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ORIGINAL PAPER

Characteristics of Out-of-Care Patients Who Required a Referral for Re-engagement Services by Public Health Bridge Counselors Following a Brief Clinic-Based Retention Intervention

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Abstract

The NC-LINK Project initiated both clinic-based retention services and state public health bridge counselor-based (SBCs) re-engagement services to retain and re-engage people living with HIV infection (PLWH) in care. The goal of this project is to compare efforts between clinic-based retention and SBC re-engagement services to determine whether patients are more or less likely to remain in HIV care services. Clinic appointment data were used to identify patients who were last seen more than 6–9 months prior. Patients either received clinic-based retention services only or were subsequently referred to the SBC re-engagement intervention if the retention services were unsuccessful. The frequency of re-engagement in care (180 days) and HIV suppression (VLS, within 1 year) was examined for patients in these two groups. The SBC group was less likely to have VLS at the visit prior to referral (adjusted OR 2.04, 95% CI 1.53, 2.72). Patients who were referred to the SBC were less likely to re-engage in care within 180 days as compared to those who received clinic-based retention services only (adjusted OR 0.29, 95% CI 0.21, 0.41).

Keywords Retention in care · HIV care · Out-of-care · Re-engagement · Patient care

Introduction

Although HIV testing and linkage to care are critical first steps along the human immunodeficiency virus (HIV) care continuum, retention in care is also critical for improving health outcomes of HIV-infected individuals and for controlling the spread of the virus [1, 2]. Research demonstrates that consistently attending HIV care appointments and remaining engaged in care increases the likelihood of viral suppression and reduces the likelihood of HIV transmission [1–4]. Conversely, missed appointments or inconsistent clinic attendance are associated with blunted CD4+ T-lymphocyte cell count (CD4) recovery, higher rates of antiretroviral therapy failure, lower rates of viral load or HIV suppression (VLS), increased likelihood of poorer health outcomes and increased risk of mortality for people living with HIV (PLWH) [5–8]. Thus, efforts to improve engagement in medical care and thereby to increase the likelihood of viral suppression are likely to have individual benefits for PLWH and a public health benefit given the dramatic decrease in HIV transmission attributable to VLS [3, 9]. However, many factors and competing demands may impede a patient's likelihood to obtain sufficient medical care, such as lack of medical insurance or the influence of stigma [10–12]. For these reasons, the need to improve retention in HIV care efforts as part of the National HIV/AIDS Strategy is supported by the Ryan White HIV/AIDS Program [9].

Among all PLWH in the United States, 42% reside in the South: an area with the highest HIV diagnosis rate among

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the four US census regions in 2011 [13]. Similar to the rest of the Southern region, North Carolina reported that only 53% of the estimated 35,600 PLWH in NC were retained in care in 2013, using a minimal standard of two or more lab values (CD4 or viral load) 3 months apart in a calendar year [14]. This estimate of retention in care is below the revised National HIV/AIDS strategy goal of 90% retention in care of PLWH [9].

As part of the federal HIV/AIDS Bureau's Special Projects of National Significance Systems Linkages and Access to Care Initiative, the NC-LINK Systems Linkages Project developed four interventions to improve testing, retention by clinical staff [15], linkage and re-engagement in care by public health staff [16] for HIV-infected persons living in North Carolina. Two of these interventions, the use of the clinic-based retention protocol [15] and public health State Bridge Counselor (SBC) re-engagement protocol, focused on retaining and re-engaging out-of-care patients. SBCs were public health department short-term patient navigators for PLWH who also worked in collaboration with public health disease intervention specialists (DIS) and used community outreach to link and re-engage people in care. Patients who were referred to the SBC likely required significant efforts to re-engage them into care. It is therefore important to examine whether patients who require these intensive interventions are comparable in their outcomes to those who required clinic-based retention efforts only. This can help in the design of future SBC programs that are equipped with the appropriate resources needed to re-engage patients into care.

Our primary objective was to determine if significant demographic and clinical differences existed among out-of-care patients who were located through clinic-based retention efforts and those who required subsequent referral to the SBC. We hypothesized that HIV-infected patients who had fallen out of care and were referred to the SBC were less likely to re-engage in care and achieve VLS compared to those who did not require a referral to the SBC. Our secondary objective was to compare the characteristics of those who received an SBC service and those who were referred but did not receive a service among the population referred to the SBC. Clarification of the differences between these populations may help determine the potential impact of this intervention in other settings.

