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Journal

AIDS Care, 30(12)

ISSN

0954-0121

Authors

Marks, Gary
O'Daniels, Christine
Grossman, Cynthia
et al.

Publication Date

2018-12-02

DOI

10.1080/09540121.2018.1510099

Peer reviewed

HHS Public Access

Author manuscript

AIDS Care. Author manuscript; available in PMC 2019 December 01.

Published in final edited form as:

AIDS Care. 2018 December ; 30(12): 1605–1613. doi:10.1080/09540121.2018.1510099.

Evaluation of a Computer-Based and Counseling Support Intervention To Improve HIV Patients' Viral Loads

Gary Marks[1], **Christine O'Daniels**[2], **Cynthia Grossman**[3], **Nicole Crepaz**[1], **Charles E. Rose**[1], **Unnati Patel**[1], **Michael J. Stirratt**[3], **Lytt I. Gardner**[1], **Edward R. Cachay**[4], **William C. Mathews**[4], **Mari-Lynn Drainoni**[5], **Meg Sullivan**[6], **Lucy Bradley-Springer**[7], **Marla Corwin**[7], **Christopher Gordon**[3], **Allan Rodriguez**[8], **Shireesha Dhanireddy**[9], and **Thomas P. Giordano**[10]

[1]Division of HIV/AIDS Prevention, Centers for Disease Control and Prevention, Atlanta, Georgia [2]Carter Consulting, Inc., Atlanta, Georgia [3]Division of AIDS Research, National Institute of Mental Health, Bethesda, Maryland [4]Department of Medicine, University of California, San Diego, California [5]School of Public Health, Boston University, Boston, Massachusetts [6]Department of Medicine, Boston University School of Medicine, Boston, Massachusetts [7]Mountain Plains AIDS Education and Training Center, University of Colorado, Denver, Colorado [8]Division of Infectious Diseases, Miller School of Medicine, University of Miami, Florida [9]Department of Medicine, University of Washington, Seattle, Washington [10]Department of Medicine, Baylor College of Medicine, and the Center for Innovations in Quality, Effectiveness and Safety, Michael E. DeBakey Veterans Affairs Medical Center, Houston, Texas

Abstract

We sought to integrate a brief computer and counseling support intervention into the routine practices of HIV clinics and evaluate effects on patients' viral loads. The project targeted HIV patients in care whose viral loads exceeded 1000 copies/ml at time of recruitment. Three HIV clinics initiated the intervention immediately, and three other HIV clinics delayed onset for 16 months and served as concurrent controls for evaluating outcomes. The intervention components included a brief computer-based intervention (CBI) focused on antiretroviral therapy adherence; health coaching from project counselors for participants whose viral loads did not improve after doing the CBI; and behavioral screening and palm cards with empowering messages available to all patients at intervention clinics regardless of viral load level. The analytic cohort included 982 patients at intervention clinics and 946 patients at control clinics. Viral loads were assessed at 270 days before recruitment, at time of recruitment, and +270 days later. Results indicated that both the control and intervention groups had significant reductions in viral load, ending with approximately the same viral level at +270 days. There was no evidence that the CBI or the targeted health coaching was responsible for the viral reduction in the intervention group. Results may stem partially from statistical regression to the mean in both groups. Also, clinical providers at control and intervention clinics may have taken action (e.g., conversations with patients, referrals to case managers, adherence counselors, mental health, substance use specialists) to help their patients reduce their viral loads. In conclusion, neither a brief computer-based nor targeted

Correspondence to: Gary Marks, 35218 Village 35, Camarillo, CA 93012, garysmarks@gmail.com, 805 5684537.

health coaching intervention reduced patients' viral loads beyond levels achieved with standard of care services available to patients at well-resourced HIV clinics.

Keywords

HIV; AIDS; viral load; computer intervention; counseling

Introduction

"Treatment as Prevention" (TasP) can dramatically reduce new HIV infections. HIV patients on antiretroviral therapy (ART) who achieve and sustain a suppressed viral load protect their own health and virtually eliminate the risk of transmitting HIV infection to others (Cohen et al., 2016; Rodger et al., 2016). In HIV clinic populations, upwards of 95% of patients have been prescribed ART (CDC, 2016) and, among patients in care, 62% have been observed to have durable suppressed viral load (<200 copies/ml) for at least two years (Crepaz et al., 2016). Increasing the percentage of patients who achieve and sustain viral suppression will help realize the goals of TasP.

A variety of interventions have been conducted to improve ART adherence and viral load. Interventions demonstrating effects on self-reported ART pill taking include providers giving messages to patients (Milam et al., 2005), text message reminders to patients (Muessig et al., 2017), and in-person counseling sessions (Koenig et al., 2008; Simoni, Pearson, Pantalone, Marks, & Crepaz, 2006). Interventions producing significant effects on actual viral load have generally been limited to cognitive-behavioral approaches and social support interventions (Kanters et al., 2017).

