Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

HHS Public Access

Author manuscript

AIDS Behav. Author manuscript; available in PMC 2021 July 01.

Published in final edited form as:

AIDS Behav. 2020 July ; 24(7): 2206–2219. doi:10.1007/s10461-020-02786-5.

A Randomized Controlled Trial of the *Shikamana* Intervention to Promote Antiretroviral Therapy Adherence among Gay, Bisexual, and Other Men Who Have Sex with Men in Kenya: Feasibility, Acceptability, Safety and Initial Effect Size

Susan M. Graham, MD MPH PhD[1,2], **Murugi Micheni, MD MSc**[2], **Oscar Chirro, DCMS**[2], **Joseph Nzioka, BSc**[2], **Andrew M. Secor, MPH**[3], **Peter M. Mugo, MSc PhD**[2], **Bernadette Kombo, MSc MA**[4], **Elise M. van der Elst, PhD**[2], **Don Operario, MS PhD**[5], **K. Rivet Amico, PhD**[6], **Eduard J. Sanders, MD MPH PhD**[2,7], **Jane M. Simoni, MA PhD**[8]

[1]Departments of Medicine, Global Health, and Epidemiology, University of Washington, Seattle, WA, USA

[2]Clinical Research, Kenya Medical Research Institute – Wellcome Trust Programme, Kilifi, Kenya

[3]Department of Global Health, University of Washington, Seattle, WA, USA

[4]Partners for Health and Development in Africa, Nairobi, Kenya

[5]Department of Behavioral and Social Sciences, Brown University, Providence, RI, USA

[6]Health Behavior and Health Education, University of Michigan, Ann Arbor, MI, USA

[7]Nuffield Department of Medicine, University of Oxford, Headington, Oxford OX3 7BN

[8]Departments of Psychology; Global Health; and Gender, Women, and Sexuality Studies; University of Washington, Seattle, WA, USA

Abstract

Gay, bisexual, and other men who have sex with men (GBMSM) living with HIV in rights-constrained settings need support for antiretroviral therapy (ART) adherence due to barriers including stigma. The *Shikamana* intervention combined modified Next Step Counseling by providers with support from trained peers to improve adherence among GBMSM living with HIV in Kenya. A randomized controlled trial with 6-month follow-up was used to determine feasibility, acceptability, safety, and initial intervention effects. Generalized estimating equations examined differences in self-reported adherence and virologic suppression. Sixty men enrolled, with 27 randomly assigned to the intervention and 33 to standard care. Retention did not differ by arm, and

Corresponding Author: Susan M. Graham, Box 359909, 325 Ninth Avenue, Seattle, WA 98104, USA, Tel: 206-351-0414, Fax: 206-543-4818, grahamsm@uw.edu.

Conflict of Interest

All authors declare no conflict of interest.

Ethical approval

All procedures were in accordance with the ethical standards of the Ethical Review Boards of KEMRI and the University of Washington and with the 1964 Helsinki declaration and its later amendments. KEMRI (#2835) and the University of Washington (#47589) approved the study protocol and monitored study progress. All men provided written, informed consent to participate. The study protocol was registered at clinicaltrials.gov at NCT02301533 .

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

no adverse events occurred. Feedback on feasibility and acceptability was positive based on exit interviews. After adjustment for baseline viral suppression and confounding, the intervention group had a 6-fold increased odds of viral suppression during follow-up. A larger trial of a scaled-up intervention is needed.

Resumen

Los hombres homosexuales, bisexuales y hombres que tienen sexo con hombres (HSH) que viven con VIH en entornos con derechos limitados necesitan apoyo para la adherencia a la terapia antirretroviral (ARV) debido a diversas barreras incluyendo el estigma. La intervención de *Shikamana* combinó consejería del próximo paso modificada (modified Next Step Counseling) realizada por proveedores con el apoyo de pares capacitados para mejorar la adherencia entre la poblacion HSH viviendo con VIH en Kenia. Se realizó un ensayo controlado aleatorizado con un seguimiento de 6 meses para determinar la factibilidad, aceptabilidad, seguridad y los efectos de la intervención inicial. Las ecuaciones de estimación generalizadas examinaron las diferencias en la adherencia autoinformada y la supresión virológica. Sesenta hombres fueron inscritos, 27 fueron asignados al azar a la intervención y 33 a la atención estándar. La retención no difirió entre ambos grupos y no ocurrieron efectos adversos. La retroalimentación según las entrevistas de salida sobre la viabilidad y aceptabilidad fue positiva. Después del ajuste de la linea basal de supresión viral y los factores de confusión, el grupo de intervención tuvo una probabilidad 6 veces mayor de supresión viral durante el seguimiento. Es necesario realizar un ensayo de intervención más amplia.

Keywords

HIV; antiretroviral therapy; medication adherence; counseling; peer group

Keywords

VIH; terapia antirretroviral; adherencia a la medicación; consejería; grupo de pares

Introduction

HIV infection is a life-long health problem that disproportionately affects gay, bisexual, and other men who have sex with men (GBMSM), including in Kenya. In 2016, HIV prevalence was estimated at 5.5% among Kenyan men from the general population, and 18.2% among Kenyan GBMSM [1]. Among GBMSM followed in a cohort run by the Kenyan Medical Research Institute (KEMRI, a state corporation tasked as the national body responsible for carrying out health research in Kenya), HIV incidence was estimated at 8.6 per 100 person-years (95% confidence interval [CI] 4.2–7.9 per 100 person-years) in 2013, with very high incidence among men who had only male sex partners, at 35.2 (95% CI 23.8–52.1) per 100 person-years [2]. Only 65% of GBMSM had access to comprehensive HIV prevention and care services, according to 2016 estimates from the Kenyan Ministry of Health [1]. While no published Kenya-specific estimates on the HIV care cascade among GBMSM are available, the HPTN 075 study estimated in 2019 that among its participants (GBMSM and transgender women at 4 sites in Kenya, Malawi, and South Africa) who were living with

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

HIV at the time of enrolment, 56.3% had been previously diagnosed, 38.8% were in care, 34.4% were on ART, and 28.4% were virally suppressed [3]. A modeling study published in 2012 found that increased access to ART for HIV-positive GBMSM could have an important impact on preventing new infections in Kenya, not only among GBMSM but also in the general population [4]. ART effectively reduces HIV transmission risk [5], but its impact depends critically on adherence and retention in care [6].

Since the scale-up of ART began in sub-Saharan Africa around 2005–2006, support for patients taking ART has been recognized as an important component of treatment success [7]. In resource-limited settings, social capital, defined as "the use of relationships to obtain benefits and achieve desired ends" was noted in 2009 as an important way that patients tap into supportive relationships to obtain resources such as transportation to appointments and funds for needed medication or food [8]. Studies published since that time have noted that stigma, discrimination, and criminalization of male-male sex may undermine the ability of GBMSM to use social capital to their advantage [9]. Indeed, Kenyan laws criminalizing sodomy and male-male sexual relations were recently upheld by Kenya's supreme court [10]. Available evidence suggests that African GBMSM suffer from lack of knowledge about and poor access to HIV services [11–13]. One study published in 2011 found that 19% of GBMSM participants in Malawi, Namibia, and Botswana reported ever being afraid to seek healthcare, 5% reported having been denied healthcare, and 21% had been blackmailed because of their sexuality [11]. A study published in 2012 reported that GBMSM participating in the KEMRI cohort of people living with HIV had lower adherence, poor weight gain, and poor CD4 count response to ART compared to heterosexual men and female sex workers participating in the same cohort [14], corroborating that GBMSM may face greater or unique adherence challenges requiring targeted intervention. In addition, studies with HIV care providers in Kenya suggested that providers were poorly equipped to address the needs of MSM and required additional training in order to provide adequate care [15–19]. While recently formed advocacy groups for lesbian, gay, bisexual, and transgender (LGBT) individuals are contributing importantly to health care gains in Kenya [20], data regarding the specific needs of GBMSM and how best to integrate their HIV care and treatment into the existing delivery system are urgently needed.