Methods

Setting

Five clinics in four of the eleven geographically-defined HIV Care and Prevention Regional Networks of Care (RNC) within North Carolina participated in both retention and re-engagement interventions. These clinics were selected based upon size of clinic population. North Carolina is divided into 11 Networks of Care of which each includes Ryan White Part B Core Medical and Support services, housing, and prevention services. Providers work together collaboratively to streamline the accessibility and availability of these services. The participating clinics served between 400 and 2000 patients annually and included both academic (2 clinics) and community-based settings (3 clinics). These clinics reflected a reasonable variety of care settings and population sizes and had the necessary infrastructure to implement the project. Retention staff were located in collaborating community HIV support service agencies (within 2 of 4 geographic regions) or were members of the medical clinic staff (within 2 of 4 geographic regions). In 2011, the NC Division of Public Health implemented a SBC system to increase the number of PLWH engaged in care. The key responsibilities of the SBC were to link newly diagnosed patients to care as well as locate and facilitate a return to care by patients who have been lost to care. SBCs received linkage referrals from DIS and re-engagement referrals from a variety of entities such as DIS, the state health department and local clinics. Similar to DIS, SBCs performed field work to help locate and re-engage patients, but had lighter caseloads and lacked the focus on control measure violations sometimes required of DIS. SBCs also possessed the capacity to work across RNC borders, and thus were able to trace the increasingly fluid population of PLWH. A SBC was appointed to each of the 11 RNCs in North Carolina. All patients who could not be re-engaged from the clinic intervention were referred to the local SBC. Patients unable to be located after reasonable effort were administratively closed after an outcome was recorded.

Intervention

Throughout 2013 and 2014, participating clinics routinely generated lists of known HIV-infected patients 18 years of age and older who were already linked to care and had not received HIV medical care from the clinic within the past 6–9 months. These data were stored in an electronic HIV reporting database: NC CAREWare [18, 19]. NC used the CAREWare database to monitor Part B Ryan White HIV/AIDS programs' quality of care on an individual and domain (or clinic) level basis [18]. Persons known to be deceased, relocated or incarcerated following initial review were removed from the out-of-care lists and the updated list was sent to retention staff in the clinics for the retention intervention. Clinic-based retention staff then attempted to locate, contact and reschedule the out-of-care patients through a variety of methods including phone contacts, internet searches, and coordination with pharmacies and other medical settings [15, 20].

Retention staff tracked efforts to retain patients in the clinic's CAREWare database. A retention services 'tab' was created and staff recorded the time spent searching for each patient and the types of actions taken to locate the patient (e.g., electronic medical record review, internet searches, phone contacts, pharmacy contacts, etc.). Assistance provided to address barriers to care such as transportation, appointment scheduling, patient education or referral to community case management was recorded in CAREWare. Clinic-based retention in care services were completed if the patient was either successfully retained, could not be found after 30 days, or had another known definitive outcome including deceased, incarcerated, and relocated. Retention staff entered an outcome code in CAREWare to indicate final status of clinic-based retention efforts for the patient.

If retention efforts were unsuccessful or the patient was not located or confirmed to be in care elsewhere within 30 days, clinic-based retention staff referred the patient to the SBC for re-engagement services via electronic referrals to the SBC in NC CAREWare. If the patient was found by the SBC, the SBC then worked with the patient to identify barriers to care and provide assistance to address those barriers. SBC personnel were trained in the principles of strengths-based case management assessment to encourage patients to re-engage in their HIV care. The SBC team also provided various services for patients including, but not limited to referrals to substance abuse treatment centers, behavioral health services, and transportation assistance. While the clinic-based retention staff had access to a statewide Ryan White service database (NC CAREWare) and used phone calls, mail and email to locate patients, the SBCs were able to perform tracking using multiple surveillance databases and home visits, which enabled them to locate hard-to-reach and difficult-to-engage patients. SBC processes in locating the patient, the services provided, and the patients' outcomes were recorded in CAREWare in a similar fashion to clinic-based efforts.

