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"Computerized Counseling Reduces HIV-1 Viral Load and Sexual Transmission Risk: Findings from a Randomized Controlled Trial"

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Abstract

Objective—Evaluate a computerized intervention supporting antiretroviral therapy (ART) adherence and HIV transmission prevention.

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Trial Registration: ClinicalTrials.gov NCT00443378, http://clinicaltrials.gov/ct2/show/NCT00443378?term=04-3810-C+01&rank=1.

Author contributions: Dr. Kurth had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Kurth, Spielberg, Bangsberg, Holmes.
Intervention content: Kurth, Clausen, Spielberg, Frick, Simoni.
Acquisition of data: Severynen, Clausen, Lambdin.
Analysis and interpretation of data: Kurth, Cleland.
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List of Supplemental Digital Content: Supplemental Digital Content 1.doc
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Supplemental Digital Content 5.doc
Supplemental Digital Content 6.doc

Design—Longitudinal RCT.

Settings—An academic HIV clinic and a community-based organization in Seattle.

Subjects—240 HIV-positive adults on ART; 209 completed nine-month follow-up (87% retention).

Intervention—Randomization to computerized counseling or assessment-only, 4 sessions over 9 months.

Main Outcome Measures—HIV-1 viral suppression, and self-reported ART adherence, and transmission risks, compared using generalized estimating equations.

Results—Overall, intervention participants had reduced viral load (VL): mean 0.17 $\log_{10}$ decline, versus 0.13 increase in controls, $p = 0.053$, and significant difference in ART adherence baseline to 9 months ($p = 0.046$). Their sexual transmission risk behaviors decreased (OR = 0.55, $p = 0.020$), a reduction not seen among controls (OR = 1.1, $p = 0.664$), and a significant difference in change ($p = 0.040$).

Intervention effect was driven by those most in need: among those with detectable virus at baseline (>30 copies/milliliter, n=89), intervention effect was mean 0.60 $\log_{10}$ VL decline versus 0.15 increase in controls, p=0.034. ART adherence at the final follow-up was 13 points higher among intervention participants versus controls, $p = 0.038$.

Conclusions—Computerized counseling is promising for integrated ART adherence and safer sex, especially for individuals with problems in these areas. This is the first intervention to report improved ART adherence, viral suppression, and reduced secondary sexual transmission risk behavior.

Keywords

HIV; computerized counseling; prevention with positives; viral load; antiretroviral adherence

INTRODUCTION

Antiretroviral therapy (ART) reduces morbidity and mortality related to human immunodeficiency virus (HIV) infection. Sustained adherence to ART improves individual outcomes and reduces secondary transmission, since low viral load is associated with reduced HIV transmission[1-3] and earlier ART initiation reduces sexual transmission by 96%.[4] It is important to identify efficient ways to support medication adherence over a lifetime, as ART is now recommended in the United States (US) for all persons living with HIV (PLWH) regardless of CD4 count.[5] However, only an estimated 77% of US patients on ART have suppressed viral loads.[6] Reducing transmission risk behaviors among PLWH ('prevention with positives') is a longstanding public health goal.[7] The chronicity of HIV infection may be accompanied by continued or increased sexual risk behaviors for some individuals; however, not all providers routinely address HIV transmission risk reduction with their HIV-positive patients.[8-10]

Scalable strategies are needed to optimize ART adherence and to reduce secondary transmission of HIV. Meta-analyses show that interventions to support ART adherence,[11,12]

and to reduce secondary HIV transmission risk,[13,14] are efficacious. Because these interventions have been largely research-based, and staff- and resource-intensive,[15,16] population-level implementation may not occur[17].[18]

We hypothesized that a computer-delivered intervention could support ART adherence *and* reduce HIV transmission risk by PLWH. We evaluated such an intervention called Computer Assessment & Rx Education for HIV-positive people (CARE+).

METHODS

Participants

Study participants were recruited from a university-affiliated public HIV clinic and a large AIDS service organization in Seattle, Washington. Eligibility criteria included age ≥18 years, on ART, able to understand spoken English; exclusions included thought disorders and current participation in ART adherence or prevention-with-positives studies. Written consent was obtained prior to randomized assignment. All procedures were approved by University of Washington Human Subjects Division, 06-1198-C. Participants received $20 at the first three, and $40 at the final, session.