In June 2013 to February 2014, we conducted 30 in-depth interviews with GBMSM living with HIV infection on the Kenyan coast, to identify key barriers and facilitators to care engagement and ART adherence [21]. Stigma and discrimination were consistent themes that appeared across discourse exploring facilitators and barriers to care and adherence, with men recounting bad experiences with health providers and in the community that negatively affected mental health and led to increased substance use and poor ART adherence [21]. Trusted providers, supportive family and friends, and men's own resilience emerged as important facilitators of good treatment outcomes [21]. During the same period, we conducted focus group discussions with health providers experienced in providing HIV care to GBMSM on the Kenyan coast, in order to assess their views on improving ART adherence for GBMSM patients [22]. While providers felt that many barriers faced by GBMSM were similar to those faced by other patient populations, providers were aware that stigma and discrimination presented additional barriers for GBMSM, and that additional training and educations were needed to decrease stigma, both in the health system and in the

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

community [22]. Providers felt that training GBMSM peers was a promising approach to assist patients by providing counseling and support that is more attuned to the specific needs of GBMSM patients [22].

Based on this work, we developed and published a conceptual model for ART adherence among Kenyan GBMSM, which emphasized the roles of access, information, motivation and behavioral skills (i.e., the situated access-IMB model) [21]. This model suggested that in the context of pervasive anti-GBMSM stigma and discrimination, increased support from providers and peers could improve HIV care engagement and promote ART adherence for this vulnerable population [21]. We used this model to develop and pilot test an adherence intervention incorporating support from both providers and peers [23]. The objective of the present study was to evaluate the feasibility, acceptability, safety, and initial effects of the *Shikamana* (Kiswahili for “to form a bond or stick together”) intervention in a pilot randomized controlled trial (RCT) to improve ART adherence and viral suppression among GBMSM living with HIV in Kenya.

Methods

Setting.

The study was carried out between December 2014 and October 2016 in a research clinic run by KEMRI in Mtwapa, Kenya, located on the Kenyan coast 17 kilometers north of Mombasa. This clinic provides HIV prevention and treatment services in the context of two ongoing cohort studies of adults (HIV-positive or HIV-negative) reporting high-risk sexual behavior, including GBMSM and both male and female sex workers [2, 14]. All clinicians and counselors working in this clinic have taken a free on-line training course (www.marps-africa.org) on GBMSM sexual health that has been demonstrated to improve knowledge and reduce anti-GBMSM stigma among Kenyan providers [17, 18].

Participant recruitment.

Eligible participants were recruited through verbal outreach and in-person information sessions by KEMRI community mobilisers at local LGBT organizations, bars, and night clubs, as well as requests for referrals from HIV care providers in the study area (i.e., within 20–30 kilometers of the research clinic). Potentially eligible individuals interested in the study were invited to the research clinic to learn more about the study and be screened for eligibility. Men who were participants in KEMRI’s HIV-positive cohort were also eligible for enrolment, as many struggled with adherence [14]. Inclusion criteria were as follows: self-reported Kenyan nationality; male at birth; 18 years or older; living or working in the study area and not planning to move in the next 12 months; self-report of engaging in penetrative or non-penetrative sex with a man in the past 12 months; documented HIV-1-infection; eligible for ART by current Kenyan guidelines (which changed from a targeted to a “test and treat” approach during the study period) [24]; and able to communicate in Swahili or English. If HIV results were not already available in the research clinic’s records, potential participants underwent HIV testing as part of the screening process. To ensure that men would be committed to continuing in the RCT, all eligible men who were not already enrolled in the KEMRI HIV-positive cohort were enrolled and completed a full cohort visit

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

with collection of data on health and sexual behavior, confirmation of HIV status, and clinical care as indicated; after this cohort visit, men were eligible to enroll into the RCT on a separate visit if interested. We aimed to recruit and enroll 60 participants, targeting ART-naïve men to the extent possible, but including at least 30 ART-experienced participants to enhance the feasibility of recruitment within the allotted timeline. Because the study was focused on feasibility, acceptability, and safety, it was not powered for an efficacy endpoint, although estimation of an initial effect size was a stated goal.

Randomization.

Independent monitoring staff from the KEMRI Clinical Trials Unit used Stata to generate random assignments (1:1) within two strata: one for ART-naïve (62 numbered envelopes prepared) and one for ART-experienced men (34 numbered envelopes prepared). After enrollment by study staff, participants drew an opaque, sealed envelope from one of two bins: one for ART-naive and the other for ART-experienced men. Based on community input and participants' strong desire to take part in the assignment process, men were allowed to draw any envelope from the bin, and were not required to choose the next consecutive numbered envelope. Men were not permitted to draw more than one sealed envelope or replace an envelope once drawn. Laboratory staff assessing virologic outcomes were blinded to study arms; otherwise, study arms could not be blinded after assignment.

Intervention.

A detailed manuscript describing development of the *Shikamana* intervention and results of initial pilot testing has been published, along with the training manuals for peers and providers [23]. Briefly, *Shikamana* consists of two main components:

1. *Next Step Counseling by trained providers*. Next Step Counseling (NSC), an approach using motivational interviewing (MI) techniques, was used by Amico et al to promote PrEP adherence in the iPrEx trial [25]. JMS, SMG, and MM trained six KEMRI research counselors and two KEMRI clinical officers providing HIV care at the study site to employ a modified 6-step version of NSC, based on the situated access-IMB model we had developed for the target population [21] and using the training manual we developed for the *Shikamana* intervention (see http://links.lww.com/QAD/A788) [23]. In this approach, intervention providers used a 6-step process to frame the topic of adherence (i.e., adherence is not easy), review progress, explore what makes it easier or harder (e.g., situations, feelings, motivation, thoughts, influences from others, skills) to adhere, have the participant identify what could make adherence easier, discuss together how to accomplish that "next step," and document the session using a standardized form [23]. Training included role playing exercises with feedback and took place over 2 days immediately after intervention development. Training was repeated in the month before trial enrolment started, and a 1-day refresher training was conducted mid-way through the trial. An experienced senior counselor with prior training in patient-centered approaches (JN) provided supervision and coaching during trial implementation. Participants in the intervention arm received individualized modified NSC at all monthly visits,

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

working together with a trained intervention provider to identify a "next step" to make their pill-taking or other aspects of adherence easier.

2. *Peer support*. Training of *Shikamana* peers, called "*Washikaji*" (slang for good friends), focussed on the provision of information, encouragement, and empathy [26]. *Washikaji* were HIV-positive, ART-experienced GBMSM nominated by staff or local LGBT groups based on their interpersonal skills and potential to be a role model. All *Washikaji* (hereafter referred to as peers) were required to be certified in peer education by the Kenyan National AIDS and STD Control Programme. SMG and MM oversaw a week-long peer training for 8 peers, with most sessions led by clinicians and counselors on the study team, using a training manual we developed specifically for the Kenyan context (see http://links.lww.com/QAD/A789) [23]. At the end of the training, peers signed confidentiality agreements and were given certificates of completion. Intervention participants were introduced to an assigned peer at the baseline visit, at which time they exchanged contact information, discussed ART adherence and care engagement, and agreed upon an individualized plan for contacts and support. To the extent possible, peers were matched to participants on sexual identity, age group, and neighborhood of residence; participants could also specify individual preferences for matching with peers. Peer duties included emphasizing the importance of pill-taking, reminding participants of appointments, and helping to trace participants who missed study visits. Peers made regular contacts (at least weekly in month 1, then at least monthly through month 6) with their assigned participants by telephone, SMS (text messages), WhatsApp (messaging app for smart phones), or in person, according to the plan determined by each peer-participant pair. Peers worked as volunteers but received 1,500 Kenya shillings (≈$15) in air time for calls and texts, as well as transport reimbursement for tracing and to attend monthly supervision meetings with a study clinician (OC) to exchange information on participant progress, receive support, reinforce training, and resolve any problems. Peers kept regular logs of their contacts with participants; these were reviewed by the supervising clinician at each meeting.

Control condition.