Data Collection

In an effort to identify potential differences among out-of-care patients who were located through clinic-based retention efforts and those who required subsequent referral to the SBC, demographic and clinical data were extracted from NC CAREWare and the statewide HIV surveillance database. Demographic characteristics of interest included age at referral to retention staff, gender, race/ethnicity, HIV transmission risk, insurance, and time in years between HIV diagnosis and referral. Insurance status was defined as patients' insurance carrier at their last medical appointment prior to being referred for retention services. Clinical data of interest included CD4 and VL test dates and results.

The primary outcomes of interest were retention and re-engagement in HIV care and VLS. Engagement in HIV care following the retention or re-engagement interventions was defined as receipt of an HIV VL test within 180 days of the referral to clinic-based retention staff. Patients who had a VL test more than 180 days after the referral and patients who were missing VL results were considered not re-engaged in care. Only patients who returned to care at their referring clinic were considered as re-engaged in care for the purpose of these analyses. The clinic-based retention staff were not able to distinguish whether the patient was in care at another clinic within NC or not in care at all. Therefore, retention and re-engagement in care at another site was not compared between the two groups.

HIV VLS was defined as at least one result < 200 copies/mL within 365 days following the date of the referral to clinic retention staff. If no VL test was performed within 365 days, or all VL results were ≥ 200 copies/mL, the patient was not considered virally suppressed.

Statistical Analyses

In our primary analyses, demographic and clinical outcomes were compared between persons who received only the clinic-based retention intervention and those who received a subsequent referral to an SBC. Logistic regression models were used to calculate unadjusted and adjusted odds ratios and 95% confidence intervals. Variables that had a statistically significant association ($\alpha = 0.05$) with the exposure (referral to SBC), the outcome of interest, or both in crude models were included in the multivariable models to control for potential confounding.

For our secondary analyses, the demographics and outcomes of interest were compared between patients referred to the SBC who received services versus those who did not. Logistic regression was used to calculate unadjusted and adjusted odds ratios and 95% confidence intervals. Variables that had a statistically significant association ($\alpha = 0.05$) with the exposure (receipt of SBC services), the outcome of interest or both in the unadjusted models were included in the multivariable models to control for confounding.

All data analyses were performed with SAS version 9.4.

Results

SBC Referral Versus Non-SBC Referrals Population

Between January 1, 2013 and December 31, 2014, a total of 1121 patients were identified as being out of care in the five participating clinics. The majority of the out-of-care patients were male (70%), black (71%), and young, with 54% between 18 and 35 years of age. Among the out-of-care patients, 264 (24%) patients could not be contacted by clinic staff and received a subsequent referral to the SBC. Patients who required referral to the SBC did not differ from those reached by the clinic with respect to age, gender, race, and HIV risk group (Table 1). The median time from HIV diagnosis to intervention was 8.3 (IQR 4.4, 13.6) years for patients referred to the SBC and 9.2 years (IQR 5.1, 14.9) for patients who received only the clinic intervention (adjusted OR 0.99, 95% CI 0.97–1.02). Patients referred to the SBC were more likely to have a last known VL ≥ 200 (adjusted OR 2.04, 95% CI 1.53, 2.72). Among patients who received a referral to the SBC, the median time from last VL to referral was 295 days (IQR 230, 353). Among patients who did not need referral to SBC, the median time from last VL was 278 days (IQR 192, 315).

Overall, 474 (42%) of the out-of-care patients returned to care within 180 days and 578 (52%) achieved VLS within 365 days. After adjusting for last VL status (suppressed or not suppressed), insurance, age, gender, and time since HIV diagnosis, patients who were not contacted by the clinic-based retention intervention and were referred to the SBC intervention were significantly less likely to re-engage in care within 180 days of referral (adjusted OR 0.29, 95% CI 0.21, 0.41) when compared to those who were contacted successfully by the clinic-based intervention (Table 2). Patients who were referred to the SBC were significantly less likely to achieve VLS within 365 days (adjusted OR 0.39, 95% CI 0.28, 0.54) when compared to those who were contacted by the clinic intervention even after adjusting for last VL result, insurance, age and time since HIV diagnosis.

