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Outcomes of a Clinic-Based, Surveillance-Informed Intervention to Relink Patients to HIV Care

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Abstract

Background—Improving patient retention in HIV care is crucial to improving the HIV care continuum. We instituted and evaluated a relinkage program that uses clinical data to identify potentially out-of-care patients, matches those data to public health surveillance, and employs a linkage specialist (LS) to coordinate care relinkage.

Methods—The intervention began November 1, 2012 in the largest HIV clinic in Washington State. We evaluated program outcomes and compared patient outcomes in the year following initiation of the intervention to a historical control cohort of patients. Cox proportional hazard ratios were used to compare time to relinkage to care between cohorts, and regression models using generalized estimated equations were performed to examine secondary outcomes of relinkage to care, engagement in care, and viral suppression.

Results—753 patients were identified as “out of care” on 11/1/12. Matching with surveillance data and initial LS investigations found that 596 (79%) of these patients had moved, transferred care or were incarcerated. Of the 157 remaining patients: 40 (25%) relinked to care before LS contact, and the LS successfully contacted 38 (24%). A total of 116 (15%) patients in the intervention cohort relinked to care and 24 (20%) were contacted by the LS. Compared to the historical cohort, the time to relinkage was shorter among patients in the intervention cohort [adjusted HR=1.7 (1.2-2.3)] and a greater proportion relinked [15% vs. 10%].

Conclusions—This clinic-based, surveillance-informed relinkage intervention showed statistically significant but modest effectiveness in returning out-of-care patients to HIV care compared to historical controls.

Keywords

Cascade of care; HIV care continuum; Engagement in care; Retention in Care; HIV surveillance

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Introduction

Retention in HIV care is a crucial part of the HIV care continuum, but the United States (US) Centers for Disease Control and Prevention (CDC) estimate that only about half of persons diagnosed with HIV infection in the US receive HIV care each year [1]. Retention in care is associated with greater adherence to antiretroviral therapy, reduced risk of mortality, and a decrease in behaviors that promote HIV transmission [2-5]. A recent randomized controlled trial demonstrated the effectiveness of a clinic-based intervention to improve patient retention in care [6]. The intervention included individualized face-to-face contact over the period of a year with a trained counselor. However, this and other clinic-based interventions to improve patient retention in care are predicated upon a patient visiting the clinic. Sitapati and colleagues described a clinic-based recall intervention designed to find and bring back into care patients who had not visited the clinic recently [7], but the effectiveness of clinic-based patient recall is uncertain and, to our knowledge, has not been examined in a controlled study.

This paper describes the outcomes of a relinkage intervention that was implemented in a large HIV clinic in Washington State in collaboration between the HIV clinic and local health department. The intervention we describe was a clinic-based program that used clinic data to identify patients who appeared to have disengaged from care and incorporated health department HIV surveillance data to refine the list of out-of-care patients. A linkage specialist (LS) was employed to conduct outreach to eligible patients and assist them in relinking to HIV medical care. Here, we report the results of a two-part evaluation of the relinkage intervention: 1) the ability of the relinkage program to identify, contact, and relink eligible “out of care” patients to HIV care and 2) the effect of the program on patient outcomes compared to a historical control patient population.

Methods

The relinkage program we describe here has two components. The first is identification of patients who appear to be out of care and refinement of that list through matching with public health HIV surveillance data. The second is the LS outreach activities to contact out-of-care patients and assist them in relinking to care. The relinkage program was implemented at the Madison (HIV) Clinic of Harborview Medical Center in Seattle, Washington in 2012 and is currently ongoing. The Madison Clinic provides care to approximately 2,800 HIV-infected patients and is the largest HIV clinic in the Northwestern US.