The control condition consisted of standard adherence counseling per Kenyan guidelines at each monthly visit and an invitation to attend a monthly support group available to all clinic patients taking ART. Per standard practice at the KEMRI research clinic, attendance at the support group was not monitored. Due to staffing constraints, the same counselors who were trained in the NSC intervention provided standard counseling for the control condition. For control participants, these counselors were instructed to strictly follow a counseling checklist that was used to operationalize standard adherence counseling in a completed randomized trial of an adherence intervention in Kenya [27]. The checklist focuses on assessing patient knowledge (7 items) and motivation (5 items), and how patients are taking their medications (Supplemental Material 1). The KEMRI Clinical Trials Unit provided external monitoring of the study, including review of digitally recorded counseling sessions to assess fidelity of

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

delivery of the intervention versus standard counseling protocols, using Supplemental Material 1 and a session recording document used for all intervention counseling visits (Supplemental Material 2).

Study procedures.

In accordance with Kenyan guidelines during the study period [24], all participants received information on their ART regimen, management of side effects, and the importance of adherence. Participants underwent safety laboratory testing (i.e., hemoglobin, ALT, and creatinine) one week prior to ART initiation; men with ART experience underwent all pre-ART study procedures while continuing their previously prescribed regimen. At the baseline visit for this study, each participant was provided his regimen in a pill bottle equipped with a medication event monitoring system cap (MEMS®, Seraing, Belgium) capable of recording the date and time of each cap opening. Participants were informed that MEMS® caps were being used to measure their medication-taking and would not be replaced if lost.

After the baseline visit, the study visit schedule followed Kenyan guidelines for monitoring, with a brief clinical check 2 weeks after ART initiation then monthly visits for 6 months. At each study visit, counseling was provided according to study arm; these sessions were digitally recorded unless recording was refused by the participant. After counseling was completed, participants went to the clinic pharmacy, where they completed a brief audio computer self-interview (ACASI) including the adherence measures described below, while awaiting their refill; this ACASI was done separately from the counseling process to reduce self-presentation bias [25]. Pharmacy staff captured MEMS® data before refilling the pill bottle. At baseline, month 3, and month 6, a more detailed ACASI survey was used to capture risk behavior and health status (including the variables presented in Table 1), a full physical exam was conducted, and blood was collected for real-time safety and CD4 count monitoring and storage for batched viral load testing at the end of the study. Participants were reminded in advance of study visits and traced by cell phone or in person if necessary, in the event of a missed visit. All non-scheduled clinic visits and participant contacts were documented. While cell phone ownership was not required for participation, most participants owned or had access to a cell phone. A transportation reimbursement was provided at all study visits, regardless of study arm; no additional reimbursement or cell phone credit was provided to intervention participants.

Per Kenyan guidelines at the time [24], all ART-naïve participants and most ART-experienced participants were prescribed a single-tablet regimen consisting of tenofovir, lamivudine, and efavirenz. Two ART-experienced participants continued an older single-tablet regimen consisting of zidovudine, lamivudine, and nevirapine, as their CD4 counts did not meet immunological failure criteria. Comprehensive HIV care was provided to all study participants in accordance with Kenyan guidelines, including screening for tuberculosis and sexually-transmitted infections and provision of co-trimoxazole and isoniazid prophylaxis as indicated [24]. Blood specimens from baseline, month 3, and month 6 were tested for CD4 cell count (BD FACSCount, BD Biosciences, San Jose, CA, USA) within one day of sample collection. Stored specimens from these 3 timepoints were batch tested for HIV-1 RNA level (Xpert® HIV-1 Viral Load, Cepheid, Sunnyvale, CA, USA) at the end of the study; viral

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

load results were not available in real time. All laboratory tests were conducted at KEMRI-Wellcome Trust laboratories.

Feasibility, acceptability, and safety measures.

Feasibility was assessed based on effort required by staff and peers, willingness of staff and peers to deliver the intervention, and the fidelity of intervention delivery as assessed by an external study monitor. Acceptability was assessed based on the willingness of GBMSM participants to participate in the trial and engage with the two intervention components, and feedback from participants about whether and to what extent the intervention helped them. Safety was assessed based on ongoing study monitoring and reporting of harms to participants, peers, or study staff. Throughout the study and after its conclusion, provider views on these three outcomes were assessed by discussions during regular staff meetings, and peer views were assessed at meetings with the peer supervisor. These meetings were minuted but not recorded. Participant views were collected during exit interviews conducted for all trial participants regardless of study arm, upon withdrawal or completion of the study. Topic guides for exit interviews were designed to elicit feedback about acceptability of the study and its procedures, determine whether intervention participants noticed any difference from standard counseling, and evaluate whether intervention participants found their assigned peer to be helpful or had any problems. In addition, participants were asked whether they felt they had experienced any social harm as a result of study participation. Detailed notes, called “debrief reports,” were taken at these interviews, which were also digitally recorded unless recording was refused by the participant.

Fidelity.

Fidelity to intervention delivery was assessed by review of documented peer contacts for the peer component. For the counseling component, digitally recorded counseling sessions and study records were reviewed to determine conformity to standard operating procedures for each study arm, guided by the standard counseling checklist (Supplemental Material 1) and NSC documentation form (Supplemental Material 2). These reviews were doneat two points during study implementation, with feedback to counselors on any divergence noted.

Adherence and viral suppression data.

Self-reported adherence measures included a question on the frequency of taking ART (“In general, how often do you take your antiretrovirals?”), two self-rating scales developed by Wilson et al (“In the last 30 days, how good a job did you do taking your HIV medication in the way you were supposed to?” and “In the last 30 days, how often did you take your HIV medication in the way you were supposed to?”) [28, 29] and a validated visual analog scale (VAS) [30]. For the VAS, participants were instructed: “Put a mark on the line below at the point showing your best estimate of how much medication you have taken in the last month. We would be surprised if this was 100% for most people.” MEMS® cap data were used to calculate adherence rates for the period since the last visit.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Data analysis.

Analysis of data on feasibility, acceptability, and safety included summary statistics on study recruitment and retention in the intervention, external monitoring reports, summaries of staff and peer meeting minutes, and interview debrief reports. These materials were reviewed in real time by the study team as part of study monitoring, using a qualitative method developed by study authors (JMS and KRA) previously found to produce accurate results [31]. Following this methodological procedure, "debrief report" materials were analyzed independently by two study authors (SMG, MM) to identify major themes related to intervention feasibility, acceptability, and safety.

Quantitative baseline characteristics of each participant group were summarized using proportions and medians with interquartile ranges. Fisher's exact tests and Wilcoxon rank sum tests were used to identify factors that were not equally distributed across study arms or associated with loss to follow-up. In assessing post-intervention clinical outcomes, we used an intent-to-treat approach, including all participants according to their randomized assignment. Because study visit attendance and retention did not differ by study arm and most participants who were lost to follow-up reported transferring their HIV care elsewhere, we used a complete-case approach and did not impute missing data after the baseline visit.

The primary clinical outcomes were post-intervention VAS adherence (dichotomized at ≥80% vs. <80% [32]), and post-intervention plasma viral load data (dichotomized at >40 copies/mL vs. ≤40 copies/mL). Because MEMS® data were missing for 27.5% of participants who attended the month 6 visit due to lost or forgotten MEMS® caps, MEMS® adherence was not analyzed as an outcome. To assess intervention impact on outcomes over multiple visits, we used generalized estimating equations (GEE) with a logit link, robust standard errors, and an exchangeable correlation matrix to account for intra-individual correlation across visits. These analyses used all visits at which each outcome was measured (i.e., months 1–6 for adherence; month 3 and month 6 for viral load suppression), with a focus on evaluating the main effect of the intervention (i.e., difference across groups), given limited power [33]. Since we had no pre-intervention baseline for adherence, we adjusted the post-intervention VAS adherence outcome for ART status before the study (i.e., ART-experienced vs. ART-naïve), since adherence may be optimal right after ART initiation and wane over time. The model for post-intervention viral load suppression was adjusted for baseline viral load suppression. We explored the effect of time on the post-intervention effect by evaluating a group by time interaction term. In addition, we evaluated for potential attrition bias by adjusting for variables associated with loss to follow-up that were also associated with the outcome of interest at $p<0.20$ when modeled with the study arm indicator and each outcome's baseline. Finally, a sensitivity analysis was conducted with VAS adherence dichotomized at ≥95% vs. <95%, to see if use of this higher threshold impacted results.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Results

Study population.