Another approach has used computer-based interventions (CBI). CBIs offer systematic delivery of content and are less personnel-intensive for clinics. Such CBIs have been tested for efficacy using randomized controlled trials (RCT) in clinic settings and have demonstrated significant improvement in self-reported ART adherence (Fisher et al., 2011; Kurth et al., 2014) and viral load (Kurth et al., 2014). However, because those studies were conducted using the strict methodology of an RCT, it remains unclear whether such technology can be fully integrated into routine clinic practices and benefit patients. The project reported here sought to integrate the combination of a brief CBI and targeted counseling intervention into the standard of care practices of HIV clinics and evaluate effects on patients' viral loads.

Methods

Project Design

The project was conducted at six HIV clinics (Birmingham, AL; Boston, MA; Houston, TX; Miami, FL; San Diego, CA; Seattle, WA). Clinics were grouped into two panels to evaluate the intervention. Three clinics immediately initiated enrollment and intervention. The other three clinics delayed for 16 months and served as a concurrent control group during that period (January 30, 2014 to May 30, 2015). All six clinics continued to offer pre-existing

standard of care services (e.g., case management, ART education, adherence counseling, mental health, substance use attention).

To create comparable panels with respect to the percentage of the clinic population that had a suppressed viral load, we rank ordered the six clinics on this dimension using clinic population data. The top two were randomized to the intervention or control panels. The middle two and the bottom two clinics were randomized using the same procedure. Clinics in Birmingham, Houston, and Seattle were in the intervention panel, and clinics in Boston, Miami, and San Diego were in the control panel.

Institutional Review Board (IRB) approval covered patient participation and use of de-identified data from all six clinics' databases. IRBs at two intervention clinics (Birmingham, Seattle) deemed the project as "research" and required signed informed consent. The IRB at the third intervention clinic (Houston) viewed the project as enhanced services and participants gave verbal consent. Patients at control clinics were not individually consented during the first 16 months; rather, they were selected from clinics' databases for this analysis (described below).

Eligibility and Recruitment

The project targeted candidates whose viral loads exceeded 1000 copies/ml, a threshold that minimized enrollment of patients with transient blips in viremia. Based on the most recent viral load in the medical record, candidates at intervention clinics were identified and recruited at primary care visits during the first seven months of the 16-month period. In selecting patients at control clinics, if a patient attended a primary care appointment during the seven-month recruitment period and had a viral load greater than 1000 copies/ml at, or nearest in time to, that visit the patient was included in the control cohort. If control patients had more than one primary care visit at which they were viral-load eligible during the recruitment period, we selected the first visit as the entry date. Figure 1 displays the steps in patient selection and confirmation of eligibility.

Intervention Components

Below is an overview of the intervention components; detailed information is provided in Supplemental Materials: Intervention.

Computer-Based Intervention.—Participants self-administered a 15-minute interactive CBI during primary care visits. Its design was informed by prior CBIs (Fisher et al., 2011; Gilbert et al., 2008; Kurth et al., 2014) and by the Information, Motivation, and Behavioral Skills model (Fisher, Amico, Fisher, & Harman, 2008). A second CBI was administered at clinic at least two months later. Participants were not offered incentives (monetary or otherwise) to enroll in the project or do the CBIs. The CBI's theme was lowering viral load and covered ART, ART adherence, clinic attendance, and safer sex. Participants were informed that their responses were private and would not be shared with clinic providers.

Health Coaching.—Eligibility for health coaching was determined by follow-up viral load. A participant's viral load at the time of the first CBI was compared with their next viral

load (at least two months later) with three possible outcomes: (1) participants who did not reach at least a 1-log reduction in viral load were offered coaching; (2) participants who reached a viral load < 200 copies/ml were not offered coaching; or (3) participants who had at least a 1-log reduction but did not reach < 200 copies/ml were monitored until their next viral load result was available; if that next viral load did not reach < 200 copies/ml coaching was offered. A small reimbursement (ten-dollar equivalent) was given at each session. Health coaches received multi-day training and attempted to deliver up to three face-to-face sessions using motivational interviewing and a strengths-based approach (Rapp, 2006).

Behavioral Screening.—Patients at intervention clinics, *regardless of their viral load level*, completed behavioral screening during primary care visits. Items included ART adherence, clinic attendance, sexual partners, substance use, and well-being. Responses were available to providers to guide conversations with patients.

Palm Cards.—A basket of palm cards was placed in the check-out area of the intervention clinics. The receptionist encouraged all patients to take a card, which contained an empowering/motivational message on ART adherence, clinic attendance, or safer sex (English and Spanish).

Statistical Analysis and Outcome Variables

The statistical model used viral load data (values and dates) to estimate a participant's viral load level at +270 days (9 months) after their entry date, at the entry date (for those who did not have a viral load on that exact date), and at −270 days before entry. This enabled us to examine trends using three points in time. The estimates were generated from a PDF-CDF model (Rose et al., 2015) using all viral load data available among panel members going back 300 days before and 300 days after entry. For participants who had an undetectable viral load, the model generated a value according to the limit of detection of the assay. Viral loads over 1,000,000 copies/ml were recoded to 1,000,000 copies/ml to reduce skew and standardize the upper limit across all six clinics.

