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An Agenda for Advancing the Science of Implementation of Evidence-Based HIV Prevention Interventions

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Abstract

In the past 25 years, a tremendous amount of time and resources have been committed to developing evidence-based HIV prevention interventions. More recently, there have been noteworthy efforts to develop an infrastructure and related policies to promote the *dissemination* (i.e., “the targeted distribution of information and intervention materials to a specific public health or clinical practice audience”) of evidence-based interventions. Despite these advances, however, we have had comparatively little success in the effective *implementation* (i.e., “the use of strategies to adopt and integrate evidence-based health interventions and change practice patterns within specific settings”) of such interventions in everyday practice or community settings. The objective of the current paper is to highlight select and initial areas of research that are critically needed to advance the state-of-the-science of implementation of HIV prevention interventions in our broader efforts to curb the epidemic worldwide.

Keywords

Implementation; HIV/AIDS; Prevention; Intervention; Dissemination

Since the emergence of the HIV epidemic, medical, behavioral and social scientists have committed a tremendous amount of time and resources to developing evidence-based HIV prevention interventions (Global HIV Working Group 2008). In the absence of a cure for HIV, and in light of recent setbacks in vaccine and microbicide development, the best available means for combating the epidemic involves widespread implementation of effective and sustainable HIV prevention behavioral interventions (Lagakos and Gable 2008). In this context, researchers have developed evidence-based HIV prevention interventions for a range of populations and prevention settings using a variety of approaches and delivery methods around the world.

Over the past several years, researchers, funding agencies, and community-based organizations have begun to emphasize the importance of disseminating and implementing evidence-based HIV prevention interventions in the community (NIH 2008; Ruiz et al. 2001), suggesting that ‘delivery science’ is as important as ‘discovery science,’ despite the former being overshadowed by the latter in most programs of research to date (Chambers and Kerner 2007). Delivery science is largely characterized by two main processes that are essential to providing individuals and communities with prevention interventions: *dissemination* (“the targeted distribution of information and intervention materials to a specific public health or clinical practice audience”) and *implementation* (“the use of strategies to adopt and integrate evidence-based health interventions and change practice patterns within specific settings;” adapted from Lomas (1993), NIH (2008), see also Eccles and Mittman (2006) and Rubenstein and Pugh (2006)). Although relatively limited, most advances in the delivery of HIV prevention interventions have been in terms of dissemination. For example, within the US, the Centers for Disease Control and Prevention (CDC) have disseminated evidence-based HIV prevention interventions to state health departments and community-based organizations through the Diffusion of Effective Behavioral Interventions program (DEBI; CDC 2008). To date, the DEBI program has, impressively, trained more than 12,000 prevention providers across 3,000 community-based agencies in the US in one or more of the 18 packaged evidence-based behavioral interventions [see www.effectiveinterventions.org for details, as well as the commentary by C. Collins (2009)].

Despite success by the DEBI program in disseminating evidence-based HIV prevention interventions, a growing body of literature highlights substantial barriers to the effective implementation of these interventions in real-world, non-research settings (e.g., Kegeles and Rebchook 2009; Kelly et al. 2000; Rebchook et al. 2006; Wingood and DiClemente 2008). Some of the most prominent challenges to successful intervention implementation include factors associated with (but not limited to) (1) the organizational context in which interventions are implemented, (2) characteristics and content of the interventions that are being implemented, and (3) a paucity of comprehensive theory-based, multi-level models developed specifically for (or articulated specifically to) the implementation of HIV prevention interventions. While considerable challenges lie ahead on the road to developing “delivery science” as a significant and substantial program of research, beginning to scientifically investigate the role of the organizational context, intervention characteristics, and multi-level theoretical models in the implementation process are essential first steps.

The goal of the current paper is to highlight select yet substantial challenges that we face in promoting and cultivating a science of implementation of evidence-based HIV prevention interventions, and to provide suggestions for initial research areas that must be developed to better inform and facilitate the optimal practice of implementation. Although not exhaustive, this preliminary research agenda highlights common challenges and offers potential research objectives for simultaneously advancing the state-of-the-science while also expanding the reach and impact of evidence-based HIV prevention interventions beyond efficacy trials.