Between June 16, 2015 and April 13, 2016, 79 men were screened for the intervention, of whom 65 were eligible (Figure 1). Five men declined to participate, saying they were not ready to start ART or needed more time to consider the study. Sixty men enrolled, of whom 33 (55%) were assigned to standard care (17 ART-experienced and 16 ART-naïve) and 27 (45%) were assigned to the intervention (16 ART-experienced and 11 ART-naïve). Table 1 presents baseline characteristics of the participants in each study arm. Although there were more ART-experienced men (59.3% vs. 51.5%, X^2=0.36, p=0.61) and more men with viral suppression at baseline (65.2% vs. 46.7%, X^2=1.81, p=0.27) in the intervention than in the standard care group, there were no significant between-group differences at baseline.

Feasibility and acceptability.

Recruitment targets were obtained on time, although we exceeded the target number of ART-experienced men due to challenges enrolling men who had never taken ART. One trained peer dropped out prior to the trial, due to competing priorities. All intervention providers and peers found procedures to be feasible and not overly time-consuming, according to analysis of qualitative notes from discussions on this topic at 40 peer and staff meetings held during and immediately after the study. Intervention providers stated that they came to prefer NSC over standard counseling, which took a similar amount of time but was less tailored, and intervention recipients appreciated that NSC was more “in depth” and focused on pill-taking.

In exit interviews conducted with 23 of the 27 intervention participants, none reported any problem with NSC when asked how they found this approach. Six ART-experienced and three ART-naïve participants who had received adherence counseling prior to the trial noted a difference from standard counseling, with comments on how it was “more intense” or “deeper,” provided closer follow-up across sessions, and had a greater focus on pill-taking skills. Three intervention participants withdrew from the peer component and continued the trial with NSC only; their reasons provided were as follows: one participant was originally from outside the study area and was unsure he and a peer could relate to each other, and two had expectations that a peer would provide financial assistance or help with household chores rather than play a more limited role focused on adherence. In all three cases, discontinuation of the peer relationship led to no identified problems for participants or peers. For the 24 successful peer-peer pairings (89%), acceptability was high and feedback positive. Although two participants reported limited contact (i.e., only monthly) with their peer after the first month, most reported more regular contact (e.g., providing daily pill reminders by SMS during the first month, often continuing with weekly or more frequent contacts after that point). Peers were praised for providing positive role models, offering counseling and education, helping men observe pill times by texting reminders, and teaching skills such as how to take pills discretely when others were around and how to plan for safe disclosure. While much of the interaction between peers and participants occurred via SMS and WhatsApp, most peers met with participants in person on a weekly basis for at least one month, and participants felt the peers were supportive and available when needed.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

At a final feedback meeting with all seven peers who had been active in the study, peers reported that the intervention had increased cooperation among themselves and between themselves and clinic staff. The peers felt that the intervention worked because a peer was more credible to GBMSM participants when providing advice, and could help overcome misinformation and other barriers to adherence in ways that providers could not. Men also felt that the one-on-one pairing between a peer and his assigned participants was more meaningful than participation in a support group, where conversations were perceived to be more superficial and sometimes quarrelsome. The only challenges reported were with participants who expected too much (e.g., help with obtaining food, help with domestic chores) or were otherwise too demanding of the peer's time; this seemed to occur more often when the peer already knew a participant prior to the study. Peers also stated that it was challenging to decrease support over time and promote independence. In line with this comment, several peers opted to continue providing support to patients they had helped after the study ended.

Safety.

Four adverse events were reported by trial participants (a road accident, appendicitis, pneumonia, and an arrest for "disturbing the peace"), none of them study-related. In addition, no study-related social harms were reported to clinic staff or peers during clinic visits, tracing contacts, or in the 23 exit interviews with intervention participants. Importantly, none of the peers reported an adverse event due to the study; because peers disclosed their HIV status to participants during the initial introduction meeting, it is noteworthy that no peer reported problems due to unwanted disclosure of their HIV status by participants.

Fidelity.

Of 292 documented successful peer-participant contacts, 75% were by phone, 23% in person, and method was missing for 2%. The median number of successful contacts in month 1 was 5 (interquartile range [IQR], 5–7); after month 1, the median number of successful contacts was 8 (IQR, 4–11). According to independent monitoring by the KEMRI Clinical Trials Unit, both conditions (i.e., intervention NSC and standard adherence counseling) were delivered with good fidelity to the study protocol, with only minor deviations (i.e., discussion of a "next step" noted in <5% of standard adherence counseling sessions audited).

Care engagement and adherence measures.

Retention was 85% in each arm (X^2=0.0013, p=1.00), with 5 of 33 standard care participants and 4 of 27 intervention participants lost to follow-up. Median visit attendance over the 6-month follow-up period, including the week 2 visit, was 7 (IQR, 6–7, range 2–7) in the standard arm versus 7 (IQR, 7–7, range 2–7) in the intervention arm (Z=−0.85, p=0.39). Figure 1 presents information on retention at specific visits. While attrition did not differ by study arm, more men who had only male sex partners were lost to follow-up than men with both male and female partners (6 of 15 [40.0%] vs. 3 of 45 [6.7%], X^2=9.80, p=0.005) and more men who had participated in the KEMRI cohort for <12 months were lost to follow-up than those who had participated for ≥12 months (7 of 25 [28.0%] vs. 2 of 35 [5.7%],

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

X^2=5.68, p=0.03). Men with lower CD4 counts at baseline were also more likely to be lost to follow-up (median CD4 count 267 vs. 510, Z=−2.50, p=0.01).

Intervention Effects.

Figure 2A presents the proportion of participants with post-intervention (i.e., month 1-month 6) VAS adherence ≥80% in each study arm; inset panels break down this difference among ART-naïve (2B) vs. ART-experienced participants (2C). In GEE analysis, the intervention was not associated with a higher odds of VAS adherence ≥80% (odds ratio [OR] 1.53, 95% confidence interval [CI] 0.63 – 3.75, Z=0.94, p=0.35); this result was very similar after adjustment for baseline ART status (i.e., ART-naïve vs. ART-experienced, Table 2). When a time-by-group interaction term was added to the model, the main effect of the intervention was not associated with an increased odds of VAS adherence ≥80% (adjusted OR 1.52, 95% CI 0.50 – 4.67, Z=0.73, p=0.46) and the group-by-time interaction term was not significant (adjusted OR 1.00, 95% CI 0.82 – 1.23, Z=0.00, p=1.00). In a limited model with adjustment for baseline ART status and time in the KEMRI cohort (which was associated with the outcome at p<0.20), the odds of VAS adherence ≥80% still did not differ between groups (adjusted OR 1.76, 95% CI 0.70 – 4.41, Z=1.21, p=0.23). Use of a VAS adherence threshold of ≥95% did not change these results.

Figure 3A presents the proportion of participants with baseline and post-intervention viral suppression in each study arm; inset panels break down this difference among those without (3B) and with (3C) viral suppression at baseline. In GEE analysis of the viral suppression outcome, the intervention was associated with a 6-fold higher odds of viral suppression (OR, 6.24, 95% CI 1.28 – 30.5, Z=2.26, p=0.02); this estimate changed only slightly after adjustment for baseline viral load suppression (adjusted OR 5.74, 95% CI 1.18 – 27.8, Z=2.17, p=0.03). A model including a group-by-time interaction failed to converge. After adjustment for baseline viral load suppression and time in the KEMRI cohort (which was associated with the outcome at p<0.20), the odds of viral suppression remained higher in the intervention group (adjusted OR 6.07, 95% CI 1.40 – 26.2, Z=2.41, p=0.02).

Discussion

The *Shikamana* intervention, which consisted of NSC and peer support for HIV-positive GBMSM taking ART, was feasible, acceptable, and safe, based on this small RCT. Trained counselors delivered the *Shikamana* NSC intervention to the intervention group at monthly visits with good fidelity, based on monitoring of recorded counseling sessions. While not all participants accepted ongoing peer support, 89% of intervention participants received support from a trained peer, called a "*Washikaji*." In qualitative feedback, peer support was deemed helpful by many of the participants, and the matching of HIV-positive peers to new ART patients proved safe. Retention was similar in both study arms, although men with lower CD4 counts at baseline, only male sex partners, or a shorter follow-up time in the KEMRI cohort before the trial were less likely to be retained in the study. The proportions of men with self-reported adherence ≥80% and with viral suppression were both higher in the intervention group at all post-enrolment timepoints and the intervention was associated with a significant increase in viral suppression, suggesting that the *Shikamana* intervention could

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

improve treatment outcomes in this vulnerable and marginalized population, if its effects are sustainable.