Identification of Patients Eligible for the Relinkage Program

The Madison Clinic data manager identifies patients for relinkage outreach semiannually using a clinic database that collates information from the electronic health records, paper intake forms, and case management databases. The clinic database includes all patients who have completed 1 visit at the Madison Clinic since 1994, regardless of the patient's HIV status or the visit type (i.e. includes HIV post-exposure prophylaxis and time-limited consultation visits in addition to primary HIV care). Patients are considered to be “out of

care” and eligible for the clinic relinkage intervention if they: 1) are HIV-infected, 2) have not died or transferred care, 3) completed 1 visit in the past 1000 days and 4) have not completed a visit for 12 months prior to the extraction date. A list of patients who meet the “out of care” criteria is sent to Public Health – Seattle & King County to be matched with health department HIV surveillance data to identify patients who have transferred HIV care, moved away, died, or are incarcerated. The health department designates these cases as “outreach not indicated”, and the linkage specialist does not investigate the cases further or attempt outreach. This method is similar to one previously implemented in Washington D.C., where the health department and HIV clinics combine data to identify out-of-care persons [8, 9]. The Public Health – Seattle & King County protocols for determining whether cases have moved away, died or transferred HIV care are described in detail elsewhere [10-12]. Briefly, laboratory-reporting of CD4 and viral load results to the health department has been mandatory in Washington State since 2006. Laboratory reports include the names of medical providers or medical practices ordering laboratory tests, and thus can be used to identify patients who transfer care to King County clinics other than Madison Clinic. Surveillance staff match HIV case records with death records annually and individually investigate all cases with no CD4 or viral loads reported for 1 year.

Components of the Relinkage Intervention

The Linkage Specialist (LS) investigates each eligible case, attempts to contact patients, and assists them with scheduling and completing a medical visit in the Madison Clinic. The LS works in coordination with case managers and medical providers. The LS searches the electronic health records and electronic case management records for information about each patient's status and then attempts to contact each patient using a hierarchical method as follows: 1) three attempts at phone contact using the phone numbers on record; 2) one attempt to contact the patient by email if an e-mail address is available; 3) an attempt to contact outside agencies for which a Release of Information form is on file in the medical or case management records; and 4) an attempt to call the designated emergency contact. In communications with persons who are not the patient, the LS states his name and requests assistance contacting the patient, but does not discuss the reason for the call or state the name of the Madison clinic or the hospital in which the clinic is located. When contact is unsuccessful, the LS refers cases to the Public Health – Seattle & King County HIV care relinkage outreach team for additional case investigation and outreach efforts.

When the LS successfully contacts a patient, he states his name, affiliation, and reason for the call. He inquires whether the patient has indeed been absent from HIV medical care for a year or more and states his interest in helping the patient relink to care. The LS works with the patient, his or her case manager and medical provider, and clinic triage and clerical staff to schedule a follow-up appointment. He then reminds patients of appointments as needed and follows up to determine whether the relinkage appointment was completed. The LS continues to follow patients until they have successfully completed an appointment, declined to return to Madison Clinic for care, or are referred to Public Health Seattle & King County for further outreach. The vast majority of the LS's contact with patients is by phone. When needed, he offers to meet patients outside of the clinic, assists with transportation, or in the case of hospitalized patients, visits patients in the inpatient unit. The LS tracks contact

attempts and interactions in a designated relinkage database. The work described in this analysis was completed with 0.75 FTE of LS time over 12 months. The relinkage intervention was designed and conducted as a service program for patients, and thus was not subject to IRB approval. The University of Washington IRB approved the analysis of the program's effectiveness.

Outcomes of the Relinkage Intervention

We evaluated process outcomes including the match of the “out-of-care” patient list with surveillance data, the results of the LS's case investigations and contact attempts, and the number of patients relinked to care among the initial list of 753 patients identified as “out of care” as of November 1, 2012. We used chi-squared tests to compare care relinkage in the patient group that the LS contacted compared to the patients for whom contact was not feasible or indicated.

Comparison of Intervention Population to a Historical Control Population

To evaluate the effectiveness of the relinkage intervention, we compared relinkage outcomes in the intervention cohort to a historical (control) population. We defined the historical cohort as all patients who would have met the criteria for relinkage services on November 1, 2011, one year prior to identification of the intervention cohort (Figure 1). Patients in the historical cohort who did not relink to care in the 12 months following cohort assignment, and thus remained eligible for inclusion in the intervention cohort, were included in both the historical and intervention cohorts. We used a historical control group because the relinkage intervention was a programmatic, clinic-wide intervention that did not include randomization; therefore, comparison to a control population required identification of a historical control group.