We calculated two types of outcomes: (1) The geometric mean viral load at −270 days, entry, and +270 days. (2) The percentage of participants who had a suppressed viral load (<200 copies/ml) at these three time points. We examined the magnitude of change in the outcomes (e.g., +270 days vs. −270 days) and compared the change at two levels: (1) By panel: eligible patients in the intervention clinics versus eligible patients in the control clinics. This panel comparison included patients at intervention clinics who completed the CBI as well as eligible patients who did not participate in the CBI but may have received the behavioral screening and palm cards. (2) By CBI participation: eligible patients at the intervention clinics who completed the CBI versus eligible patients at the intervention clinics who did not join the project and thus did not do the CBI. We performed unadjusted comparisons and multivariable models that controlled for demographic and clinical variables (length of time since HIV diagnosis, CD4 cell count, ART variables described in Table 1).

To examine counseling effects, the baseline viral load was the value closest in time prior to, or concurrent with, the date of the first counseling session; or, alternatively, closest in time to coaching eligibility determination dates for patients who declined coaching, failed to appear

at coaching sessions, or who were missed with an offer of coaching. We monitored viral loads for 12 months from the baseline date. For each of the four coaching groups (none, one, two, or three sessions), we calculated the mean $\log_{10}$ viral load at baseline and the mean during the 12-month follow-up and compared coaching groups. Statistical analyses were performed using SAS software version 9.4 (SAS Institute, Cary, North Carolina, USA).

Results

Panel Sizes and Characteristics

A total of 982 patients comprised the intervention panel (Houston: 595, Birmingham: 251, Seattle: 136). This total included eligible patients who participated in the project, eligible patients who declined, and eligible patients who were missed for enrollment (Figure 1). Of these 982 patients, 599 (61%) participated in the project and completed the first CBI. By clinic, the participation rate among those approached was 78% at Houston, 35% at Birmingham, and 37% at Seattle. The control panel included 946 eligible patients (San Diego: 371, Miami: 359, Boston: 216).

Table 1 displays the characteristics of the two panels. Compared to the control panel, the intervention panel had a larger percentage of young patients (17–39 years old), non-Hispanic black patients, persons who acquired HIV infection through heterosexual risk factors, and patients with low CD4 cell count at time of study entry. The intervention panel also had a larger percentage who newly started or re-started ART in the 30 days before entry into the project.

Intervention versus Control Panel Comparisons

Table 2 presents the geometric mean viral loads in each panel. The mean at baseline (entry) was highly similar in the two panels (intervention: 10599 copies/ml, control: 10087 copies/ml). At 270 days after baseline, the mean viral load was substantially lower in both panels, somewhat lower in the control than intervention group (15 copies/ml vs. 33 copies/ml; risk ratio [RR] = 2.3, $p = 0.004$), but this difference is clinically insignificant. Viewed from a wider context, at 270 days before baseline, the geometric mean viral load was, unexpectedly, substantially higher in the intervention panel (7018 copies/ml) than control panel (580 copies/ml) (RR = 12.1, $p < 0.001$). This large pre-existing difference between panels at −270 days was virtually eliminated at 270 days after entry. This pattern was observed in several subgroups of patients (Supplemental Tables), and the data pattern was highly similar in each of the three intervention clinics and in each of the three control clinics (Supplemental Tables).

Table 3 presents the percentage of patients who had a suppressed viral load in each panel. Fewer than 1.0% in each panel had an estimated suppressed viral load at baseline, but there was, again, a large pre-existing difference between panels in percent suppressed at −270 days (intervention: 7%; control: 28%, $p < 0.001$). At +270 days, a considerably larger percent in each panel had suppressed viral load (intervention; 74%; control: 80%, $p < 0.001$) and the difference between panels at +270 days was much smaller than it was at −270 days.

Participants Who Completed the CBI versus Eligible Patients Who Did Not

To examine CBI effects directly, we compared participants in the intervention clinics who completed the first CBI (CBI-yes, n=599) with eligible patients at intervention clinics who declined to participate or who were missed during recruitment and thus did not do the CBI (CBI-no, n=383). As seen in Table 4, the CBI-yes and CBI-no groups had similar geometric mean viral loads at baseline and at 270 days before baseline. At +270 days, both CBI groups had markedly lower viral loads (CBI-no group: 12 copies/ml; CBI-yes group: 64 copies/ml, $p < 0.001$).

Table 5 shows the results for percent virally suppressed. Fewer than 1% of each CBI group had a suppressed viral load at baseline, and approximately 7% of each CBI group was suppressed at 270 days before baseline. Both CBI groups had a much higher percentage suppressed at 270 days after baseline (CBI-no group: 86%; CBI-yes group 66%, $p < 0.001$).