The *Shikamana* intervention used NSC, which involves brief guided discussions to identify adherence needs and strategize on how to make taking ART easier in the context of one's life, using MI techniques. We modified NSC slightly to simplify procedures for our setting, where most HIV counselors have limited training [23]. While MI-based approaches such as NSC have become common in the United States, their application to ART adherence promotion in African settings has been limited to date, despite their promise [34, 35]. In this study, the MI approach was preferred by counselors and described as being equally or more acceptable by participants compared to standard adherence counseling, which is more didactic and less patient-centered in its approach. Moreover, NSC involves a joint process of problem identification and solving, with ongoing monitoring of these efforts; standard counseling does not focus on this process in the same way. We did not provide any set topics for discussion over a given number of intervention sessions, which increased feasibility by having counselors focus on a general approach instead of a detailed curriculum. This format also enhanced tailoring to whatever topic was most salient for each patient, whether disclosure concerns or having their pills available when away from home (two frequently discussed topics). Importantly, NSC providers and Washikaji were trained to maintain focus on improving participants' adherence and engaging in care; although they were trained to be receptive to and validating of participants' other types of problems (e.g., social, financial), they referred participants to other sources for assistance with these issues. Notes on prior sessions helped counselors to remember the "next steps" discussed at prior sessions and to build on or review past efforts. Counselor training in intervention provision was conducted twice before the RCT, and a refresher training was conducted mid-way through the trial. This investment in counselor training helped build important skills and may have addressed staff needs such as sensitivity training that were identified in our qualitative work [22].

This study was somewhat unique in combining peer support by trained ART-experienced men with the provider-delivered NSC intervention. Peer supporters or "navigators" have been successfully used in studies to support ART adherence in a number of settings, although results have been mixed [36–38]. Our trained GBMSM peers were selected based on their HIV status, willingness to disclose their status to matched peers, successful ART adherence, and personal attributes. Of note, the *Washikaji* had similar backgrounds and faced similar structural and economic barriers to those faced by the intervention participants. While one trained peer dropped out of the program, seven peers provided valuable information about HIV and sexual health, encouragement to adhere, and empathy regarding social challenges to their assigned participants. Our peers also provided valuable information to the care team on specific problems their assigned participants were facing, acting as informal case managers when men needed assistance related to side effects, mental health, or substance use. Study participants' feedback on the peer component was positive and seemed most important for men who were socially isolated or knew no one else living with HIV infection. While peer interventions to promote ART adherence have been used successfully in many settings, this is the first study to our knowledge of the use of a peer intervention to promote ART adherence for GBMSM in an African setting.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

While this small RCT had promising results, a fully powered trial is needed to evaluate the *Shikamana* intervention for GBMSM in sub-Saharan Africa. Such a trial would be challenging, given the stigma and criminalization faced by this population in many African countries; study sites would need to be carefully selected to ensure that research could be conducted without risk to participants. In a larger study, potential mediators or moderators of the intervention could be evaluated, leading to important insights about how this approach might work. Our initial results presented here suggest that men who had already attained viral suppression at baseline may have benefitted minimally from the intervention, implying that specifically targeting ART-naïve men and those with adherence challenges could be more impactful. Men who had low CD4 counts at baseline and men who had only male partners were less likely to be retained, suggesting that men who face higher levels of stigma and those who have delayed seeking care may need more support and attention. Given high levels of stigma, depression and substance use in this and other GBMSM cohorts in Kenya [39, 40], interventions that address these mental health issues specifically are also needed. Of note, we asked our intervention providers to focus the NSC used in *Shikamana* on ART adherence and left risk reduction counseling to the peers. While integrated NSC approaches have been successfully implemented in the United States [41], adapting the integration of safer sex components for GBMSM in African settings will require GBMSM community input, to ensure a sex-positive and non-stigmatizing approach, which was beyond the scope of this pilot. For this reason, we are currently using a community-based participatory approach to adapt the *Shikamana* intervention for HIV prevention, including pre-exposure prophylaxis (R34 MH118950).

Despite promising results in terms of feasibility, acceptability, safety, and initial effect size, this RCT had several limitations. First, while retention was 85% overall, outcomes including acceptability, safety, and viral suppression are unknown for participants who did not complete the study. In addition, some outcome data were missing due to skipped ACASI questions or failed viral load tests. MEMS® data capture was suboptimal due to frequent loss of MEMS® caps, and we did not have funds for testing of antiretroviral drug levels. Second, because the intervention combined NSC with peer support, we are unable to say which of the two intervention components is most promising. Third, acceptability and feasibility were assessed using qualitative measures, and no quantitative scales or a priori benchmarks to assess these constructs were included in study instruments. Fourth, the trial took place in a research clinic with years of experience providing care to GBMSM and a high ratio of both peers and providers to participants, and therefore may not reflect what is achievable in a less monitored or well-resourced setting. Although the same team delivered the intervention and standard care due to staffing constraints, close monitoring by the KEMRI clinical trials group likely limited exposure to the intervention in the standard care arm. Fifth, follow-up was limited to 6 months, and therefore we cannot comment on the sustainability of any effect after this timepoint. Finally, the men who agreed to participate in this study may differ from other HIV-positive GBMSM in Kenya, and results cannot be generalized to the broader population of Kenyan GBMSM.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Conclusions

In conclusion, the *Shikamana* intervention, which used peer and provider support to promote care engagement and ART adherence among HIV-positive GBMSM, appears to be feasible, acceptable, and safe in a rights-constrained setting in which stigma and discrimination are pervasive. While power was very limited, our results suggest an effect size compatible with increased viral suppression in this vulnerable population. A fully powered trial to evaluate the two intervention components and assess for effectiveness in a larger setting is needed. Additional interventions and implementation science research to support GBMSM living with HIV infection and to foster the adoption of successful MI- and peer-based approaches to ART adherence support will be needed to build on this preliminary work.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

We thank the men who participated in all phases of the *Shikamana* intervention development and RCT for their contributions. We express special gratitude to our seven dedicated and hardworking peers. We thank the staff of the HIV/STI project at the KEMRI-Wellcome Trust Research Programme in Kilifi for their commitment to serving GBMSM, as well as Dr. Anisa Omar of the Kenyan Ministry of Health. We are also grateful for support and guidance provided by the KWRTP to carry out research with stigmatized and vulnerable populations.

Funding

Support for this study was provided by NIH grant R34 MH099946 (PI: SMG). SMG was also supported by the Robert W. Anderson Endowed Professorship in Medicine. JMS was supported by NIH grant K24 MH093243. DO was supported by R24 HD07796. The KWRTP at the Centre for Geographical Medicine Research-Kilifi is supported by core funding from the Wellcome Trust (#203077/Z/16/Z). Additional infrastructure funding was provided by the University of Washington Center for AIDS Research, an NIH funded program (P30 AI027757) supported by the following NIH Institutes and Centers (NIAID, NCI, NIMH, NIDA, NICHD, NHLBI, NIA, NIGMS, NIDDK). Our work with GBMSM has also been funded by the International AIDS Vaccine Initiative (IAVI) with the generous support of USAID and other donors; a full list of IAVI donors is available at www.iavi.org. The views expressed in this publication are those of the authors and do not necessarily represent the official views the United States Government. This report was published with permission from the Director of the KEMRI-Wellcome Trust Research Programme.