Table 1 Characteristics of out-of-care HIV-infected patients referred to the clinic-based retention program between 2013 and 2014, by SBC referral status (n = 1121)

	Not referred to SBC (n = 857) n (%) or median (IQR)	Referred to SBC (n = 264) n (%) or median (IQR)	Chi square p-value	Odds ratio (95% CI)	Adj. odds ratio (95% CI)[d]
Age, years					
18–25	223 (26)	79 (30)	0.18	Referent	Referent
26–35	274 (32)	93 (35)		0.96 (0.68, 1.36)	1.05 (0.73, 1.52)
36–45	240 (28)	65 (25)		0.77 (0.53, 1.11)	0.90 (0.61, 1.34)
≥ 46	120 (14)	27 (10)		0.64 (0.39, 1.04)	0.74 (0.45, 1.23)
Gender					
Female	250 (29)	80 (30)	0.74	Referent	Referent
Male	602 (71)	183 (70)		0.95 (0.70, 1.28)	0.89 (0.65, 1.22)
Race/Ethnicity					
White	209 (24)	52 (20)	0.27	Referent	Referent
Black	601 (70)	195 (74)		1.30 (0.92, 1.84)	1.24 (0.86, 1.77)
Other[a]	47 (6)	17 (6)		1.45 (0.77, 2.74)	1.42 (0.73, 2.76)
HIV Risk Group					
MSM	359 (43)	105 (41)	0.64	0.90 (0.67, 1.20)	0.94 (0.54, 1.63)
IDU	72 (9)	19 (7)		0.81 (0.47, 1.39)	0.89 (0.65, 1.20)
Heterosexual	414 (49)	135 (52)		Referent	Referent
Insurance status					
Insured[b]	477 (59)	127 (50)	0.02	Referent	Referent
Uninsured	334 (41)	126 (50)		1.42 (1.07, 1.88)	1.33 (1.00, 1.78)
Most recent viral load (copies/mL)					
< 200	565 (66)	126 (48)	< 0.001	Referent	Referent
≥ 200	288 (34)	137 (52)		2.13 (1.61, 2.82)	2.04 (1.53, 2.72)
Time since HIV diagnosis (years)	9.2 (5.1, 14.9)	8.3 (4.4, 13.6)	0.13	0.98 (0.96, 1.01)[c]	0.99 (0.97, 1.02)[c]

[a] Other race includes multi-race, Asian, Native Hawaiian/Pacific Islander, and American Indian/Alaska Native, etc.

[b] Insurance includes public (Medicaid, Medicare, Champus, or VA) or private insurance captured at the last medical appointment prior to falling out of care

[c] Time since HIV diagnosis was modeled as a 1 year increase since diagnosis

[d] Multivariable logistic regression models included insurance status and most recent viral load for each demographic characteristic

Table 2 Re-engagement in HIV care and viral suppression among HIV-infected patients referred to the clinic-based retention program between 2013 and 2014, by SBC referral status (n = 1121)

	Retention referral, no SBC referral (n = 857)[a] n (%)	Retention referral, SBC referral (n = 264) n (%)	Odds ratio (95% CI)	Unadj. Chi square p-value	Adj. odds ratio (95% CI)	Adj. Chi square p-value
Re-engaged in care within 180 days	582 (49)	98 (21)	0.28 (0.21, 0.37)	< 0.0001	0.29 (0.21, 0.41)[b]	< 0.0001
Achieved viral suppression within 365 days	496 (58)	82 (31)	0.33 (0.25, 0.44)	< 0.0001	0.39 (0.28, 0.54)[c]	< 0.0001