Intervention

Design—The computerized-counseling intervention was evaluated in a prospective two-arm randomized controlled trial (RCT). The study sample of n=240 was assigned via an automated pseudo-random number generation algorithm, disallowing any exposure to intervention by controls. The experimental group received CARE+ (audio-narrated assessment, tailored feedback, skill-building videos, health plan, and printout) on a tablet computer and standard care, while controls received assessment only on tablets and standard care. Each group underwent four sessions specific to assigned arm at three-month intervals over nine months. Sessions were scheduled on same day as clinic visits wherever possible.

CARE+ is a .NET-based (Microsoft, Redmond, WA) custom software application on touchscreen computers. Intervention content is based on theoretical frameworks: information-motivation-behavior including ‘importance’ and confidence’ scales around ART use and transmission risk-reduction,[19] transtheoretical including stage of change questions around condoms,[20] social cognitive role-modeling with peers demonstrating healthy behaviors in videos,[21] and motivational interviewing including messages acknowledging ambivalence around behavior change and highlighting user’s commitment[22]). The tool incorporates evidence-based elements shown in RCTs to improve ART adherence or reduce sexual risk,[23,24] such as feedback including consequence-framed messages (e.g., “Unprotected sex may expose you to STDs”)[25] and videos.[26] Content recommendations were obtained through 30 qualitative interviews conducted with PLWH.[27] Final CARE+ content was reviewed by an expert panel for face validity.

Figure 1 summarizes the CARE+ session. Users received tailored feedback based on risk assessment responses, and viewed video versions for heterosexuals or for men who have sex with men (MSM) showcasing skills around HIV disclosure, ART adherence, safer sex, substance abuse, male/ female condoms, condom use negotiation, working with providers,

and HIV natural history and ART mechanisms. Users develop a plan for ART adherence or safer sex (user choice at 1st session, and switched at 3rd session). A personalized printout summarized feedback, health plan, and referral phone numbers.

The control condition comprised computerized risk-assessment only (sexual behaviors, substance use, mental health, ART regimen, side effects, adherence in last 7 and 30 days).

In both study arms, the tool flagged reports of severe depression by Patient Health Questionnaire (PHQ-9 score of ≥20),[28] intimate partner violence (IPV), or suicidal ideation; as outlined in the consent, study staffers notified case managers for appropriate follow-up. At repeat sessions, these participants were asked how referrals went. All intervention participants were reminded of their last plan and asked to continue or make a new health plan. Software usability was evaluated among an additional 30 HIV-positive clients, and one week test-retest reliability assessment was done to establish psychometric performance of key tool variables.[29]

Outcome Measures

The primary biological outcome was HIV-1 RNA viral load (VL), determined using a 500 microliter (mL) plasma specimen in a TaqMan real-time polymerase chain reaction assay with 30 copies/microliter (mL) as the lower limit of quantification for detectable HIV-1. HIV-1 viral load was assessed using specimens drawn on day of study interview or as part of patient care within a month prior to study visit. The same laboratory was used for all study and clinical viral loads and was determined by personnel blinded to study arm. Primary behavioral outcome measures collected by self-report in both arms consisted of a composite variable of sexual transmission risk – no condom use (unprotected sex) or condom use with problems/errors (i.e., vaginal or anal sex either without a condom or where a condom was used but HIV exposure may have occurred due to mechanical or user failure) – and ART adherence by 30-day visual analog scale (VAS).[30,31]. Accurate reporting was encouraged during enrollment, consent, and sessions through normalizing language and reiteration that the study would not share self-reported data to providers, with sole exception of IPV, severe depression, and suicidality, which (as noted in the consent) prompted appropriate provider referral. Secondary outcome measures included changes in ART/condom stage of change and HIV disclosure.

Statistical Methods

Fisher's exact and Wilcoxon rank sum tests assessed differences between intervention and control groups and between study sites in baseline study population characteristics. We utilized generalized estimating equation (GEE) models with a Gaussian link and an unstructured correlation structure to compare changes in viral load ($\log_{10}$-transformed) and ART adherence (30-day VAS) between intervention and control groups and from baseline to nine-month follow-up. GEE models with a logit link and an unstructured correlation structure compared odds of undetectable viral load and sexual transmission risks between intervention and control groups and from baseline to nine-month follow-up. All GEE models included main effects for intervention condition and linear trend as well as an interaction between these terms to capture differences in change between intervention conditions. The

analysis was intent-to-treat. Covariates in the models included likely depression diagnosis by PHQ-9 since this was the only variable that differed significantly between study arms at baseline, as well as education, condom use with main partner at baseline, and study site. These analyses were done for the whole sample, and for the subgroup who had detectable viral load at baseline. Estimates for these 'detectables' were obtained by including relevant main and interaction effects for an indicator variable specifying whether each participant had detectable viral load at baseline. When modeling odds of viral load being undetectable within this subgroup, only the three follow-up assessments were included. Analyses were performed using R,[32] including geepack[33] for GEE, doBy[34] for post-estimation, and ggplot2[35] for result visualization.