References

1. National AIDS Control Council. Kenya AIDS Response: Progress Report 2016. Nairobi, Kenya: Kenya Ministry of Health; 2016.
2. Sanders EJ, Okuku HS, Smith AD, et al. High HIV-1 incidence, correlates of HIV-1 acquisition, and high viral loads following seroconversion among MSM. AIDS. 2013;27(3):437–446. [PubMed: 23079811]
3. Sandfort TGM, Dominguez K, Kayange N, et al. HIV testing and the HIV care continuum among sub-Saharan African men who have sex with men and transgender women screened for participation in HPTN 075. PLoS One. 2019;14(5):e0217501. [PubMed: 31150447]
4. Sullivan PS, Carballo-Diéguez A, Coates T, et al. Successes and challenges of HIV prevention in men who have sex with men. Lancet. 2012;380(9839):388–399. Erratum in: Lancet. 2012 Jul 28;380(9839):340. [PubMed: 22819659]
5. Donnell D, Baeten JM, Kiarie J, et al. Heterosexual HIV-1 transmission after initiation of antiretroviral therapy: a prospective cohort analysis. Lancet. 2010;375(9731):2092–2098. [PubMed: 20537376]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

6. Rosen S, Fox MP, Gill CJ. Patient retention in antiretroviral therapy programs in sub-Saharan Africa: a systematic review. PLoS Med. 2007;4(10):e298. [PubMed: 17941716]
7. Nachega JB, Knowlton AR, Deluca A, et al. Treatment supporter to improve adherence to antiretroviral therapy in HIV-infected South African adults. A qualitative study. J Acquir Immune Defic Syndr. 2006;43 Suppl 1:S127–133. [PubMed: 17133196]
8. Ware NC, Idoko J, Kaaya S, et al. Explaining adherence success in sub-Saharan Africa: an ethnographic study. PLoS Med. 2009;6(1):e11. [PubMed: 19175285]
9. Cloete A, Simbayi LC, Kalichman SC, Strebel A, Henda N. Stigma and discrimination experiences of HIV-positive men who have sex with men in Cape Town, South Africa. AIDS Care. 2008;20(9):1105–1110. [PubMed: 18608067]
10. Available at https://www.npr.org/2019/05/24/726541735/kenyas-judges-uphold-laws-that-criminalize-gay-sex. Downloaded on 10 4, 2019.
11. Fay H, Baral SD, Trapence G, et al. Stigma, health care access, and HIV knowledge among men who have sex with men in Malawi, Namibia, and Botswana. AIDS Behav. 2011;15(6):1088–1097. [PubMed: 21153432]
12. Lane T, Mogale T, Struthers H, McIntyre J, Kegeles SM. "They see you as a different thing": the experiences of men who have sex with men with healthcare workers in South African township communities. Sex Transm Infect. 2008;84(6):430–433. [PubMed: 19028941]
13. Tun W, Kellerman S, Maimane S, et al. HIV-related conspiracy beliefs and its relationships with HIV testing and unprotected sex among men who have sex with men in Tshwane (Pretoria), South Africa. AIDS Care. 2012;24(4):459–467. [PubMed: 22084826]
14. Graham SM, Mugo P, Gichuru E, et al. Adherence to antiretroviral therapy and clinical outcomes among young adults reporting high-risk sexual behavior, including men who have sex with men, in coastal Kenya. AIDS Behav. 2013;17(4):1255–1265. [PubMed: 23494223]
15. Taegtmeyer M, Davies A, Mwangome M, et al. Challenges in providing counselling to MSM in highly stigmatized contexts: results of a qualitative study from Kenya. PLoS One. 2013;8(6):e64527. [PubMed: 23762241]
16. van der Elst EM, Gichuru E, Omar A, et al. Experiences of Kenyan healthcare workers providing services to men who have sex with men: qualitative findings from a sensitivity training programme. J Int AIDS Soc. 2013;16 Suppl 3:18741. [PubMed: 24321109]
17. van der Elst EM, Smith AD, Gichuru E, et al. Men who have sex with men sensitivity training reduces homoprejudice and increases knowledge among Kenyan healthcare providers in coastal Kenya. J Int AIDS Soc. 2013;16 Suppl 3:18748. [PubMed: 24321111]
18. van der Elst EM, Gichuru E, Muraguri N, et al. Strengthening healthcare providers' skills to improve HIV services for MSM in Kenya. AIDS. 2015;29 Suppl 3:S237–240. [PubMed: 26372492]
19. van der Elst EM, Kombo B, Gichuru E, et al. The green shoots of a novel training programme: progress and identified key actions to providing services to MSM at Kenyan health facilities. J Int AIDS Soc. 2015;18:20226. [PubMed: 26493863]
20. National SOGIE Research Advisory Committee. G10 Research Engagement: A 3 Year Roadmap for Action for Sexual Orientation Gender Identity and Expression (SOGIE) Engagement in Research (2016/17 −2018/2019). Nairobi, Kenya: International AIDS Vaccine Initiative; 2016.
21. Graham SM, Micheni M, Secor A, et al. HIV care engagement and ART adherence among Kenyan gay, bisexual, and other men who have sex with men: a multi-level model informed by qualitative research. AIDS Care. 2018;30(sup5):S97–S105. [PubMed: 30668136]
22. Micheni M, Kombo BK, Secor A, et al. Health provider views on improving antiretroviral therapy adherence among men who have sex with men in coastal Kenya. AIDS Patient Care STDS. 2017;31(3):113–121. [PubMed: 28282249]
23. Graham SM, Micheni M, Kombo B, et al. Development and pilot testing of an intervention to promote care engagement and adherence among HIV-positive Kenyan MSM. AIDS. 2015;29 Suppl 3:S241–249. [PubMed: 26562813]
24. National AIDS and STI Control Programme. Guidelines on Use of Antiretroviral Drugs for Treating and Preventing HIV Infection: A Rapid Advice. Nairobi, Kenya: Kenya Ministry of Health; 2014.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

25. Amico KR, McMahan V, Goicochea P, et al. Supporting study product use and accuracy in self-report in the iPrEx study: next step counseling and neutral assessment. AIDS Behav. 2012;16(5):1243–1259. [PubMed: 22460228]
26. Simoni JM, Huh D, Frick PA, et al. Peer support and pager messaging to promote antiretroviral modifying therapy in Seattle: a randomized controlled trial. J Acquir Immune Defic Syndr. 2009;52(4):465–473. [PubMed: 19911481]
27. Chung MH, Richardson BA, Tapia K, et al. A randomized controlled trial comparing the effects of counseling and alarm device on HAART adherence and virologic outcomes. PLoS Med. 2011;8(3):e1000422. [PubMed: 21390262]
28. Lu M, Safren SA, Skolnik PR, et al. Optimal recall period and response task for self-reported HIV medication adherence. AIDS Behav. 2008;12(1):86–94. [PubMed: 17577653]
29. Feldman BJ, Fredericksen RJ, Crane PK, et al. Evaluation of the single-item self-rating adherence scale for use in routine clinical care of people living with HIV. AIDS Behav. 2013;17(1):307–318. [PubMed: 23108721]
30. Oyugi JH, Byakika-Tusiime J, Charlebois ED, et al. Multiple validated measures of adherence indicate high levels of adherence to generic HIV antiretroviral therapy in a resource-limited setting. J Acquir Immune Defic Syndr. 2004;36(5):1100–1102. [PubMed: 15247564]
31. Simoni JM, Beima-Sofie K, Amico KR, Hosek SG, Johnson MO, Mensch BS. Debrief reports to expedite the impact of qualitative research: Do they accurately capture data from in-depth interviews? AIDS Behav. 2019;23(8):2185–2189. [PubMed: 30666522]
32. Bangsberg DR. Less than 95% adherence to nonnucleoside reverse-transcriptase inhibitor therapy can lead to viral suppression. Clin Infect Dis. 2006;43(7):939–941. [PubMed: 16941380]
33. Huh D, Flaherty BP, Simoni JM. Optimizing the analysis of adherence interventions using logistic generalized estimating equations. AIDS Behav. 2012;16(2):422–431. [PubMed: 21553253]
34. Holstad MM, Essien JE, Ekong E, Higgins M, Teplinskiy I, Adewuyi MF. Motivational groups support adherence to antiretroviral therapy and use of risk reduction behaviors in HIV positive Nigerian women: a pilot study. Afr J Reprod Health. 2012;16(3):14–27. [PubMed: 23437496]
35. Parry CD, Morojele NK, Myers BJ, et al. Efficacy of an alcohol-focused intervention for improving adherence to antiretroviral therapy (ART) and HIV treatment outcomes – a randomised controlled trial protocol. BMC Infect Dis. 2014;14:500. [PubMed: 25212696]
36. Simoni JM, Nelson KM, Franks JC, Yard SS, Lehavot K. Are peer interventions for HIV efficacious? A systematic review. AIDS Behav. 2011;15(8):1589–1595. [PubMed: 21598034]
37. Haberer JE, Sabin L, Amico KR, et al. Improving antiretroviral therapy adherence in resource-limited settings at scale: a discussion of interventions and recommendations. J Int AIDS Soc. 2017;20(1):21371. [PubMed: 28630651]
38. Mills EJ, Lester R, Thorlund K, et al. Interventions to promote adherence to antiretroviral therapy in Africa: a network meta-analysis. Lancet HIV. 2014;1(3):e104–111. [PubMed: 26424119]
39. Secor AM, Wahome E, Micheni M, et al. Depression, substance abuse and stigma among men who have sex with men in coastal Kenya. AIDS. 2015;29 Suppl 3:S251–259. [PubMed: 26562814]
40. Korhonen C, Kimani M, Wahome E, et al. Depressive symptoms and problematic alcohol and other substance use in 1476 gay, bisexual, and other MSM at three research sites in Kenya. AIDS. 2018;32(11):1507–1515. [PubMed: 29734218]
41. Amico KR, Miller J, Balthazar C, et al. Integrated Next Step Counseling (iNSC) for sexual health and PrEP use among young men who have sex with men: Implementation and observations from ATN110/113. AIDS Behav. 2019l;23(7):1812–1823. [PubMed: 30315429]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