The primary outcome measure for the analysis comparing the intervention and historical cohorts was time to care relinkage. We defined the time to relinkage as the elapsed time between the date of identification as “out of care” and the date of the first completed medical visit at the Madison Clinic during the subsequent 12 months. We created Kaplan Meier curves for each cohort, and we used Cox proportional hazards with clustering on the patient ID to compare time to relinkage across cohorts and identify variables associated with time to relinkage.

Finally, generalized estimated equations (GEE) (with Poisson error distribution, log link, independent correlation, and robust standard errors) methodology was used to develop three secondary outcome models: the relative risk (RR) of patients who successfully relinked to care at any time during the 12 month observation period, the RR of patients who met the criteria for retention in continuous care (completed 2 visits 3 months apart), and RR of patients with viral suppression (HIV RNA <200 copies/mL). GEE was used in order to account for multiple measures and expected correlation between analysis periods among the patients in both cohorts. For adjusted models, variables of age and income were added to the models as these were the only variables associated with the intervention and the outcome of relinkage to care. All analyses were conducted with a significance level of 0.05 and were performed using STATA/IC 12.1 (College Station, TX).

Results

Outcomes of the Relinkage Intervention

Figure 2 shows the investigation and relinkage outcomes of the 753 patients in the intervention cohort. Matching with public health surveillance records identified 347 (46%) patients for whom relinkage intervention was not indicated because of migration out of the area or laboratory test results suggesting receipt of care through a facility other than Madison clinic. The LS determined through case investigation that an additional 249 (33%) were ineligible for relinkage outreach because medical records indicated they had moved out of the area, transferred care elsewhere (i.e. were Madison patients and had moved to another provider or clinic), were engaged in primary HIV care elsewhere that had not been ascertained in the clinic database (i.e. were never established Madison patients but had visited Madison while in care elsewhere), or were incarcerated. Thus, only 157 (21%) of the 753 persons who appeared to be out of care were defined through case investigation as truly out of care (See Figure 2). Among these 157, 40 (25%) relinked to care before the LS attempted to contact them. The LS was not able to contact 33 (21%) due to lack of contact information or case manager preference to assume the primary responsibility of contact. Thus, the LS attempted to contact 84 persons (54% of eligible cases) and successfully reached 38 (45%).

Of the 753 patients in the intervention cohort, 116 (15%) relinked to HIV care in the following year; only 24 (20%) were among the patients whom the LS attempted to contact. The remainder either relinked to care on their own before the LS investigations (N=40/116, 34%), through other outreach efforts (N=3/116, 3%), or were “ineligible” for relinkage outreach through matching with surveillance data (N=49/116, 43%). Investigation of these 49 ineligible patients revealed that 11 (22%) were incarcerated, 17 (35%) had transferred care to another clinic but transferred care back to Madison Clinic during the analysis period, 10 (21%) had moved out of King County but moved back during the analysis period, 4 (8%) were in-care with laboratories ascertained through a research study, 4 (8%) had CD4 or VL results reported from an emergency department or inpatient hospital, and 3 (6%) patients were erroneously identified as ineligible.

The proportion of patients in the “contact attempted” group who relinked to care (24 of 84; 29%) was higher than the proportion in the group for which contact was not attempted (e.g. patient refused contact, no contact information was available, or the patient's case manager (CM) advised the LS to refrain from contacting the patient) (3 of 33; 9%) and the group identified as ineligible (“outreach not indicated”) by Public Health (i.e. patient had moved, transferred care, was in care elsewhere, or was incarcerated) (49 of 596; 8%) ($p<0.001$). The LS contacted patients a median of 99 days after intervention cohort assignment (IQR: 78-150 days). The LS contacted patients a median of 4 times (interquartile range (IQR): 3-6 times) before relinkage or case closure. For the 24 patients who relinked after the LS attempted contact, the median time from initial contact to relinkage was 78 days (IQR: 52-126 days).