RESULTS

We approached 301 individuals at two study sites; 240 enrolled (80% acceptance), 239 completed baseline, and 87% (209/239) were retained for nine-month study duration (Fig. 2). Participants were consented, enrolled, then randomized. The 30 lost to follow-up had similar numbers and reasons across arms, suggesting non-differential dropout (p = .56 for attrition by arm).

Table 1 shows participant characteristics at baseline by study arm. At baseline intervention participants were less likely than controls to obtain a positive screening result for likely depression diagnosis (n=14 vs. 25, p = 0.032). There were several significant differences at baseline between clinic- and organization-recruited participants including proportion of MSM, proportion incarcerated more than one night, condom use, self-reported ART adherence (VAS), proportion with resistant virus, and proportion victimized by intimate partner violence [Supplemental Table 1].

Figure 3 shows 95% confidence intervals for outcome means by time and study condition. Detailed GEE results are in Supplemental Digital Content Tables 2-4 showing impact on VL, proportion with undetectable VL, ART adherence, and sexual transmission risks in the full sample [Supplemental Table 2] and the subset of participants with detectable VL at baseline [Supplemental Table 3], as well as contrasts between intervention and control conditions at each time point and between baseline and nine-month time points within each condition, for full and subset samples [Supplemental Table 4].

Figure 4 summarizes main outcomes of interest. The first four contrasts in each figure are intervention versus control at each time point while the last two contrasts in each figure compare baseline with nine-month follow-up within each study arm.

HIV-1 Viral Load Effect

Figure 4a shows 95% confidence intervals for $\log_{10}$ viral load point-in-time study condition mean differences and change within each group from baseline to nine-month follow-up. Figure 4b shows 95% confidence intervals for point-in-time study condition differences and change within each group from baseline to nine-month follow-up in the odds of having undetectable viral load. There were marginally significant differences in change from baseline to the nine-month follow-up between study arms in $\log_{10}$ viral load (p = 0.053) and

in the odds of having undetectable viral load ($p = 0.090$). CARE+ intervention participants overall had an average decrease of 0.17 $\log_{10}$ viral load ($p = 0.112$; 95% CI: −0.39–0.04) while control participants had an increase of 0.13 ($p = 0.250$; 95% CI: −0.09–0.35) [Fig. 4a Right]. Relative to baseline, the odds of having undetectable viral load at the nine-month follow-up were increased in the CARE+ condition (OR = 1.57; $p = 0.037$; 95% CI: 1.03–2.39) but reduced in the control condition (OR = 0.98; $p = 0.925$; 95% CI: 0.71–1.37) [Fig. 4b Right]. At the nine-month follow-up, CARE+ intervention participants were lower than controls in $\log_{10}$ viral load (−0.06; $p = 0.741$; 95% CI: −0.4 −0.30) and had increased odds of undetectable viral load (OR = 1.03; p = 0.920; 95% CI: 0.58–1.81), but neither of these differences were significant.

Among the subgroup who had detectable viral load at baseline, CARE+ intervention participants had an average decrease of 0.60 $\log_{10}$ viral load ($p = 0.004$; 95% CI: −1.01–−0.19) [Fig. 4a Left] while control participants had an increase of 0.15 $\log_{10}$ viral load ($p = 0.641$; 95% CI: −0.48–0.78). At the nine-month follow-up, CARE+ intervention participants were lower than controls in $\log_{10}$ viral load (−0.73; 95% CI: −1.42– −0.03), a significant difference ($p = 0.041$) [Fig. 4a Left]. CARE+ intervention participants also had higher odds of undetectable viral load than controls at the nine-month follow-up (OR= 2.32; 95% CI: 0.85–6.34), although this difference was only marginally significant ($p = 0.101$) [Fig. 4b Left]. For the subgroup with detectable viral load at baseline, in Figure 4b we do not show odds ratios for the baseline time point nor changes from baseline to the nine-month follow-up time point within each group, because all of the participants in this subgroup had detectable viral load at baseline. For the $\log_{10}$ viral load outcome, the three-way interaction between baseline detectable VL, study arm, and time was significant ($p = 0.034$), indicating CARE+ was more effective than control for those with detectable viral load at baseline [Supp. 6].