Ancillary Analyses

Of the 599 participants who completed the first CBI, 314 (52%) completed the second CBI. When we limited the analysis to only those who completed both CBIs, the results were the same as reported above.

Of the 599 participants who completed the first CBI, 229 (38%) were eligible for health coaching. A total of 155 of these 229 participants (68%) received one or more coaching sessions (none: 74, one: 34, two: 32, three: 89). Among coaching-eligible patients who did not receive any coaching, there was a 1-log improvement in average viral load compared to their viral load at the time coaching eligibility was determined (baseline: 4.10, follow-up: 3.05). A similar 1-log improvement was observed in patients who received one coaching session (baseline: 4.47, follow-up: 3.47) or two sessions (baseline: 4.48, follow-up: 3.46). There was a 1.41 log reduction among patients who received three sessions (baseline: 4.28, follow-up: 2.87). Differences were not statistically significant.

Discussion

We found that, on average, *both* the intervention and control panels had markedly lower viral loads at 270 days after entry into the project. A few factors apart from our intervention components may have contributed to this finding. The project targeted patients who had high viral loads, exceeding 1000 copies/ml at the time of recruitment. When patients' viral loads were re-assessed at follow-up, we would expect some statistical regression to the mean in both panels. Also, providers at intervention *and* control clinics may have taken action (e.g., conversations with patients, referrals to case managers or adherence counselors) to help their patients reduce their viral loads.

One intriguing aspect of the results was that the pre-existing viral load (270 days *before* entry) was more than ten times higher in the intervention than control panel. And the intervention panel's viral load at −270 days (7018 copies/ml) was only modestly lower than their baseline (10599 copies/ml), attesting to stable, pre-existing viral levels. The substantial reduction in viral load from −270 days to +270 days in the intervention group to a level well below the pre-existing viral level suggests that factors beyond regression to the mean may

have played a role. We did not find evidence that the CBI component had a significant effect. Improved viral load was observed in patients who did the CBI and in those who did not. Surprisingly, the improvement was larger among those who did *not* do the CBI. One possibility is that patients who joined the project and completed the CBI may have had unaddressed social, psychological, and behavioral needs to a greater extent than patients who did not join the project. Second, the health coaching component did not yield significant effects. Each health coaching group, including patients eligible for coaching who did not receive any sessions, exhibited improved viral load. Third, there were two other intervention components (available to patients regardless of viral load status): behavioral screening and palm cards containing empowering messages. The screening was a new endeavor at one of the intervention clinics (Houston). The other two intervention clinics already had screening and continued during the project. By comparison, only one of the three control clinics had pre-existing screening. It is possible that screening and provider conversations with patients at the intervention clinics contributed to the reduction in viral load, but we do not have any direct data to document an effect. Regarding the palm cards, we doubt whether that minimal component played an appreciable role.

At the time of entry into the project, some patients may have had temporary disruption in access to ART, and other patients may have had longstanding difficulty with ART adherence stemming from mental health, substance use, or other issues. Our CBI and coaching components were not designed to address these types of background needs, although our health coaches made referrals to clinic-based case managers when necessary. All of the six participating clinics were well-resourced, with multiple services available to patients (described in Methods). It is possible that our brief CBI and health coaching were not sufficient to produce an effect beyond existing standard of care services at the clinics. Additional research is necessary to examine whether our intervention components might have significant effects at limited-resource clinics.

Future work might consider linking the computerized component with a provider component. The CBI was private and the patient's provider did not see the patient's responses. One modification would be to have eligible patients do the CBI in a mobile electronic format accessible from home. The patient's responses could be made available to their providers who could use the information to engage and reinforce their patients. This coupling of components might produce a stronger intervention effect.

One final feature of our project merits comment. The IRBs at two of the intervention clinics determined that the project was research and required signed informed consent. Those two clinics had patient participation rates that were much lower than the other intervention clinic where the IRB determined that the project could be described to patients as enhanced services and required only verbal consent. This finding could be instructive for investigators planning projects similar to the one reported here.

In conclusion, we integrated a brief computerized intervention and health coaching component into routine practices at HIV clinics without disruption. Participation hovered around 50% and at times it was challenging to deliver follow-up intervention due to inconsistent patient attendance at clinic. Our evaluation did not find evidence that the CBI or

targeted health coaching reduced patients' viral loads beyond standard of care services available at the clinics. Behavioral screening and provider conversations may have helped patients at intervention clinics, but we do not have direct data to demonstrate an effect. Additional work is needed to find a brief CBI and counseling mechanism that can be integrated into clinical care and helpful in lowering patients' viral loads beyond pre-existing services available at HIV clinics.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

Centers for Disease Control and Prevention (2016). Behavioral and Clinical Characteristics of Persons Receiving Medical Care for HIV Infection—Medical Monitoring Project, United States, 2014 Cycle (June 2014–May 2015). HIV Surveillance Special Report 17.

Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N, … Fleming TR (2016). Antiretroviral therapy for the prevention of HIV-1 transmission. New England Journal of Medicine, 375, 830–839. [PubMed: 27424812]

Crepaz N, Tang T, Marks G, Mugavero MJ, Espinoza L, & Hall HI (2016). Durable viral suppression and transmission risk potential among persons with diagnosed HIV infection: United States, 2012–2013. Clinical Infectious Diseases, 63, 976–983. [PubMed: 27358354]

Finocchario-Kessler S, Catley D, Thomson D, Bradley-Ewing A, Berkley-Patton J, & Goggin K (2012). Patient communication tools to enhance ART adherence in low and high resource settings. Patient Education and Counseling, 89, 163–170. [PubMed: 22575433]

Fisher JD, Amico KR, Fisher WA, & Harman JJ (2008). The information-motivation-behavioral skills model of antiretroviral adherence and its applications. Current HIV/AIDS Reports, 5, 193–203. [PubMed: 18838059]

Fisher JD, Amico KR, Fisher WA, Cornman DH, Shuper PA, Trayling C, … Friedland G (2011). Computer-based intervention in HIV clinical care setting improves antiretroviral adherence: the LifeWindows Project. AIDS and Behavior, 15, 1635–1646. [PubMed: 21452051]

Gilbert P, Ciccarone D, Gansky SA, Bangsberg DR, Clanon K, McPhee SJ, … Gerbert B (2008). Interactive "Video Doctor" counseling reduces drug and sexual risk behaviors among HIV-positive patients in diverse outpatient settings. Public Library of Science One, 3, 1–10.

Kanters S, Park JJ, Chan K, Socias ME, Ford N, Forrest JI, … Mills EJ (2017). Interventions to improve adherence to antiretroviral therapy: a systematic review and network meta-analysis. Lancet HIV, 4, 31–40.

Koenig LJ, Pals SL, Bush T, Pratt Palmore M, Stratford D, & Ellerbrock TV (2008). Randomized controlled trial of an intervention to prevent adherence failure among HIV-infected patients initiating antiretroviral therapy. Health Psychology, 27, 159–169. [PubMed: 18377134]

Kurth AE, Spielberg F, Cleland CM, Lambdin B, Bangsberg DR, Frick PA, … Holmes KK (2014). Computerized counseling reduces HIV-1 viral load and sexual transmission risk: findings from a randomized controlled trial. Journal of Acquired Immunodeficiency Syndromes, 65, 611–620.

Milam J, Richardson JL, McCutchan A, Stoyanoff S, Weiss J, Kemper C, … Bolan R (2005). Effect of a brief antiretroviral adherence intervention delivered by HIV care providers. Journal of Acquired Immunodeficiency Syndromes, 40, 356–363.

Muessig KE, LeGrand S, Horvath KJ, Bauermeister JA, & Hightow-Weidman LB (2017). Recent mobile health interventions, to support medication adherence among HIV-positive MSM. Current Opinion in HIV and AIDS, 12, 432–441. [PubMed: 28639990]

Rapp RC (2006). Strengths-based case management: enhancing treatment for persons with substance abuse problems. In: Saleebey D, ed. The strengths perspective in social work practice. 4th ed. Boston: Allyn and Bacon, 128–147.

Rodger A, Cambiano V, Bruun T, Vernazza P, Collins S, van Lunzen J, … Lundgren J (2016). Sexual activity without condoms and risk of HIV transmission in serodifferent couples when the HIV-positive partner is using suppressive antiretroviral therapy. Journal of the American Medical Association, 316, 171–181. [PubMed: 27404185]

Rose CE, Gardner LI, Craw J, Girde S, Wawrzyniak AJ, Drainoni ML, … Marks G (2015). A comparison of methods for analyzing viral load data in cohort studies of HIV patients. Public Library of Science One, DOI: 10.1371/journal.pone.0130090.

Rothman AJ, Bartels RD, Wlaschin J, & Salovey P (2006). The strategic use of gain- and loss-framed messages to promote healthy behavior: How theory can inform practice. Journal of Communication, 56, s202–s220.

Simoni JM, Pearson CR, Pantalone DW, Marks G, & Crepaz N (2006). Efficacy of interventions in improving highly active antiretroviral therapy adherence and HIV-1 RNA viral load. A meta-analytic review of randomized controlled trials. Journal of Acquired Immunodeficiency Syndromes, 43(Suppl 1), s23–s35.

