as the result of the intervention.

Secondary Prevention and Mental Health Interventions

Evidence suggests that PLWHA experience high rates of mental health difficulties and substance abuse problems [63, 64]. Recent reviews suggest that cognitive-behavioral interventions tailored to the unique concerns of PLWHA can result in significant decreases in depressive symptoms, anxiety levels, and overall stress [65–67]. A number of studies also highlight the efficacy of substance use interventions for PLWHA to reduce the use of alcohol [68, 69], opiates [70], injection drugs [71], and crack cocaine [72]. While there are efficacious interventions to address the psychological needs of PLWHA, PLWHA with mental illness often have limited access to psychiatric treatment and do not receive adequate mental health services [73]. Unfortunately, untreated mental illness may be associated with increased health risk behaviors by PLWHA, including unprotected sexual encounters [74, 75]. Additionally, a minority of secondary prevention interventions incorporates mental health treatment [76, 77].

Despite the clear need for both mental health treatment and secondary prevention, few interventions have addressed both of these needs. In one such intervention trial, Wyatt and colleagues [78] developed and evaluated an intervention for HIV-infected women with histories of child abuse. The intervention consisted of 11 cognitive-behavioral sessions designed to reduce sexual risk behaviors, improve medication adherence, and address psychological symptoms [78]. This intervention had a particular focus on addressing the association between childhood sexual abuse and the individual's current cognitive, affective, and behavioral patterns [78]. Results indicate that women assigned to the treatment group reduced their sexual risk behaviors and reported improved medication adherence, particularly among participants attending more of the group sessions [78]. Similarly, Sikkema and colleagues [48] evaluated a 15-session intervention for HIV-infected women and men with abuse histories and found that participants in the treatment condition reported decreased frequency of unprotected sex relative to the support group control condition.

Secondary Prevention Tailored to Specific At-Risk Populations

MSM

MSM continue to experience elevated rates of HIV infection [79], but previous interventions with MSM have demonstrated limited efficacy in reducing sexual risk behaviors [19•]. Two recent studies have examined the efficacy of secondary prevention interventions for MSM [80, 81]. Rosser and colleagues [81] recruited 675 HIV-infected MSM who were randomized to one of three conditions: 1) a weekend, 14-hour to 16-hour, large group-delivered intervention to reduce sexual risk behaviors with a focus *specific to HIV-infected MSM*; 2) a weekend, 14-hour to 16-hour, large group-delivered intervention to reduce sexual risk behaviors with a focus on *MSM more broadly*; or 3) a 3-hour group session utilizing HIV prevention videos for MSM. Those in the two more intensive intervention conditions reported greater intentions to reduce sexual risk behaviors; however, there were equivalent reductions in unprotected anal sexual encounters with serodiscordant partners across conditions [81]. In a second trial, Lapinski and colleagues [80] compared the efficacy of an intervention combining group and individual-counseling to an individual-counseling only condition to improve communication skills related to sexual risk reduction. HIV-infected MSM in the combined treatment group demonstrated improvements in desire to not engage in sexual encounters when under the influence of alcohol or drugs, improved communication skills, and increased likelihood of disclosing their HIV serostatus to partners [80]. However, there were no differences in perceived norms regarding sexual behaviors or HIV knowledge [80].

Serodiscordant Couples

In the US, African Americans have experienced disproportionately elevated rates of HIV/AIDS relative to other racial groups [1]. Among African American women, the most common form of HIV transmission is via heterosexual contact, and this is the second most common transmission mode among African American men [1, 82]. To reduce rates of HIV transmission, the multisite Eban intervention was conducted to examine the efficacy of couples-based secondary prevention among couples with one HIV-infected

partner and one uninfected partner [83]. In this large randomized controlled trial, 535 couples were randomly assigned to either an intervention consisting of eight weekly 2-hour sexual risk reduction sessions led by male and female co-facilitators or a time-equivalent health promotion comparison condition [83]. Couples in the treatment condition reported increased condom-protected encounters, consistent condom use, and fewer unprotected sexual encounters at the 12-month follow-up [83]. However, there were no differences in STI rates or rates of concurrent partners between the intervention and control conditions over the follow-up period [83].

Older Adults

In the meta-analysis conducted by Johnson and colleagues [19•] they found that secondary prevention interventions demonstrated greater efficacy for sexual risk reduction among younger individuals. Given the improved long-term prognosis of PLWHA with HAART medication, there is a clear need for secondary prevention programs to sustain engagement in safer sexual practices for older individuals. However, only one intervention has been designed for older PLWHA [84]. The intervention consisted of four sessions based on the Information-Motivation-Behavior skills model of HIV risk behavior tailored to the prevention needs of PLWHA who were 45 years or older [84]. Relative to a comparison condition consisting of an educational HIV prevention brochure, those in the treatment group reported decreased unprotected sexual encounters with all partners, but particularly with HIV-negative or unknown serostatus partners [84]. However, participants in both conditions demonstrated overall reductions in sexual risk behaviors [84].