Although additional areas of research are needed to improve the science of *dissemination*, this paper will focus on an initial research agenda for improving the science of *implementation*, as we believe this is an area that has received far less attention in the HIV prevention intervention domain than dissemination to date. It is important to note that each suggested priority area of research has an associated body of literature that is only touched upon in this brief report; key pieces of literature are highlighted to guide more comprehensive and detailed examinations into these and other implementation research areas in the future.

Targeted Research on the Role of the Organization in the Implementation Process

In order to ensure the effective implementation of HIV prevention interventions, it is critical to better understand the organizational context into which interventions are introduced and ideally maintained. Indeed, the organizational context can influence everything from *what* gets implemented to whether *anything* gets implemented (Glisson and Schoenwald 2005). Despite their importance, however, conceptual or empirical exploration into how organizational factors affect the implementation of HIV prevention interventions is at a relatively early stage of development (Kegeles and Rebchook 2009; Miller 2001).

Ample opportunities exist for targeted research to investigate how the organizational context plays a role in the implementation of HIV interventions. Initial research may focus on better understanding the role of key organizational constructs, including organizational readiness for change, structure, size, leadership, staff turnover, top-down versus bottom-up decision-making, staff support, and innovativeness, in facilitating or impeding the implementation process (Durlack and DuPre 2008; Fixsen et al. 2005; Greenhalgh et al. 2004; Lehman et al. 2002). Additional research may also examine the role of the organizational *social* context [i.e., “the norms, values, expectations, perceptions, and attitudes of the members of the organization” p. 2, Glisson (2007); Glisson et al. (2008)] in implementing evidence-based HIV prevention interventions, with a particular emphasis on how organizational culture (“the way things are done in the organization”), organizational climate (“the way people perceive their work environment”), and work attitudes enhance or obstruct the implementation process (Aarons and Sawitzky 2006; Durlack and DuPre 2008; Fixsen et al. 2005; Greenhalgh et al. 2004; Verbeke et al. 1998).

The identification of key organizational constructs that influence the implementation of HIV prevention interventions is essential in providing evidence-based guidance to organizations that seek to effectively adopt, implement, and sustain such interventions in practice. Which organizational factors (e.g., culture, climate, readiness for change, work attitudes) appear most amenable to modification, and the extent to which such changes may lead to better organizational outcomes (e.g., lower staff turnover and greater productivity), better implementation outcomes (e.g., increased uptake and fidelity), and better health outcomes among intervention participants (e.g., reduced HIV risk behavior) are important areas for future targeted research. Furthermore, designing and implementing organizational-level interventions (see Glisson and Schoenwald 2005 for an example) to promote characteristics of the organizational social context that facilitate intervention implementation are necessary to ensure the successful implementation of evidence-based HIV prevention interventions in real-world settings.

Targeted Research on the Role of Intervention Characteristics in the Implementation Process

Despite recommendations against making substantial changes to pre-packaged evidence-based HIV prevention interventions, community-based organizations frequently adapt, alter, or delete intervention content, scope, focus, and/or delivery method. Such modifications may be intentional in order to improve the fit between the intervention and the target population and/or the available organizational resources (e.g., staff members, funds, training level, equipment; Cohen et al. 2008; Rebchook et al. 2006), or unintentional as a result of insufficient training or technical assistance.

Absolute fidelity to the original efficacy-tested intervention protocol is not likely a realistic objective when implemented in real-world settings. Demanding rigid adherence to a disseminated intervention and adopting policies and perspectives that largely prohibit adaptations to it may result in poor uptake, minimal responsiveness to practice needs, and may even inadvertently promote resistance from organizations and their staff. Instead, intentional modifications to “interventions-in-a-box” are arguably necessary to promote ownership of the intervention, tailor the intervention content to the specific needs and cultural aspects of the target population (which may be different than those in the original research trial; Collins 2009), and improve the fit between the intervention and the context in which it is being implemented in order to promote maintenance and sustainability over time.