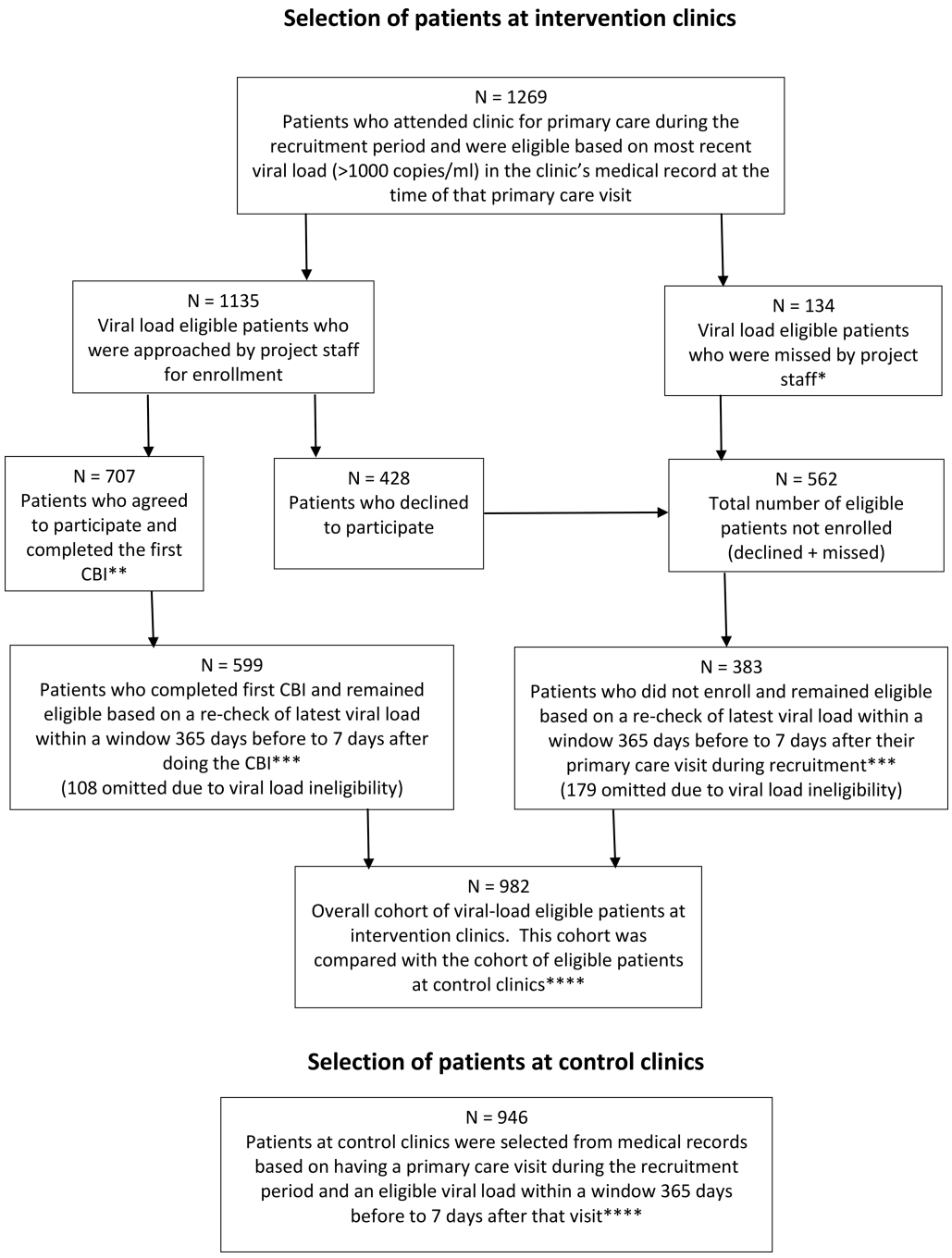

Figure 1. Selection of viral load eligible patients at intervention and control clinics.

*Patients may have been missed for a variety of reasons: project staff was interacting with another patient, the patient was called to see provider after minimal time in waiting room, or the patient left the waiting room.

**Computer-based intervention..

***These two groups were compared to specifically examine the effect of the CBI..

****Approximately 90% of the patients in the two cohorts had entry viral loads within 60 days before to 7 days after their project entry date.

Table 1.

Characteristics of the intervention and control panels at recruitment.

Variable	Intervention Panel (N = 982) % (n)	Control Panel (N = 946) % (n)	P-level[1]
Sex			
Female	30.6% (300)	34.3% (324)	0.16
Male	68.6% (674)	64.9% (613)	
Transgender	0.8% (8)	0.7% (7)	
Age			
17–39	40.2% (395)	33.2% (314)	< 0.001
40–49	30.2% (297)	28.4% (269)	
50+	29.5% (290)	38.4% (363)	
Race/ethnicity			
White	16.2% (159)	39.1% (370)	< 0.001
Black	69.3% (681)	31.4% (297)	
Hispanic	13.1% (129)	26.2% (248)	
Other[2]	0.8% (8)	2.3% (22)	
Unknown	0.5% (5)	1.0% (9)	
Length of time since HIV+ diagnosis			
0–3 months	6.5% (64)	10.5% (99)	< 0.001
4–12 months	5.7% (56)	3.6% (34)	
>12 months	87.8% (862)	85.9% (809)	
Risk factor for acquiring HIV infection			
Heterosexual	48.6% (477)	40.0% (378)	< 0.001
MSM	32.4% (318)	30.3% (287)	
MSM + IDU	5.6% (55)	4.5% (43)	
IDU	6.4% (63)	6.3% (60)	
Unknown/indeterminate	7.0% (69)	18.8% (178)	
Clinic			
Boston		22.8% (216)	
San Diego		39.2% (371)	
Miami		38.0% (359)	
Seattle	13.8% (136)		
Birmingham	25.6% (251)		
Houston	60.6%) (595)		
CD4 cell count categories			
<200	44.2% (434)	36.5% (345)	0.004
200–500	37.5% (368)	41.3% (391)	
>500	18.3% (180)	22.1% (209)	