ART Adherence Effect

Figure 4c shows 95% confidence intervals for point-in-time VAS mean differences between groups and mean change within each group from baseline to nine-month follow-up. There was a statistically significant difference in change from baseline to the nine-month follow-up between study arms ($p = 0.046$) in self-reported ART adherence by 30-day VAS [Supplemental Content 2]. CARE+ intervention participants had an average increase of 4.71 points in the percentage of medication doses taken ($p = 0.014$; 95% CI: 0.95–8.48) while control participants had a decrease of 1.39 points ($p = 0.556$; 95% CI: −6.03–3.24) [Fig. 4c Right]. At the nine-month follow-up, CARE+ intervention participants were higher than controls in ART adherence (4.77; 95% CI: − 0.79–10.33), but this difference was not significant ($p = 0.093$) [Fig. 4c Right].

Among those with detectable viral load at baseline, CARE+ intervention participants had an average VAS adherence increase of 8.00 points ($p = 0.040$; 95% CI: 0.37–15.62) while control participants had a decrease of 1.53 points ($p = 0.822$; 95% CI: −14.84–11.78) [Fig. 4c Left]. At the nine-month follow-up, CARE+ intervention participants were higher than controls in ART adherence (13.44; 95% CI: 0.73–26.14), a significant difference ($p = .038$) [Fig. 4c Left].

Secondary HIV Transmission Risk Effect

Figure 4d shows confidence intervals for point-in-time study condition differences and change within each group from baseline to nine-month follow-up in self-reported transmission risks, defined as sex without a condom or condom use with errors. There was a statistically significant difference in change from baseline to the nine-month follow-up between study arms in self-reported transmission risks ($p = 0.040$). Among CARE+ intervention participants, the odds of transmission risks were 0.55 times lower at the nine-month follow-up than at baseline ($p = 0.020$; 95% CI: 0.34–0.91) while for control participants the odds of transmission risks increased over time (OR = 1.10; $p = 0.664$; 95% CI: 0.72–1.67) [Fig. 4d Right]. At the nine-month follow-up, CARE+ intervention participants had a reduced odds of transmission risks when compared with controls (OR = 0.46; 95% CI: 0.25–0.84), a significant difference ($p = .012$) [Fig. 4d Right].

Clinic Site and Detectable Viral Load at Baseline as Effect Modifiers

None of the three-way interactions involving study arm, linear trend, and clinic site were statistically significant, suggesting similar intervention effects in the university-affiliated and community-based organization sites (Supplement 5). Detectable viral load at baseline was a modifier of study arm effects on log10 viral load, as indicated by a significant three-way interaction between study arm, linear trend, and detectable viral load at baseline ($p = 0.034$). Three-way interactions involving study arm, linear trend, and detectable viral load at baseline were not statistically significant for other outcomes (Supplement 6).

Health Promotion Behavior Plans

CARE+ intervention participants made a concrete plan for ART adherence or transmission risk reduction (controls did not make plans). Many individuals (78%) indicated at baseline that they had an approach that was working for them, which they detailed with specific steps in the CARE+ session; 12% made a new plan. Common plans for ART adherence were to ‘keep doing what I am doing’ (n = 32) ‘use reminders’ (31), and ‘get support’ (25). Common plans for transmission risk reduction were to ‘not have sex’ (31), ‘use condoms’ (27), ‘have fewer or only 1 sex partner(s)’ (22), or ‘only have sex with people who are also positive’ (7).

Intervention participants’ confidence in their plan success increased over time, from 66% at three months to 80% at nine months (McNemar’s χ^2 $p = .02$). Confidence in their ability to not transmit HIV increased over time: 0-10 ascending scale for confidence, mean 8.43 (SD 2.27) at baseline and 9.14 (SD 1.53) at nine months, $p = .02$.

At baseline, 41 referrals were made for intervention participants and 52 for controls for reported severe depression (37%), IPV (9%), or suicidal ideation (53%); at nine months total referrals for these conditions were 21 and 32, respectively ($p = .10$).