Women

Rates of HIV infection are on the rise among several subgroups in the US, including low-income, minority women [82]. However, relatively few secondary prevention programs have been developed to decrease sexual risk behaviors among HIV-infected women. As described in previous reviews, Wingood and colleagues [27] developed an efficacious four-session gender and culturally tailored intervention for African American HIV-infected women that resulted in decreased unprotected sexual encounters, fewer STIs, and improved related HIV risk reduction constructs (eg, condom use self-efficacy, HIV knowledge). In a newly developed intervention, Teti and colleagues [85] described the development of a multifaceted intervention for HIV-infected women that included prevention messages delivered by PLWHA's clinicians, a group-based intervention led by a health educator, and a peer-led support group. While a multicomponent intervention shows promise, the authors identified a number of feasibility concerns including staff burden for administering the intervention and challenges enrolling and retaining women in the program that resulted in poor intervention participation [85].

Conclusions

The first generation of secondary prevention interventions demonstrates promise for reducing sexual risk behaviors among PLWHA [18•, 19•, 20•]. While previous intervention approaches typically relied on multiple group-delivered intervention sessions, more recent secondary prevention interventions have been integrated within routine medical care for HIV using formats that have the potential to be more cost effective to implement (eg, brief provider-delivered approaches). In particular, interventions to improve HIV medical providers' ability to incorporate sexual risk reduction within routine care show potential for delivering tailored, individualized prevention messages to PLWHA on an ongoing basis. Additionally, technology-based risk assessments may serve as an effective adjunct to secondary prevention within primary care. To advance such interventions, strategies to bolster the long-term efficacy of provider-delivered interventions are needed. Additional research to understand characteristics of PLWHA for whom briefer, provider-delivered prevention is most effective is needed. In turn, the use of an adaptive intervention approach [86] could facilitate ongoing assessment of sexual risk behaviors and guide the selection of an appropriate intervention approach for a particular individual.

Newer interventions that provide a combined focus on sexual risk reduction and mental health treatment [76, 78] may be more acceptable to PLWHA [87] and offer the potential to reduce both psychological distress and sexual risk behaviors. Indeed, both of the reviewed interventions were successful in reducing sexual risk behaviors, while also addressing psychological distress associated with a history of childhood sexual abuse [76, 78]. Unfortunately, secondary prevention interventions to address sexual risk reduction for PLWHA with more severe mental illness are lacking [65, 77]. First, improving strategies to identify PLWHA with mental health concerns as part of routine HIV care is needed [73]. Psychiatric treatment provided within the context of comprehensive HIV care may be an optimal forum to integrate secondary prevention. Similar to the primary care model of secondary prevention delivery, mental health professionals treating PLWHA may benefit from additional training to address HIV-specific concerns and incorporate prevention messages as a part of mental health treatment.

With the improved long-term prognosis following an HIV diagnosis, secondary prevention intervention approaches to target subpopulations at increased risk for either transmitting HIV or experiencing negative health consequences are needed. Interventions such as Eban that provided a couples-delivered intervention demonstrated efficacy to address the complicated sexual behavior dynamics within serodiscordant couples [83]. Interventions that move beyond individual-level approaches to behavior change should be examined to address sexual risk behavior reduction within the broader socio-ecological context. For example, secondary prevention interventions could be bolstered by complementary structural interventions [21]. In addition, efficacious interventions are needed for specific subpopulations. Thus far, secondary prevention interventions have demonstrated limited efficacy for MSM. Targeting other high-risk groups, such as incarcerated individuals or those with comorbid substance abuse or mental illness, is also urgently needed.

As we enter the third decade of the HIV epidemic, continued secondary prevention intervention efforts are needed to reduce the number of new HIV infections and promote PLWHA's sexual health. While initial prevention efforts were directed toward primary prevention, the growing body of secondary prevention literature highlights a number of efficacious intervention approaches. Moving forward, strategies to disseminate efficacious interventions to reach a larger number of PLWHA are needed. Programs such as the CDC's Dissemination of Evidenced-Based Interventions offer one approach to promote widespread use of secondary prevention interventions. Ultimately, intervention approaches that can be effectively delivered in resource-limited settings and result in reduced sexual risk behaviors offer great potential to improve the health of PLWHA and also prevent the spread of HIV to uninfected partners.

Acknowledgments This research was supported by a grant from the National Institute of Mental Health (5R01 MH070537) to Ralph J. DiClemente (PI). Additional support was provided by the Emory Center for AIDS Research (P30 AI050409). Jennifer L. Brown was supported by K12 GM000680 from the National Institute of General Medical Sciences.

Disclosure No potential conflicts of interest relevant to this article were reported.

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