Variable	Intervention Panel (N = 982) % (n)	Control Panel (N = 946) % (n)	P-level[1]
History of ART prescriptions in 12 months before entry but did not newly start or restart ART within 30 days before entry			
No	36.4% (357)	39.9% (377)	0.11
Yes	63.6% (625)	60.1% (569)	
Newly started ART within 30 days before entry			
No	87.1% (855)	92.0% (870)	< 0.001
Yes	12.9% (127)	8.0% (76)	
Re-started ART within 30 days of entry after having no ART prescriptions in past 12 months			
No	90.3% (887)	95.6% (904)	<0.001
Yes	9.7% (95)	4.4% (42)	

The data are from the medical records or databases at the participating clinics. There were a few instances of missing data on sex (n = 2), time since HIV diagnosis (n = 4), and CD4 cell count (n = 1) in the control panel.

[1]P-level from chi-square test.

[2]Asian, Pacific Islander, Alaskan/Native American

MSM, Men who have sex with men; IDU, injection drug use; ART, antiretroviral therapy.

Table 2.

Univariate and multivariable findings on geometric mean viral load, by intervention versus control panels.

Comparison	GM and 95% CI at 270 days before baseline	Ratio and 95% CI at −270 days	GM and 95% CI at baseline	Ratio and 95% CI at baseline	GM and 95% CI at 270 days after baseline	Ratio and 95% CI at +270 days	Ratio and 95% CI reflecting comparison of ratios at −270 days vs. +270 days
Univariate Findings							
Overall panel comparison							
Intervention panel (N=982)	7018 (4786, 10290)	12.1 (7.0, 21.0)	10599 (8662, 12970)	1.1 (0.8, 1.4)	33 (23, 49)	2.3 (1.3, 3.9)	5.3 (2.4, 12.1)
Control panel (N=946)	580 (390, 862)	REF	10087 (8206, 12400)	REF	15 (10, 22)	REF	REF
		p < 0.001		p = 0.74		p = 0.004	p < 0.001
Multivariable Findings[1]							
Panel comparison							
Intervention panel (N=982)	6844 (5965, 7843)	10.5 (6.1, 18.0)	9908 (8935, 10987)	1.0 (0.7, 1.3)	34 (29, 41)	2.2 (1.2, 3.6)	5.0 (2.2, 11.3)
Control panel (N=941)	601 (517, 699)	REF	10426 (9439, 11524)	REF	15 (12, 18)	REF	REF
		p < 0.001		p = 0.79		p = 0.007	p < 0.001

[1]The multivariable model controlled for starting or restarting ART within 30 days before entering project, having prior prescription of ART > 30 days to 12 months prior to entry, time since HIV diagnosis, CD4 cell count at time of entry, and age. Race/ethnicity and risk factor for acquiring HIV infection were screened but not retained in the final model because their p-levels were > 0.2. GM, geometric mean; CI, confidence interval; ART, antiretroviral therapy.

Table 3.

Univariate and multivariable findings on percentage of patients who had a suppressed viral load (<200 copies/ml), by intervention versus control panels.

Comparison	% suppressed and 95% CI at 270 days before baseline	Difference in % suppressed and 95% CI at −270 days	% suppressed and 95% CI at baseline	Difference in % suppressed and 95% CI at baseline	% suppressed and 95% CI at 270 days after baseline	Difference in % suppressed and 95% at +270 days	Difference between groups at −270 days vs. difference at +270 days and 95% CI
Univariate Findings							
Overall panel comparison							
Intervention panel (N=982)	7.4 (5.8, 9.2)	−20.6 (−23.8, −17.3)	0.5 (0.1, 1.0)	0.3 (−0.2, 0.9)	73.5 (70.6, 76.2)	−6.36 (−10.2, −2.4)	14.3 (9.0, 19.6)
Control panel (N=946)	28.0 (25.3, 30.8)	REF	0.2 (0.0, 0.5)	REF	79.7 (77.2, 82.2)	REF	REF
		p < 0.001		p = 0.85		p < 0.001	p < 0.001
Multivariable Findings[1]							
Panel comparison							
Intervention panel (N=982)	8.0 (6.4, 9.9)	−20.9 (−24.3, −17.6)	0.5 (0.1, 1.0)	0.7 (−1.0, 1.5)	72.7 (69.9, 75.6)	−7.8 (−11.6, −4.0)	13.1 (7.9, 18.5)
Control panel (N=941)	29.0 (26.3, 31.8)	REF	1.2 (0.0, 2.2)	REF	80.6 (77.9, 83.1)	REF	REF
		p < 0.001		p = 0.045		p < 0.001	p < 0.001