Comparison of Patients in the Intervention Cohort and Historical Control Cohort

753 patients met eligibility criteria for relinkage outreach as identified on November 1, 2012 and were assigned to the intervention cohort, while 646 patients met the same eligibility criteria in November 1, 2011 and were assigned to the historical cohort. Patients in the intervention and historical control cohorts were demographically similar to the general population of Madison Clinic patients (Madison Clinic data not shown). Table 1 shows the demographics of both cohorts: most were male (over 80% of both cohorts), over 40 years of age (over 65% of both cohorts), and non-Hispanic white (60%). The majority (over 65% of both cohorts) reported annual incomes <\$30,000, and 24% of historical cohort and 36% of the intervention cohort had private insurance coverage. The vast majority (over 90% of both cohorts) was missing CD4 count and viral load measurements in the last year before cohort assignment, and over 50% of both cohorts been diagnosed with HIV for 5 years at the time of cohort assignment. Approximately half of the patients in the relinkage cohort (N=363) were also included in the historical control cohort. Compared to the historical cohort, patients in the intervention cohort were significantly younger and more recently diagnosed with HIV, though these differences were small. The completeness of data regarding insurance status and foreign birthplace also differed between the two groups. We included all patients in the intervention cohort when comparing historical and intervention cohorts, including those that were ineligible for the LS outreach services, because we did not have surveillance information for the historical cohort.

Effect of the Relinkage Intervention Compared to Historical Controls

For the primary outcome of time to relinkage from cohort assignment, patients in the intervention cohort relinked to care earlier [unadjusted hazard ratio (HR) = 1.6 (1.2-2.2), adjusted HR=1.7 (1.2-2.3)]. Table 2 demonstrates the demographic variables associated with time to care relinkage over the 12 month surveillance period for both cohorts. Age over 30 years and income over \$30,000 were independently associated with a longer time to relinkage.

Detailed results of the analyses of the secondary outcomes of relinkage to care at any point during the 12-month study period, ongoing engagement in care, and viral suppression, are summarized in Appendix Table 3. Patients in the intervention cohort were more likely to relink to care compared to the historical cohort [15% relinked in the intervention cohort vs. 10% relinked in the historical cohort ($p<0.01$ with GEE); unadjusted RR =1.6 (1.2-2.1), adjusted RR= 1.6 (1.2-2.1)]. In adjusted analysis, relinkage to care at any time during the 12 month study period was less likely for persons over 30 years of age, and for persons with annual incomes over \$30,000. Patients in the intervention cohort were also more likely to be engaged in continuous care (2 visits 3 months apart) [unadjusted RR=2.4 (1.5-3.8) and adjusted RR=2.4 (1.5-3.9)] and were more likely to be virally suppressed, but the adjusted RR was not significant [Unadjusted RR= 1.6 (1.0-2.5); Adjusted RR=1.6 (0.97-2.6)]. The proportion of patients who relinked to care and were virally suppressed were similar across cohorts [27 of 64 (42%) of patients in the historical cohort vs. 50 of 116 (43%) of patients in the intervention cohort].

Patients who were in both cohorts, and thus did not have a medical visit or lab for at least 24 months prior to data extraction, were less likely to relink to care in comparison with the historical-only and intervention-only cohorts [Unadjusted RR=0.3 (0.2-0.5), Adjusted RR=0.3 (0.2-0.5), using multiple logistic regression adjusted for categorical variables of age, income, and housing status, which were associated with both the intervention and outcome in logistic regression of these independent groups].

Discussion

We demonstrated that a clinic-based relinkage program conducted in collaboration with a local health department significantly decreased the time to HIV care re-engagement and increased the likelihood that patients would relink to care compared to a historical control group. However, the absolute effect of the intervention was small.

The majority of patients who we initially classified as being out of care had migrated out of the area, been incarcerated, had transferred care from the Madison Clinic to other clinics; they were not truly out of care. As a consequence, the factors we found to be associated with care relinkage may, more accurately, be associated with a lower likelihood of moving away or transferring care. This finding is consistent with other studies that have used surveillance and clinical data to identify patients thought to be out of care[7, 11], and highlights uncertainty of current estimates of the number of persons who are out of care and how difficult it is to relink patients to care. Indeed, like Sitapati and colleagues [7], we found that the primary benefit of our relinkage intervention clinic may have been an improved clinic registry containing accurate information regarding the status of the patient population.