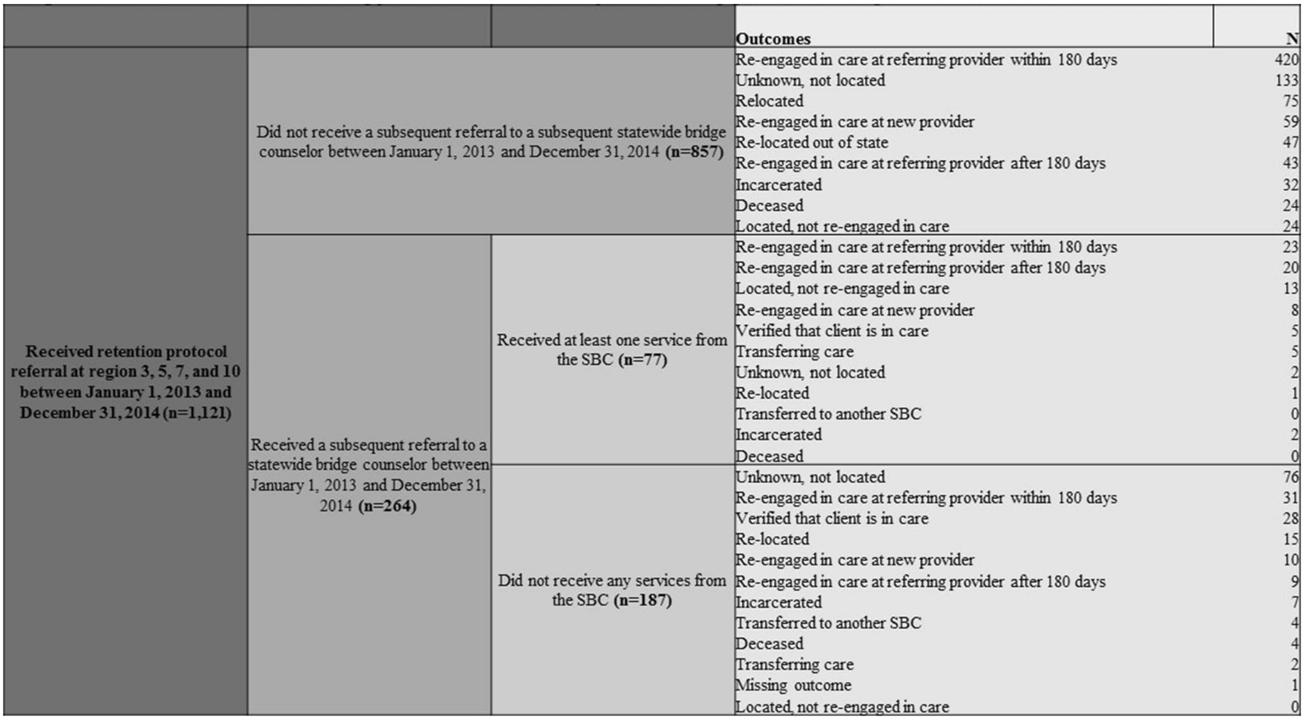
[a] Referent Group

[b] Odds ratio is adjusted for insurance, last viral load, gender, and time (years) since HIV diagnosis

[c] Odds ratio is adjusted for insurance, last viral load, age, and time (years) since HIV diagnosis

Receipt of SBC Service Versus No Receipt of SBC Service

Of the 264 patients who were referred from the clinic intervention to the SBC program, 77 (29%) received an SBC service. The remaining 187 patients were found to be deceased or incarcerated or were not able to be reached by the SBC or had evidence of re-location out of state. The outcomes of those who did not receive a service from the SBC are provided (Fig. 1). SBC services included outreach via phone calls, home visits, transportation to and from appointments, referral to housing assistance, and help with scheduling medical appointments [17]. There were no significant differences in age, gender, race/ethnicity or HIV risk group between the patients that received an SBC service and those that did not (Table 3). In addition, there was no difference in the last known VL, with approximately one-half of the patients in each group having viral loads ≥ 200 copies/



			Outcomes	N
Received retention protocol referral at region 3, 5, 7, and 10 between January 1, 2013 and December 31, 2014 (n=1,121)	Did not receive a subsequent referral to a subsequent statewide bridge counselor between January 1, 2013 and December 31, 2014 **(n=857)**		Re-engaged in care at referring provider within 180 days	420
			Unknown, not located	133
			Relocated	75
			Re-engaged in care at new provider	59
			Re-located out of state	47
			Re-engaged in care at referring provider after 180 days	43
			Incarcerated	32
			Deceased	24
			Located, not re-engaged in care	24
	Received a subsequent referral to a statewide bridge counselor between January 1, 2013 and December 31, 2014 **(n=264)**	Received at least one service from the SBC **(n=77)**	Re-engaged in care at referring provider within 180 days	23
			Re-engaged in care at referring provider after 180 days	20
			Located, not re-engaged in care	13
			Re-engaged in care at new provider	8
			Verified that client is in care	5
			Transferring care	5
			Unknown, not located	2
			Re-located	1
			Transferred to another SBC	0
			Incarcerated	2
			Deceased	0
		Did not receive any services from the SBC **(n=187)**	Unknown, not located	76
			Re-engaged in care at referring provider within 180 days	31
			Verified that client is in care	28
			Re-located	15
			Re-engaged in care at new provider	10
			Re-engaged in care at referring provider after 180 days	9
			Incarcerated	7
			Transferred to another SBC	4
			Deceased	4
			Transferring care	2
			Missing outcome	1
			Located, not re-engaged in care	0