Intervention Acceptability

Nearly all (97%) CARE+ intervention participants found the tool easy to use; 99% rated session length as “just right”; 97% felt they had “enough privacy” during the session. Most (93%) felt the CARE+ session helped them as much or more than face-to-face counseling

with a staff person, and 75% said they would prefer the computer over a human counselor in the future. No harms or unintended effects were noted in either arm of the study.

DISCUSSION

We found that a computerized counseling tool was effective at helping PLWH improve ART adherence and reduce HIV transmission risk behaviors, as measured by improvement in self-reported adherence, reduction in viral load, and improvement in reported correct and consistent condom use, compared to controls receiving usual care. The adherence effect was most pronounced among those whose plasma HIV-1 was not suppressed at baseline. The reduced viral load and fewer sexual transmission risk behaviors seen among those undergoing the intervention both may contribute to decreasing HIV transmission to sexual partners.

In our study population area, chart audits found that fewer than half of HIV-positive clients were assessed for sexual risks, STD testing or referral.[36] Another study assessing 26 HIV clinics across the US found that providers reported delivering prevention-with-positives counseling at 67% of initial visits but only 53% of subsequent regular visits.[37] Computerized counseling may lack some advantages offered by a highly-skilled human counselor, but it is delivered consistently with fidelity,[38] without need for staff time or training. In our study it proved highly acceptable and had an efficacious impact on priority behaviors and objective measures of viral load response.

Multiple studies have utilized computers to assess ART non-adherence,[39-41] or HIV transmission risk[42-48] among PLWH, but fewer have been used to influence patient behavior.[49,50] Lightfoot found that computer-assisted self-monitoring of transmission risk behaviors can be a strategy for PLWH.[51,52] Fisher et al. found that computerized counseling supported ART adherence though this study did not find a viral load impact.[53] Others have used computerized counseling to reduce HIV acquisition risk,[54-56] which meta-analyses have found to be effective.[57]

Economic evaluation models have found that adherence interventions with modest effectiveness may provide survival benefit to patients and be cost-effective.[58] The intervention we tested that does not require staff time, training, and monitoring may be easier to introduce into busy practice settings.

Study limitations include the fact that two-thirds of our population already had suppressed VL at baseline and 60% did not engage in sexual activities at any timepoint. Both limitations present conservative biases to the null. Mirroring the Seattle HIV epidemic, the sample was predominantly male. This makes extension of these results to females, or to those living outside the US, less generalizable. These were heavily treatment- and intervention-experienced populations. Half the sample was from an HIV clinic whose approach to ART adherence support was itself found to reduce $\log_{10}$ viral load.[59] The potential for detecting intervention effect, and magnitude of effect, may be greater in populations with lower ART adherence or higher sexual risk at baseline.[60] The study was well-powered to detect a clinically meaningful intervention effect, i.e., a mean half-$\log_{10}$ change in viral load.

However, given that this is one study, examining intervention effects in additional diverse HIV-positive samples would contribute to important next steps of replication and generalization. Future research could include examination of the interplay of multiple HIV behaviors such as nonadherence and sexual risk. The intervention may have influenced risk behavior reporting, though computerized approaches can reduce social desirability bias[61] and the VL differences seen is consistent with differences in reported adherence behavior. In previous work with the CARE platform users reported that it was easier to be honest with the computer and that the session allowed them to reflect on recent risk behaviors.[62] Self-reports of sexual transmission risk outcomes and of ART adherence are limitations. Follow-up of nine months did not allow evaluation of longer-term impact or effect duration. Though the study was conducted in a period when there were fewer ART regimens available, inconsistent ART adherence even to current simplified regimens continues to be a major challenge.[63]

The study was strengthened by including community- and clinic-based samples, which had similar intervention effects, increasing generalizability.

CONCLUSION

Computer-delivered counseling had a modest, but significant, positive impact on HIV-1 viral load—a primary driver of morbidity and genital compartment infectivity[64]—and on self-reported HIV transmission risks. This was particularly the case for those who had non-suppression of viral load at baseline – precisely the highest-need group in whom an intervention can have impact. This group's average VL at baseline declined by a clinically meaningful reduction of approximately 0.5 $\log_{10}$ a reduction that has implications for the person's own health as well as infectiousness. Their reported ART adherence increased by around 10% (76% at baseline to 85% at 9-months), whereas controls started at 74% mean adherence and showed no improvement over time. The intervention's relatively modest absolute changes were enough to get this vulnerable group into better ranges of medication adherence, as seen by viral load impact. The importance of supporting treatment adherence has been highlighted by Gardner and others who have shown how few HIV-positive individuals even in care are virally suppressed in the US.[65] Interventions to support adherence have tended to show relatively small effects, highlighting the need for efficacious interventions that can be implemented without straining health system resources,[63] as is the promise of computerized counseling tools such as CARE+.