These results demonstrate the feasibility of combining clinic and public health data to identify patients who may be out of care. Moreover, combining these data sources can improve the efficiency of relinkage by identifying large numbers of persons who are known to be out of the area or in care based on surveillance data, thereby reducing the number of persons who require outreach investigations. However, results also highlight major challenges in using such data to meaningfully improve the HIV care continuum. Despite the use of more than one data source, most patients we tried to relink to care were already in care, out of the area, incarcerated, or not contactable. Moreover, a substantial proportion of patients we identified at baseline as ineligible for relinkage outreach returned to the clinic in the 12 month study period. Our chart review confirmed that the identification of these patients as ineligible at baseline was indeed accurate, but their living and care situations were not static. The ongoing movement of patients between correctional settings and community, between different geographic areas, and between different clinical care sites is a challenging issue for both clinic and health department-based relinkage interventions to address. We support the strategy of combining data sources to identify disengaged patients, but our findings highlight the need for continual data-system maintenance to ensure accuracy.

Furthermore, our finding that 43% of out of care patients were virally suppressed upon relinkage calls into question the definition of “out of care” that was used for this and other program evaluations and research studies. Defining which patients are out of care is

challenging and all metrics of retention in care have shortcomings. Programs designed to relink persons to care typically use absence from care over a certain interval as a way of identifying patients who may be out-of-care. Although the virally suppressed patients in this intervention had no visits for 12 months, they almost certainly continued on antiretroviral therapy. While it is important for patients to be seen periodically while they are on antiretroviral therapy, these virally suppressed “out of care” patients are not the priority population for interventions to improve the HIV care continuum. Our experience suggests that one way of prioritizing patients for outreach could be to focus on patients who were viremic at the time of last measurement or who were not taking antiretroviral therapy at the time of their last appointment. Evidence-based tools to predict which patients are most likely to benefit from an intervention and relinkage assistance could enhance the efficiency of such efforts.

The limitations of our study include our focus on a single site and only one year of follow-up data. Longer follow-up may be needed to investigate the impact of this relinkage program on virologic outcomes. Although our comparison to a historical cohort provided a control population, other secular changes in Madison Clinic and the community may have impacted engagement in care apart from the implementation of this relinkage program. Furthermore, we were unable to more specifically compare the population patients who were eligible for the intervention in the intervention cohort with eligible patients in the historical cohort because we did not have surveillance information for the patients in the historical cohort.

In summary, we found that a clinic-based intervention to identify persons out of HIV care and return them to care was modestly effective. Our results demonstrate the feasibility of collaborative clinic-health department interventions to improve the HIV care continuum and highlight the need to increase the efficiency, effectiveness, and population-targeting of such efforts. Data sharing between clinics and health departments, as well as between different state departments could increase the accuracy of the HIV care continuum across the nation. Although it can be administratively complicated, data sharing should be a priority for public health and clinical staff who are working to improve the HIV care continuum. Our experience as well as others' demonstrates that it is achievable [8, 13, 14].

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Summary

This study assessed the effectiveness of a clinic-based, surveillance-informed outreach intervention to identify and relink patients to HIV care. The intervention was associated with a shorter time to care relinkage among patients in the intervention cohort compared to historical controls.

Figure 1.

Figure 2.

Figure 3.

Table 1

Demographic characteristics of intervention and control cohorts.

	Historical		Intervention		P-value ^a
	N=646	%	N=753	%	
Gender					0.4
Male	535	83%	630	84%	
Female	111	17%	121	16%	
Transgender	0	0%	2	0%	
Age					0.03*
<30	49	8%	74	10%	
30-39	143	22%	181	24%	
40-49	245	38%	252	33%	
50	209	32%	246	33%	
Race					1
White	390	60%	453	60%	
Black	138	21%	157	21%	
Multiple	5	1%	5	1%	
Native American	24	4%	27	4%	
Pacific Islander	1	0%	2	0%	
Missing	88	14%	109	14%	
Ethnicity					0.4
Hispanic	74	11%	94	12%	
missing	572	89%	659	88%	
Foreign Born					0.6
No	184	28%	371	49%	
Yes	44	7%	81	11%	
Missing	418	65%	301	40%	
Income					0.02*
<\$15,000	341	53%	414	55%	
\$15,001-30,000	94	15%	116	15%	
>\$30,000	75	12%	64	8%	