In recognition of this need and importance, several researchers and agencies have created frameworks and guidelines for identifying core intervention components and adapting individual intervention components (Cohen et al. 2008; McKleroy et al. 2006; Solomon et al. 2006; Wingood and DiClemente 2008). Although these efforts provide much-needed guidance in practice, there is currently minimal *empirically* based research targeting the identification of core intervention components and the adaptability of individual intervention components. We do not yet know what aspects of a given intervention are truly essential, nor do we know how much and what type of adaptation these core intervention components can withstand without sacrificing efficacy. Targeted research is needed to identify the necessary balance between sufficient flexibility and appropriate fidelity to the factors that are directly related to intervention efficacy in controlled trials.

The systematic and scientific distillation of “core intervention components” is a promising strategy for finding a better balance between fidelity and flexibility of intervention components without compromising efficacy. While many HIV-prevention intervention manuals currently have “core components” designated, these designations are typically made without empirical support. Moreover, interventions are commonly evaluated as a whole and not in terms of the efficacy of each intervention component. Indeed, evidence from other domains suggests that different intervention components can have varying effects on behavior change (Stigler et al. 2006). Given the frequent deletion of intervention components by implementing organizations, oftentimes due to lack of human or financial resources (Rebchook et al. 2006), the identification of empirically supported core components may help reduce intervention burden on organizations’ already-limited resources by informing which components may be considered optional or even dropped. Such an approach would likely lead to the creation of more potent and efficient HIV prevention interventions, as well.

Research studies that systematically alter the presence or absence of particular intervention components and evaluate intervention efficacy under different conditions are one type of approach for identifying core intervention components. Work by Kalichman et al. (1996) provide a noteworthy example of the type of research needed to identify core intervention

components that are most effective in changing behavior. Alternatively, sophisticated statistical techniques (e.g., growth curve modeling) and post hoc component analyses (see Stigler et al. 2006 for an illustrative example) can be used to model the effects of particular intervention components, and, in doing so, help determine which components are most effective, least effective, or altogether ineffective at changing behavior. Further, such modeling techniques allow for evaluating both the individual effect of distinct intervention components as well as the synergistic effect of combinations of intervention components on behavior change. The identification of common intervention factors (Rotheram-Borus et al. 2009a, b), principles (Rotheram-Borus et al. 2009a,b), behavior change taxonomies (Abraham and Michie 2008), and meta-analytic work identifying theoretical drivers of behavior change (Albarracin et al. 2001) can also help inform what specific intervention components should be tested in future designs.

In addition to the empirical identification of core intervention components, targeted research is also needed to determine how much and what type of adaptation to core intervention components is tolerable, non-consequential to demonstrated efficacy, and perhaps even an improvement to the intervention. Because adaptation during the implementation process appears to be relatively common (Kelly et al. 2000; Rebchook et al. 2006)—even among ‘core intervention components’—and arguably may be necessary to better match the packaged intervention to the target group and organization’s needs (Collins 2009), it becomes increasingly important to systematically monitor, catalogue, and classify the degree of adaptation that occurs over time. These activities necessarily must take place in the real-world setting where the intervention is adopted. Numerous methods, strategies, and designs have been developed or proposed for this type of applied research (e.g., McKleroy et al. 2006; Wingood and DiClemente 2008); however, forward movement in this area will require specific support and sponsorship by funding agencies and reviewers alike.