As far as we know this is the first ART adherence and secondary HIV transmission risk intervention to find biological effect (viral load) and behavioral impact among persons living with HIV. The computer format was highly acceptable and facilitated delivery in busy settings. Such an approach warrants further evaluation to determine utility in improving HIV treatment outcomes and reducing secondary HIV transmission among persons living with HIV.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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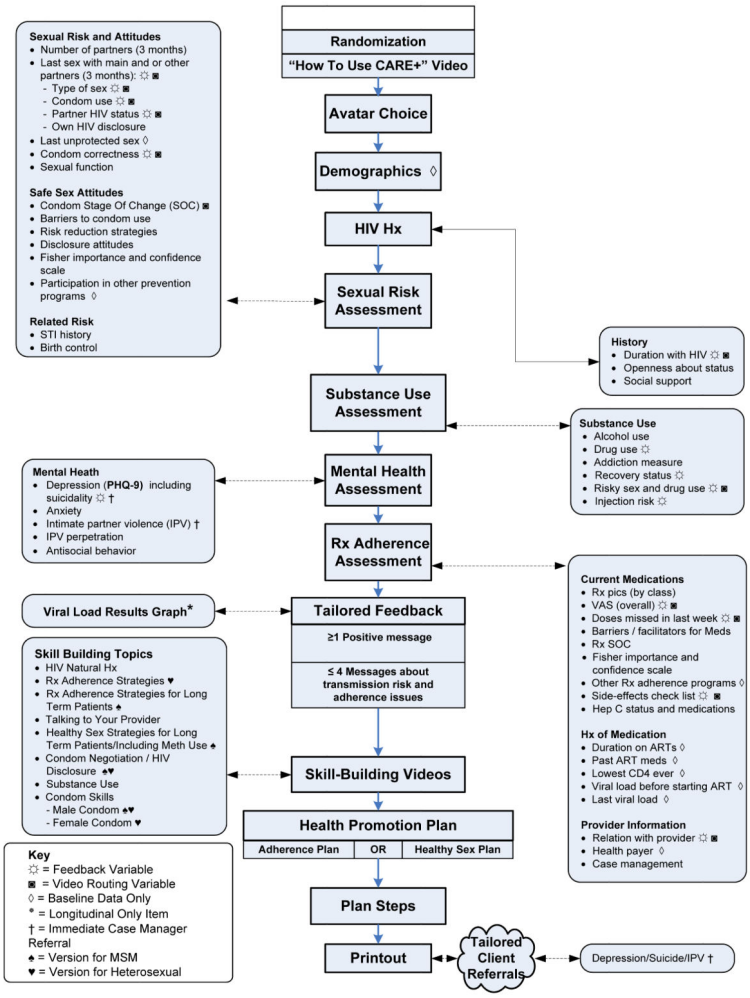