[1]The multivariable model controlled for starting or restarting ART within 30 days before entering project, having prior prescription of ART > 30 days to 12 months prior to entry, time since HIV diagnosis, CD4 cell count at time of entry, and age. Race/ethnicity and risk factor for acquiring HIV infection were screened but not retained in the final model because their p-levels were > 0.2. CI, confidence interval; ART, antiretroviral therapy.

Table 4.

Univariate and multivariable findings on geometric mean viral load among patients in the intervention panel who did the computer-based intervention (CBI) versus patients who did not do the CBI.

Comparison	GM and 95% CI at 270 days before baseline	Ratio and 95% CI at −270 days	GM and 95% CI at baseline	Ratio and 95% CI at baseline	GM and 95% CI at 270 days after baseline	Ratio and 95% CI at +270 days	Ratio and 95% CI reflecting comparison of ratios at −270 days vs. +270 days
Univariate Findings							
Overall CBI comparison							
CBI Yes (N=599)	7522 (4728, 11969)	1.3 (0.6, 2.8)	11720 (9127, 15050)	1.3 (0.96, 1.9)	64 (41, 99)	5.4 (2.5, 11.6)	0.2 (0.1, 0.7)
CBI No (N=383)	5756 (3209, 10325)	REF	9084 (6576, 12549)	REF	12 (6, 23)	REF	REF
		p = 0.48		p = 0.22		p < 0.001	p = 0.012
Multivariable Findings[1]							
CBI comparison among patients in intervention panel							
CBI Yes (N=547)	7659 (6489, 9039)	1.2 (0.68, 2.5)	11392 (10021, 12948)	1.2 (0.8, 1.8)	63 (51, 79)	4.8 (2.3, 10.3)	0.3 (0.08, 0.8)
CBI No (N=315)	5792 (4657, 7203)	REF	8878 (7607, 10363)	REF	12 (9, 16)	REF	REF
		p = 0.60		p = 0.40		p < 0.001	p = 0.015

[1]The multivariable model controlled for starting or restarting ART within 30 days before entering project, having prior prescription of ART > 30 days to 12 months prior to entry, time since HIV diagnosis, CD4 cell count at time of entry, and age. Race/ethnicity and risk factor for acquiring HIV infection were screened but not retained in the final model because their p-levels were > 0.2. GM, geometric mean; CI, confidence interval; ART, antiretroviral therapy.

Table 5.

Univariate and multivariable findings on percent who had a suppressed viral load (<200 copies/ml) for patients in the intervention panel who did the computer-based intervention (CBI) versus patients who did not do the CBI.

Comparison	% suppressed and 95% CI at 270 days before baseline	Difference in % suppressed and 95% CI at −270 days	% suppressed and 95% CI at baseline	Difference in % suppressed and 95% CI at baseline	% suppressed and 95% CI at 270 days after baseline	Difference in % suppressed and 95% at +270 days	Difference between groups at −270 days vs. differences at +270 days and 95% CI
Univariate Findings							
Overall CBI comparison							
CBI Yes (N=599)	6.8 (4.9, 9.1)	−0.7 (−4.1, 2.7)	0.3 (0.0, 0.8)	−0.4 (1.6, 0.5)	66.1 (62.5, 69.7)	−19.7 (−24.8, −14.0)	−19.0 (−24.8, −12.8)
CBI No (N=383)	7.6 (5.0, 10.2)	REF	0.8 (0.0, 1.8)	REF	85.9 (82.2, 89.3)	REF	REF
		p = 0.33		p = 0.23		p < 0.001	p < 0.001
Multivariable Findings[1]							
CBI comparison among patients in intervention panel							
CBI Yes (N=547)	6.3 (4.4, 8.5)	−1.8 (−5.0, 1.8)	0.3 (0.0, 0.9)	−0.45 (−1.49, 0.54)	65.3 (61.6, 68.9)	−19.8 (−24.8, −14.4)	−18.1 (−24.3, −11.9)
CBI No (N=315)	8.1 (5.3, 10.9)	REF	0.8 (0.0, 1.8)	REF	85.1 (81.4, 88.4)	REF	REF
		p = 0.15		p = 0.22		p < 0.001	p < 0.001

[1]The multivariable model controlled for starting or restarting ART within 30 days before entering project, having prior prescription of ART > 30 days to 12 months prior to entry, time since HIV diagnosis, CD4 cell count at time of entry, and age. Race/ethnicity and risk factor for acquiring HIV infection were screened but not retained in the final model because their p-levels were > 0.2. CI, confidence interval; ART, antiretroviral therapy.