Fig. 1 Referrals, services and outcomes among persons referred to the retention protocol for re-engagement services in regions 3, 5, 7, and 10 of North Carolina, 2013–2014, n = 1121

Table 3 Characteristics of HIV-infected patients referred for SBC intervention following a clinic-based retention intervention between 2013 and 2014, by service status (n = 264)

	Did not receive a SBC service (n = 187) n (%) or median (IQR)	Received SBC service (n = 77) n (%) or median (IQR)	Chi square p-value	Odds ratio (95% CI)
Age				
≤ 30 years	82 (44)	40 (52)	0.23	1.38 (0.81, 2.36)
> 30 years	105 (56)	37 (48)		Referent
Gender				
Female	51 (27)	29 (38)	0.10	Referent
Male	135 (73)	48 (62)		0.63 (0.36, 1.10)
Race/ethnicity				
Black	139 (74)	56 (73)	0.79	0.92 (0.51, 1.68)
Non-black[a]	48 (26)	21 (27)		Referent
HIV Risk Group				
MSM	72 (39)	33 (43)	0.55	1.18 (0.69, 2.02)
All others	113 (61)	44 (57)		Referent
Insurance status				
Insured[b]	85 (47)	42 (58)	0.10	1.58 (0.91, 2.75)
Uninsured	96 (53)	30 (42)		Referent
Most recent viral load (copies/mL)				
< 200	94 (51)	34 (44)	0.43	1.24 (0.73, 2.11)
≥ 200	92 (49)	43 (56)		Referent
Time since HIV diagnosis (years)[c]	8.62 (4.60, 13.80)	6.89 (3.76, 13.06)	0.13	0.97 (0.92, 1.01)

[a] Non-black race includes white, Hispanic, multi-race, Asian, Native American, and other

[b] Insurance includes public (Medicaid, Medicare, Champus, or VA) or private insurance captured at the last medical appointment prior to falling out of care

[c] Time since HIV diagnosis was modeled as a 1 year increase since diagnosis

ml before being lost to care. The median time from HIV diagnosis to intervention was 6.9 years for the SBC service group and 8.7 years for the group that did not receive an SBC service.

Of the 264 patients who were referred to the SBC, 54 (20%) re-engaged in care within 180 days and 82 (31%) achieved viral suppression within 365 days (Table 4). Patients who received an SBC service were twice as likely as those who did not receive service to re-engage in care at the referring provider within 180 days (adjusted OR 2.43 95% CI 1.27, 4.63). However, there was no significant difference in viral suppression within 365 days between the patients who received an SBC service and those who did not, although there was a trend towards greater viral

Table 4 Re-engagment in HIV care and viral suppression among 264 HIV-infected patients referred to the clinic based retention program and the SBCs between 2013 and 2014, by SBC service status, North Carolina (n = 264)

	No SBC service* n (%)	SBC service n (%)	Odds ratio	Unadj. Chi square p-value	Adj. odds ratio	Adj. Chi square p-value
Re-engaged in care within 180 days	30 (39)	68 (36)	1.12 (0.65, 1.93)	0.69	1.19 (0.68, 2.07)[a]	0.55
Achieved viral suppression within 365 days	53 (28)	29 (38)	1.53 (0.87, 2.67)	0.14	1.74 (0.96, 3.13)[b]	0.07

*Referent group

[a] Odds ratio adjusted for time since HIV diagnosis

[b] Odds ratio adjusted for last VL and time since diagnosis

suppression in the patients who received a service (38% vs. 28%).

Discussion

Our study examined the differences between patients who were retained in care through a clinic-based retention protocol versus those who were not located by the same protocol and subsequently referred to the SBC. Our study showed that patients who were referred to the SBC were less likely to re-engage in care within 180 days and less likely to achieve viral load suppression within 1 year of referral compared to patients who were retained in care by the clinic-based efforts alone.