Figure 1.
CARE+ Computerized Counseling Intervention Content By Session

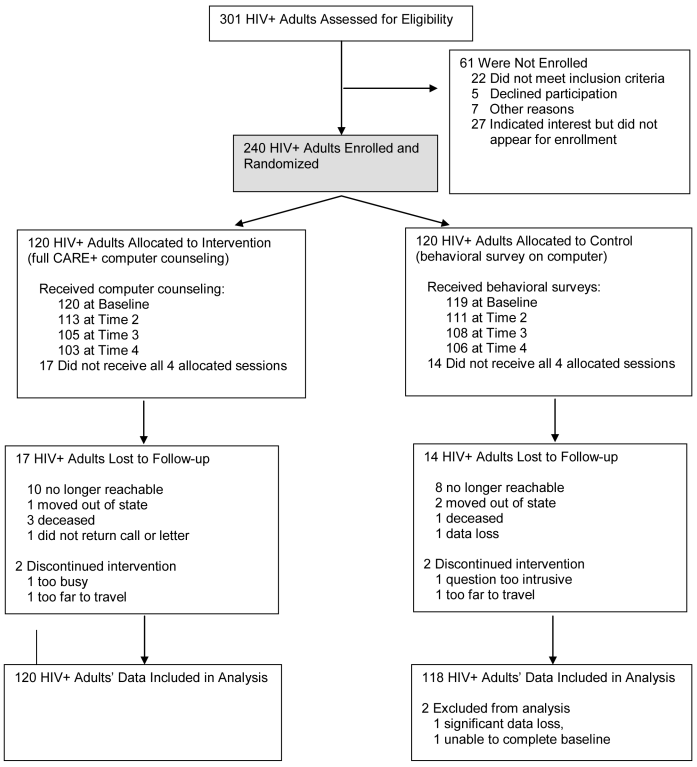

Figure 2.

CARE+ Computerized Counseling Intervention Trial, Four Sessions Over 9 Months

HIV denotes human immunodeficiency virus-1.

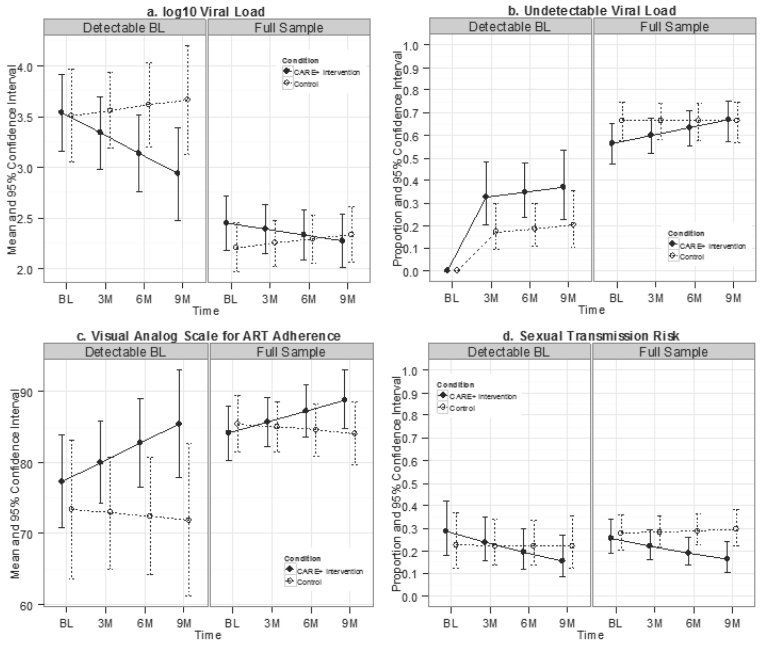

Figure 3. Adjusted Means* by Time and Treatment Condition

* NOTE: For these independent 95% confidence intervals, non-overlap indicates $p < .05$, but overlap does not reliably indicate that $p > .05$ (Cumming, 2009). See Fig. 4 for contrasts. Detectable BL: had detectable HIV1 viral load at first baseline (BL) session Full sample: All participants regardless of viral load status at baseline

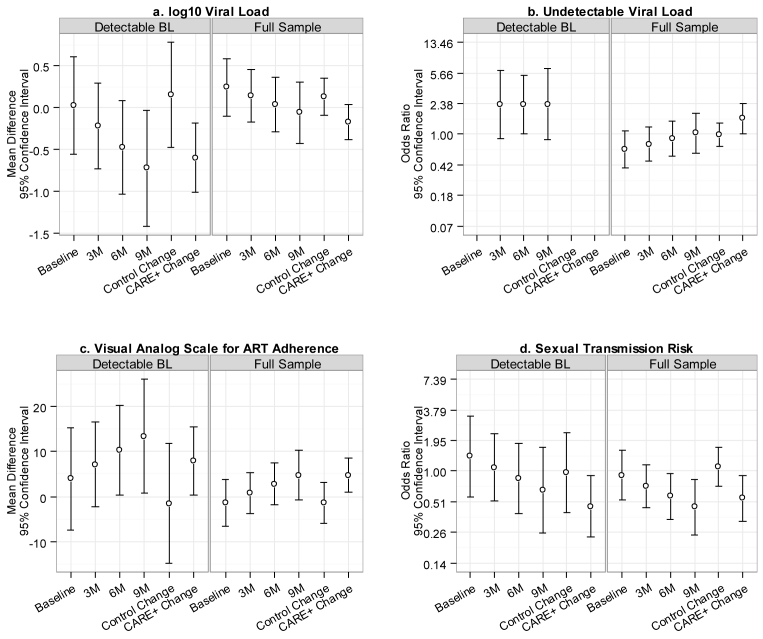

Figure 4.