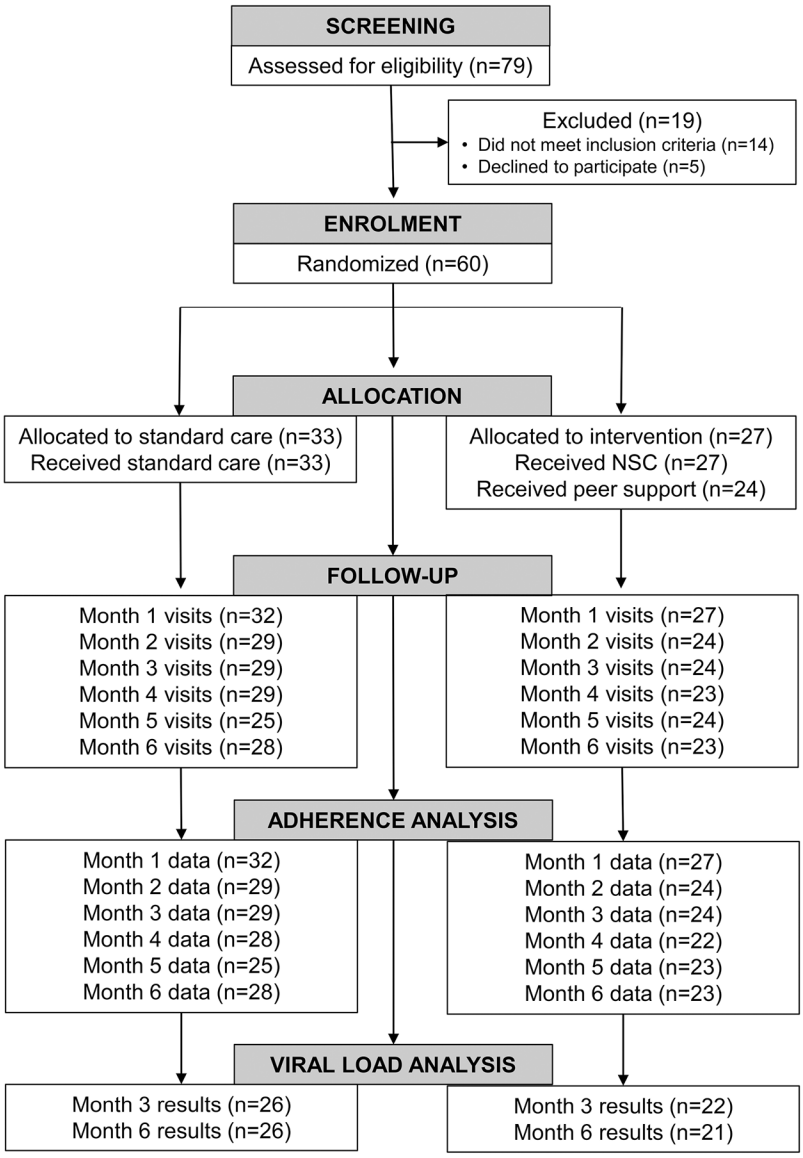

Figure 1.
CONSORT trial flow diagram.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

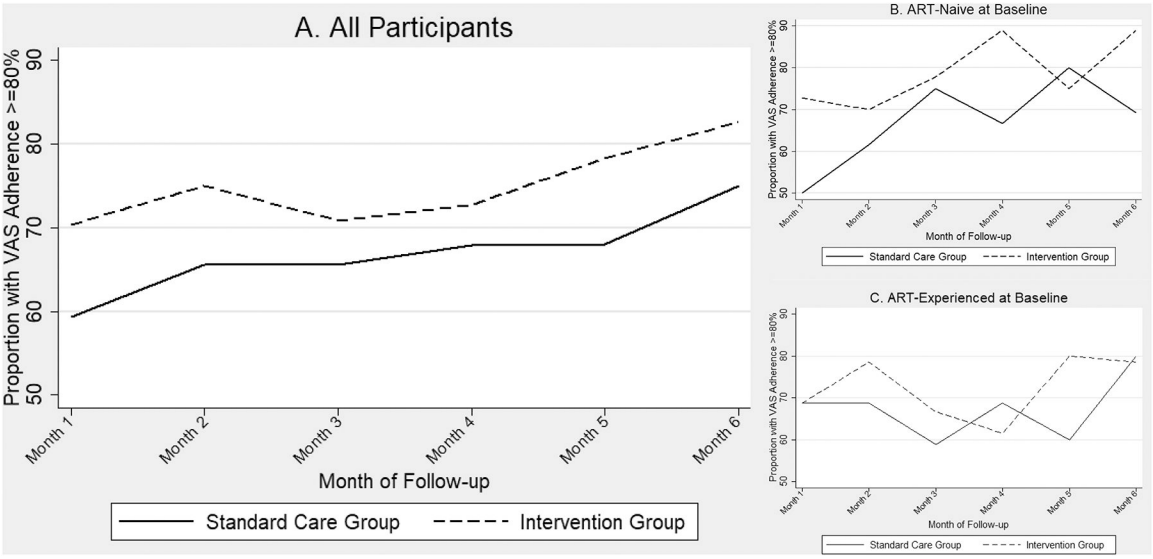

Figure 2. Proportion of participants in each study arm who reported VAS adherence ≥80% at each post-intervention timepoint (i.e., months 1–6 after study enrolment).

Panel A graphs responses for the 59 participants with at least one follow-up visit. Panel B graphs responses for the 27 participants who were ART naïve at baseline and had at least one follow-up visit. Panel C graphs responses for the 32 participants who were ART experienced at baseline and had at least one follow-up visit. Although a higher proportion of participants in the intervention arm reported VAS adherence ≥80% at all post-intervention timepoints, this difference was not significant in GEE analysis.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