Patients who were referred to the SBC were more likely to have a detectable VL at the last clinic visit prior to becoming out of care as compared to those who were located by the clinic-based protocol alone. This finding suggests that these patients potentially had more on-going challenges with use of anti-retroviral therapy compared with those who were located by the clinic efforts alone. The same barriers, such as lack of transportation, unstable housing, poverty and mental health and substance abuse issues that can adversely impact adherence to anti-retroviral therapy and medical care, also add to the challenges of contacting patients and re-engaging them to care. Field programs, such as the SBC program or community outreach efforts, can complement the efforts of clinic staff to locate patients who are hard to reach by using strategies that may not be available to clinic-based staff. While the SBC intervention resulted in less re-engagement rates compared to the clinic-based intervention, it is important to note, 70% more patients were located and had identified outcomes, and 21% more patients were re-engaged into care (Fig. 1). The SBC intervention was therefore had an added benefit by re-engaging additional persons into care. Our study findings can be useful in the development of future programs by describing the outcomes for supplementary outreach programs that utilize field workers such as the SBC to re-engage hard to reach populations. Additionally, our study emphasizes the need for these outreach field workers to have access to multiple data sources to locate patients who are lost to care. Patients who are not virally suppressed are a key subpopulation for such combined efforts especially in a setting where clinic-based retention efforts may be constrained by limited staff availability.

Our analysis demonstrates that patients who could not be contacted through clinic-based retention efforts and were subsequently referred to the SBC, were less likely to be insured at the time of referral. Prior research suggests that patients who are uninsured are less likely to engage in HIV care and achieve viral load suppression [21]. Lack of insurance in the SBC group may be an indicator of other barriers to HIV care such as poverty, lack of transportation and access to health care, and not just medical costs which would be expected to be offset by attending a RW clinic [9–11]. However, this work was performed in a state that did not expand Medicaid, and the impact of insurance status may be different in settings with broader access to insurance for PLWH with lower incomes.

Limitations

This study has several limitations. First, we were unable to identify whether patients had truly fallen out of care, or if the patient had moved out of the state of North Carolina, but engaged in HIV care elsewhere. Consequently, we will underestimate care and viral suppression among all patients. However, by using statewide data, rather than clinic-specific laboratory data, the status of patients who transferred their care to a different service area within state of NC were captured and these patients were able to be identified as in care elsewhere. Second, outcome status data entry consistency and quality were highly dependent on the clinical staff and raise the possibility of missing or erroneous entries. We minimized the impact of this limitation by using drop-down menus for most data elements, running monthly data quality reports, and assigning a research team member to be readily available for technical assistance. We reviewed the data with awareness of this limitation and all the selected variables demonstrated consistency in data collection. Future studies focusing on those patients who are not located by the clinic staff may clarify the challenges faced by these patients and offer strategies to increase access to medical care. Another key limitation was the use of VL labs to define re-engagement in care services, as we are unable to guarantee that these labs coincided with a visit to a medical provider. However, the use of surveillance viral load lab data is a common and accepted practice for measuring engagement in medical care [20, 22]. It is also important to point out that the clinic settings and the relationship between local retention efforts and state bridge counselors may not be generalizable to all HIV care settings. The use of data from four regions in NC suggests generalizability to other southeastern USA jurisdictions that are considering implementing a collaborative clinic and public health intervention. Lastly, while the SBC intervention had less time, in theory, because the intervention began after the clinic-based intervention and the outcome timeframe was not extended, both interventions were time limited (30 days). To address this concern time to retention or re-engagement was not used as an outcome measure. Also, the upper interquartile range for patients returning to care in each group was 142 days, suggesting that the SBC had adequate time to re-engage a person in care and that this cut-off did not misrepresent the results. In the secondary analysis, patients who were referred to the

SBC and subsequently received a service from the SBC were compared to those who were referred to the SBC but did not receive a service. There were no significant differences in baseline characteristics or outcomes between the two groups in these analyses.

Overall, this study provides information about the out-of-care clinic population in the southeastern United States. Patients who were not returned to care by clinic retention efforts and were referred to the SBC were more likely to have had detectable VL at the time of referral and be uninsured both of which are indications of a prior to difficulty with engagement in care. This group was also less likely to re-engage in care within 180 days or achieve VLS within 1 year. These findings may help direct efforts in other clinics and regional or statewide jurisdictions. Focused efforts between both HIV care providers and prevention/outreach workers to support keeping these patients in comprehensive care and on effective antiretroviral therapy will be required to achieve goals of the National HIV/AIDS Strategy [9].

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Compliance with Ethical Standards

Conflict of interest None of the authors have conflicts of interest to report.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical Considerations for Animal Research: this article does not contain any studies with animals performed by any of the authors.

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