	Historical		Intervention		P-value [^]
	N=646	%	N=753	%	
Missing	136	21%	159	21%	
Housing Status					0.4
Permanent	280	43%	340	45%	
Temporary or Unstable	93	14%	116	15%	
Institution	16	2%	14	2%	
Other	31	5%	32	4%	
Missing	226	35%	251	33%	
Health Insurance					<0.001*
Private Insurance	158	24%	270	36%	
State Insurance or other public insurance	177	27%	205	27%	
No insurance	140	22%	164	22%	
Missing	171	26%	114	15%	
HIV Risk Factor					<0.001
MSM	280	43%	291	39%	
MSM-IDU	73	11%	104	14%	
IDU	55	9%	48	6%	
Heterosexual	105	16%	118	16%	
Transfusion	0	0%	2	0%	
Unknown/missing	133	21%	190	25%	
CD4 Strata at cohort assignment					0.08
<500	35	5%	35	5%	
>500	25	4%	14	2%	
Missing	586	91%	704	93%	
Viral Suppression at cohort assignment					0.009*
No	11	2%	15	2%	
Yes	43	7%	30	4%	
Missing	592	92%	708	94%	
Median time since HIV diagnosis (year)					0.007*
<5	236	37%	316	42%	

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	Historical		Intervention		P-value [^]
	N=646	%	N=753	%	
10-May	216	33%	241	32%	
>10	194	30%	196	26%	

[^] P-values calculated using GEE (with Poisson error distribution, log link, independent correlation, and robust standard errors)
* P-value<0.05

Table 2

Factors associated with time to relinkage to care.

Characteristic	N	N Relinked	% Relinked	[^] Adjusted HR (95% CI)
Cohort				
Historical cohort	646	64	10%	1
Intervention cohort	753	116	15%	1.7 (1.2-2.3) *
Gender				
Male	1165	153	13%	1
Female	232	26	11%	1.0 (0.7-1.6)
Age				
<30	123	24	20%	1
30-39	324	51	16%	0.8 (0.5-1.4)
40-49	497	55	11%	0.5 (0.3-0.9) *
>50	455	50	11%	0.6 (0.3-0.97) *
Income				
<\$15,000	755	122	16%	1
\$15,001-30,000	210	29	14%	0.8 (0.5-1.2)
>\$30,000	139	11	8%	0.5 (0.3-0.97) *
Foreign Born				
No	555	140	25%	1
Yes	125	38	30%	1.2 (0.8-1.8)
Race-Ethnicity				
non-Hispanic White	800	100	13%	1
non-Hispanic Black	291	43	15%	1.2 (0.8-1.8)
Hispanic	117	14	12%	0.7 (0.4-1.4)
Housing Status				
Permanent	620	99	16%	1
Temporary or Unstable	209	49	23%	1.3 (0.9-1.9)
Other/Institution	93	8	9%	0.5 (0.3-1.1)
Health Insurance				
Private Insurance	428	74	17%	1
State insurance or other public insurance	382	50	13%	0.7 (0.5-1.1)
No Insurance	304	44	14%	0.8 (0.5-1.2)
HIV Risk Factor**				
MSM	571	75	13%	1
MSM-IDU	177	29	16%	1.2 (0.8-2.0)
IDU	103	16	16%	1.3 (0.7-2.3)
Heterosexual	223	41	18%	1.5 (1.0-2.2)
Median time since HIV diagnosis (yr)				
<5	552	70	13%	1
5-10	457	68	15%	1.4 (0.9-2.0)

Characteristic	N	N Relinked	% Relinked	[^] Adjusted HR (95% CI)
>10	390	42	11%	1.1 (0.7-1.7)

[^] Adjusted for categorical variables of age and income, with cox proportional hazards clustering on patient ID.

* P-value<0.05

** Transfusion category is omitted

Note: Missing categories are omitted from analysis