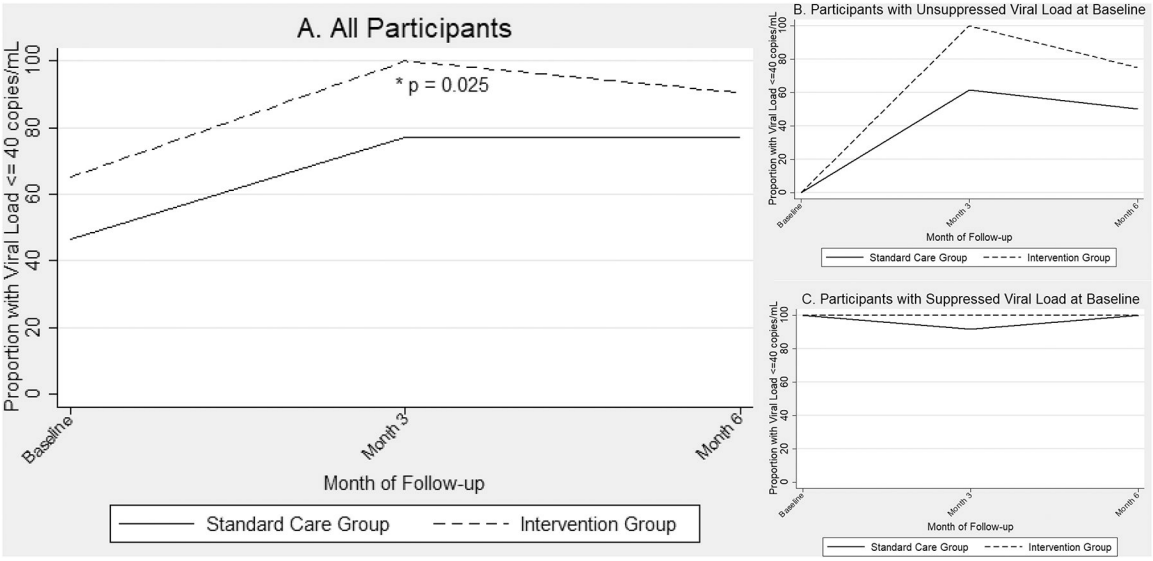

Figure 3. Proportion of participants in each study arm with viral suppression (≤40 copies/mL) at baseline, month 3, and month 6.

Panel A graphs responses for 53 participants at baseline, 48 at month 3, and 47 at month 6. Panel B graphs responses for participants who had unsuppressed viral load at baseline, including 24 participants at baseline, 20 at month 3, and 20 at month 6. Panel C graphs responses for participants had suppressed viral load at baseline, including 29 participants at baseline, 25 at month 3, and 25 at month 6. Overall, the proportion of participants with viral suppression in the intervention group was initially higher and remained higher at the two post-intervention timepoints. Among participants with unsuppressed viral load at baseline, a higher proportion of participants in the intervention arm had viral suppression at month 3 and month 6, compared to the standard care group. Among participants with suppressed viral load at baseline, all intervention participants maintained viral suppression at post-intervention timepoints, while some participants in the standard care group were unsuppressed at month 3.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

AIDS Behav. Author manuscript; available in PMC 2021 July 01.

Table 1.

Baseline Characteristics of *Shikamana* Participants by Study Arm

Characteristic	**Overall n = 60 N (%) or median (interquartile range)**	**Standard Care Arm n = 33 N (%) or median (interquartile range)**	**Intervention Arm n = 27 N (%) or median (interquartile range)**	**P value for comparison (Fisher's exact or Wilcoxon rank sum test)**
ART-experienced	33 (55.0%)	17 (51.5%)	16 (59.3%)	X^2=0.36, p=0.61
Viral load ≤40 copies/mL[a]	29 (54.7%)	14 (46.7%)	15 (65.2%)	X^2=1.81, p=0.27
CD4 count (cells/μL)	450 (306 – 588)	456 (317 – 581)	379 (277 – 607)	Z=0.54, p=0.59
Age group				X^2=1.50, p=0.50
18–24 years	12 (20.0)	8 (24.2)	4 (14.8)	
25–34 years	34 (56.7)	19 (57.6)	15 (55.6)	
>34 years	14 (23.3)	6 (18.2)	8 (29.6)	
Marital status				X^2=0.91, p=0.71
Single	53 (88.3)	28 (84.8)	25 (92.6)	
Currently Married	3 (5.0)	2 (6.1)	1 (3.7)	
Separated/Divorced	4 (6.7)	3 (9.1)	1 (3.7)	
Education				X^2=1.41, p=0.49
Primary or none	25 (41.7)	16 (48.5)	9 (33.3)	
Secondary	29 (48.3)	14 (42.4)	15 (55.6)	
Higher/tertiary	6 (10.0)	3 (9.1)	3 (11.1)	
Religion				X^2=0.22, p=0.94
Christian	31 (51.7)	17 (51.5)	14 (51.8)	
Muslim	17 (28.3)	10 (30.3)	7 (25.9)	
None/Other	12 (20.0)	6 (18.2)	6 (22.2)	
Employment				X^2=0.34, p=0.89
None	18 (30.0)	9 (27.3)	9 (33.3)	
Self	29 (48.3)	17 (51.5)	12 (44.4)	
Formal	13 (21.7)	7 (21.2)	6 (22.2)	
Sexual risk, past week				X^2=1.13, p=0.61
Not sexually active	43 (71.7)	22 (66.7)	21 (77.8)	
All acts protected	13 (21.7)	8 (24.2)	5 (18.5)	

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Characteristic	Overall n = 60 N (%) or median (interquartile range)	Standard Care Arm n = 33 N (%) or median (interquartile range)	Intervention Arm n = 27 N (%) or median (interquartile range)	P value for comparison (Fisher's exact or Wilcoxon rank sum test)
Any unprotected acts	4 (6.7)	3 (9.1)	1 (3.7)	
Sex of partners				X^2=0.56, p=0.55
Both men and women	45 (75.0)	26 (78.8)	19 (70.4)	
Men only	15 (25.0)	7 (21.2)	8 (29.6)	
Past or current sex work	49 (81.7)	29 (87.9)	20 (74.1)	X^2=1.89, p=0.20
Alcohol use in past month	24 (40.0)	11 (33.3)	13 (48.2)	X^2=1.36, p=0.30
Khat or marijuana use in past month	46 (76.7)	24 (72.7)	22 (81.5)	X^2=0.64, p=0.54
Disclosure of HIV status to anyone outside clinic	33 (55.0)	17 (51.5)	16 (59.3)	X^2=0.36, p=0.61
Personal assets[b]	3 (2 – 4)	3 (2 – 4)	3 (2 – 4)	Z=−0.10, p=0.92
Followed in KEMRI cohort for <12 months[c]	25 (41.7)	12 (36.4)	13 (48.2)	X^2=0.85, p=0.43

[a]Viral load results at baseline were missing for 3 men in the standard care group and 4 men in the intervention group due to failed tests and insufficient volume for retesting.

[b]Total of the following: private piped water, own/private toilet/latrine, radio, electricity, television, cell/mobile phone

[c]All men were required to join the KEMRI HIV-positive cohort and attend at least one follow-up visit prior to enrollment.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 2.

Main Intervention Effect on VAS Adherence over Months 1–6 and Viral Suppression in Months 3 and 6

Outcome	*VAS Adherence ≥80%*	*Plasma viral load ≤40 copies/mL*
Unadjusted Association	OR 1.53 (0.63 – 3.75) Z=0.94, p=0.35	OR 6.24 (1.28 – 30.5) Z=2.26, p=0.02
Adjusted for Baseline[a]	aOR 1.52 (0.62 – 3.70) Z=0.92, p=0.36	aOR 5.74 (1.18 – 27.8) Z=2.17, p=0.03
Adjusted Model with Group by Time Interaction Term[b]	aOR 1.52 (0.50 – 4.67) Z=0.73, p=0.46	Failed to converge
Limited Adjusted Model[c]	aOR 1.76 (0.70 – 4.41) Z=1.21, p=0.23	aOR 6.07 (1.40 – 26.2) Z=2.41, p=0.02

N.B.: Results presented are unadjusted and adjusted odds ratios (OR, aOR) for the main effect of the intervention group, with 95% confidence intervals in parentheses and model Z scores and p values beneath these estimates. Generalized estimating equations (GEE) were used with a logit link, robust standard errors, and exchangeable correlation structure.

[a]For the VAS adherence outcome, the adjustment was for ART-experienced vs. ART-naïve status at baseline. For the plasma viral load outcome, the adjustment was for baseline viral suppression (≤40 copies/mL).

[b]The adjusted model with the group by time interaction term was also adjusted for baseline. In the model for VAS adherence, the interaction term was not significant (adjusted OR 1.00, 95% CI 0.82 – 1.23, Z=0.00, p=1.00). The model for plasma viral load failed to converge.

[c]The limited adjusted model for VAS adherence included time in the KEMRI cohort and baseline ART status. The limited adjusted model for plasma viral load included time in the KEMRI cohort and baseline viral suppression.

AIDS Behav. Author manuscript; available in PMC 2021 July 01.