Monitoring and evaluation of intervention adaptation *as well as* quality outcomes during the implementation process (e.g., specific changes made to the intervention in the process of implementation and the impact of the intervention implemented on behavior change) would provide a wealth of information pertaining to intervention flexibility and adaptation. Monitoring intervention implementation and impact can be accomplished by including brief, real-time assessments that document, for example, the frequency of intervention implementation, the number of patients or clients receiving an intervention, on-going characterization of the intervention delivered, and patient-level assessments of the targeted behaviors over time. Indeed, such measures may be quite similar to quality assurance and quality improvement measures that many clinics and organizations already have in place. Further, implementation research can foster the direct involvement, representation, and collaboration of practice communities in the study of intervention uptake and refinement, which is likely critical in the ultimate success of HIV prevention interventions in reaching their desired targets and outcomes (Dworkin et al. 2008; Wandersman et al. 2008). Collaborations between research and practice communities to develop and implement monitoring and evaluation strategies for intervention adaptation as well as intervention outcomes is a key step toward bridging the gap between science and practice that continues to distance the realities of implementation from the systematic study of it.

Targeted Research to Develop Multi-Level, Theory-Based Implementation Process Models

Successful movement of HIV prevention interventions from research into practice can be greatly facilitated by the development of multi-level, theory-based implementation process models. In doing so, we can begin to better understand the barriers and facilitators at each implementation phase, starting with initial intervention adoption and progressing toward

long-term sustainability. Moreover, identifying implementation barriers and facilitators at multiple levels of influence, including the organizational context (e.g., culture, climate, work attitudes, and readiness for change) and characteristics of the intervention (e.g., flexibility and adaptability), lends itself to a dynamic understanding of the interaction and complex interplay between these and other macro-level factors (e.g., health care plans, policies, and politics) during the implementation process. Future research to develop such models may draw heavily from important frameworks already articulated for particular phases within the HIV domain (e.g., intervention adaptation, Wingood and DiClemente 2008; technology transfer models, Kraft et al. 2000), as well as existing research in other key areas (e.g., mental health services, Glisson and Schoenwald 2005; health services research, Rubenstein and Pugh 2006; and quality improvement initiatives, Rubenstein et al. 2000). Frameworks that explicitly incorporate multi-level factors into the implementation process (e.g., Fixsen et al. 2005; Klein and Sorra 1996; Mendel et al. 2008; Wandersman et al. 2008) may be particularly helpful for informing HIV-specific implementation process models, as well.

Using a multi-level theory-based lens to view the implementation process also lends itself to developing and testing evidence-based strategies for moving interventions effectively and efficiently along the implementation continuum. Dynamic models can help inform what type of support, guidance, and assistance (e.g., onsite vs. online training, skills-building, or problem-solving) may be needed during each phase of the implementation process and at what particular level(s) (e.g., intervention, provider, and/or organizational). For example, organizational-level interventions to improve culture, climate, and work attitudes may need to be deployed in preparation of receiving an evidence-based intervention (Glisson and Schoenwald 2005). Technical assistance and training for both the organization and for intervention implementers may be needed during the initial implementation phase of the intervention, and gradually tapered-off as the intervention becomes incorporated into the organizational routine and ultimately integrated as standard-of-care. The optimal length, duration, intensity, and type of assistance needed to ensure effective implementation across the continuum, however, is unknown, and highlights an additional area of inquiry ripe for research in the HIV domain.

Conclusion

Efforts to implement evidence-based HIV prevention interventions in real-world settings have met substantial and formidable barriers. Targeting research efforts to address these challenges is critical to curbing the HIV epidemic via risk-reduction interventions. In this brief, agenda-setting report, we have sought to identify and articulate the pressing needs for systematic scientific inquiry into three broad research areas that are well positioned to maximally benefit implementation practice with respect to HIV prevention interventions. Specifically, we suggest that focused research efforts are needed to better understand (1) the role of the organizational context in which interventions are implemented, (2) the role of intervention characteristics in facilitating or impeding the implementation process, and (3) the need for conceptualizing and testing dynamic, multi-level, theory-based implementation process models. In order for our effective interventions to truly have an impact on curbing the epidemic worldwide, we must approach ‘delivery science’ with the same scientific rigor, dedication, and urgency that has characterized our investment in ‘discovery science’ to date. In doing so, we can begin to identify empirically guided strategies that are essential for supporting the widespread and effective implementation of HIV prevention interventions into everyday settings.

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