Comparison of Viral Load, ART Adherence, and Unprotected Sex for Each Follow-up Point and Changes within each Treatment Condition.

Table 1

Baseline Characteristics of CARE+ Intervention and Control Conditions and by Academic and Community-Based Study Sites.

	CARE+ (n=120) Study Arm	CONTROL (n=119) Study Arm	Difference by Study Arm *p*-value	Difference by Study Site *p*-value
Female Gender	12	9	0.6732	NS
Age	45 (11)	45 (9.75)	0.7759	NS
Hispanic/Latino	9	8	0.8161	NS
American Indian or Alaska Native	12	12	1.0000	NS
Asian	1	3	0.2109	NS
Black or African-American	28	31	0.7765	NS
Native Hawaiian or Other Pacific Islander	0	2	0.2448	NS
White	57	53	0.6020	NS
Other Race	10	8	0.6488	NS
No High School (HS) Diploma/GED	15	14	1.0000	NS
HS Diploma/GED Only	50	39	0.0919+	NS
More than High School	35	47	0.0862+	NS
Man Who Has Sex with Men	72	77	0.3738	0.0118 *
Incarcerated More Than One Night	45	53	0.2452	0.0280 *
Injecting Drug Use Past 3 Months	17	10	0.1831	NS
Any Methamphetamine	20	13	0.1610	NS
Any Cocaine	19	22	0.6338	NS
Any Methamphetamine or Cocaine	34	28	0.3279	NS
Any Sex Past 3 Months	61	59	0.7926	NS
No Condom with Main Partner	8	15	0.0688+	NS
No Condom with Other Partner	12	16	0.4648	NS *
Unprotected Discordant Sex with Main Partner	2	1	1.0000	NS
Unprotected Discordant Sex with Other Partner	2	5	0.3333	NS
Condom Use with Problems	14	11	0.5588	NS
Any Sex without Condoms	19	27	0.1693	0.0310 *
Any Sex without Condoms or with Condom Problems	29	34	0.4879	0.0508 +
Adherence Visual Analog Scale (VAS)	94.5 (12.25)	93 (15)	0.4189	0.0357 *
96%+ VAS Adherence	43	44	0.8952	0.0173 *
90%+ VAS Adherence	69	70	0.8874	0.0152 *
86%+ VAS Adherence	76	74	0.8798	0.0150 *
80%+ VAS Adherence	83	83	1.0000	NS
70%+ VAS Adherence	87	90	0.5463	NS

	CARE+ (n=120) Study Arm	CONTROL (n=119) Study Arm	Difference by Study Arm	Difference by Study Site
			p-value	*p*-value
Missed Doses Past 7 Days	0 (1)	0 (1)	0.6648	NS
CD4 Nadir	125.5 (214.5)	91 (188.75)	0.4800	NS
Viral Load Before Medication	4.95 (2.24)	4.88 (2.39)	0.5201	NS
Ever Told Resistant Virus	16	17	0.8627	0.0348 *
Years Since HIV Diagnosis	12 (9.25)	11 (9.75)	0.3634	0.0503 +
Depression Severity (PHQ-9)	6 (10.5)	7 (14)	0.0969 +	NS
Depression Diagnosis (PHQ-9)	14	25	0.0319 *	NS
Anxiety More than Half of Past 7 Days	31	29	0.7774	NS
Intimate Partner Violence (IPV) Perpetration	2	3	0.4462	NS
IPV Victimization	9	7	0.6336	0.0031 **
Past Adherence Intervention	7	3	0.3753	NS
Past Prevention with Positives Intervention	12	10	0.8359	NS
$\log_{10}$ HIV-1 Viral Load	1.48 (1.49)	1.48 (0.99)	0.1149	NS
Detectable Viral Load	44	33	0.1102	NS
CD4	394 (347.5)	341 (364.5)	0.4872	NS

Notes: Percentage or Median (Interquartile Range); comparison by Fisher's exact test or Wilcoxon rank-sum test.

+ p <.10;

* p <.05;

** p <.01. A $\log_{10}$ viral load of 1.48 is "undetectable".