Effect of an Electronic Alert on Targeted HIV Testing Among High-Risk Populations

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ABSTRACT

Context: Screening for HIV infection in medical settings remains suboptimal.

Objective: To examine the real-world effectiveness of an electronic clinician alert on the same-day HIV testing rate and early diagnosis in high-risk populations.

Design: We identified Kaiser Permanente Southern California Health Plan members aged 14 years or older who received tests for sexually transmitted infections.

Main Outcome Measures: Encounter-based same-day HIV testing rate, positive test result rate, and $CD4^+$ cell count and HIV viral load at diagnosis.

Results: We identified 1,800,948 patients who made 2,326,701 health care encounters eligible for HIV testing before implementation (January 1, 2008 - June 30, 2012) and 1,362,479 eligible encounters after implementation (January 1, 2013 - June 30, 2015). The same-day HIV testing rate increased from 36.7% to 44.1% (standardized mean difference = 0.15, significant difference). The alert was associated with a moderate difference and statistically significant increase in the HIV testing rate (adjusted odds ratio = 1.17, 95% confidence interval = 1.16-1.18). The positive test result rate increased from 0.02% to 0.04% ($p < 0.001$). During the postimplementation period, fewer HIV-infected patients had a $CD4^+$ cell count below 200 and/or an HIV viral load of 10,000 copies/mL or higher at diagnosis.

Conclusion: Implementation of a targeted electronic alert embedded in the electronic medical record improved same-day HIV screening rate and positive test result rates among patients receiving tests for sexually transmitted infections in a large health organization. This intervention has potential for facilitating frequent screening and early identification of HIV infection in high-risk populations.

INTRODUCTION

Early diagnosis of HIV infection improves personal and public health outcomes. Clinical trial data have indicated that the early initiation of antiretroviral therapy (ART) reduces rates of clinical events and leads to a sustained decrease in linked HIV Type 1 (HIV-1) infections in sexual partners on the basis of phylogenetic analysis of HIV-1 polymerase region sequences.[1,2] Furthermore, persons aware of their HIV infection tend to be less likely to engage in risky sexual behaviors than do unaware persons.[3,4] In 2006, to foster earlier detection of HIV infection and to identify and link persons with unrecognized HIV infection to clinical and prevention services, the Centers for Disease Control and Prevention (CDC) recommended routine opt-out HIV screening of persons aged 13 to 64 years in all health care settings except in communities where the prevalence of undiagnosed HIV infection is documented at less than 0.1%, and that persons at high risk of HIV infection should be screened for HIV at least annually.[5]

Despite the widespread availability of HIV testing, an estimated 13% of persons living with HIV were unaware of their infection in 2012,[6] and many have a diagnosis of advanced HIV disease (AIDS). There are missed opportunities for HIV testing among high-risk populations in various medical care settings. A study using data from the 2009 National Hospital Ambulatory Medical Care Survey estimated that the HIV testing rate in US Emergency Departments (EDs) in all 50 states and the District of Columbia was very low (about 2.3%) among persons for whom targeted testing was indicated (ie, sexually transmitted diseases, sexual abuse, or pregnancy).[7] Another study, using the data of the National Survey of Family Growth, reported that the rate of annual HIV testing was low for men with a sexual risk of HIV infection (range = 23.9%-41.7% during 2008-2010), and little improvement took place from 2002 to 2006-2010[8] after the 2006 CDC recommendations for HIV testing among high-risk populations.[5] Persons with indication of unsafe sexual activities who seek care and tests for sexually transmitted infections (STIs) are at particularly high risk of HIV infection through unprotected sexual activities. Because sexual contact accounts for most new HIV diagnoses in the US,[9] targeted HIV screening during STI health care encounters presents an opportunity for early identification of HIV infection and timely linkage to HIV specialty care.

As an integrated health care system, Kaiser Permanente (KP) Southern California (KPSC), uses an electronic health record (EHR; Epic Systems Corp, Verona, WI) that captures laboratory, pharmacy, and diagnostic data for members of KPSC. Such a system enables clinical decision support (CDS) tools to be created that would assist practitioners in ordering clinically appropriate HIV tests via a series of prompts. We conducted a retrospective cohort study to 1) examine the real-world effectiveness of a CDS tool embedded in an EHR of a large health care organization on the same-day HIV testing rate among patients seeking care for STIs; 2) study correlates of receiving

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a same-day HIV test and determine whether the associations differ during preimplementation vs postimplementation; and 3) examine the impact of the CDS tool on HIV positivity rates and early identification of HIV infection.

METHODS

Study Setting

KPSC is the largest Region of KP, a large managed care organization in the US. This Region serves more than 4 million Health Plan members in Southern California. Members of KP are insured though prepaid health plans and receive integrated primary and specialty care. Members of KPSC are very similar to the general population in California regarding age, sex, and race/ethnicity, with only slight underrepresentation of those in very low and very high income and education categories.[10] Electronic reminders and alerts are widely used in KPSC's comprehensive EHR system as a CDS tool to assist clinicians in identifying high-risk patients and in closing care gaps. The electronic reminders and alerts use comprehensive prespecified algorithms based on certain inclusion and exclusion criteria to identify eligible patients through the EHR system and provide real-time support to clinicians' decision making at the point of care. A best practice alert (BPA) is a "hard-stop" CDS tool, which pops up on the computer screen when a clinician opens a patient's chart or signs off on an order, and the clinician needs to either act on the alert or dismiss the alert before s/he can close the patient's electronic chart.

Electronic Best Practice Alert for HIV testing

To increase opt-out HIV testing among high-risk populations, KPSC launched an HIV/STI Screening and Immunizations BPA in October 2012. The BPA was embedded in the EHR system to remind clinicians to order HIV/STI screening tests for patients aged 14 years or older when ordering tests for syphilis, chlamydia, gonorrhea, hepatitis B surface antigen, or hepatitis C antibody, if HIV or AIDS status was unknown or there were no recent results for an HIV screening test. Specifically, if a test for gonorrhea/chlamydia, hepatitis B surface antigen, or hepatitis C antibody screening were ordered for a patient whose HIV infection status is unknown, and there was no HIV test result documented within the last 30 days, the alert would fire when the clinician signs the order for an STI test. Because patients receiving syphilis treatment often undergo frequent syphilis tests for antibody titers to monitor syphilis treatment efficacy, the alert was not designed to fire at every subsequent follow-up syphilis test. For patients who received a syphilis test order, the alert would fire if there was no HIV test result documented within the last 365 days. The BPA prompted the physician to order an HIV screening test and other relevant STI tests, along with a list of recommended vaccines on the basis of the patient's age and history of vaccination (eg, human papillomavirus and hepatitis B vaccines). Links for ordering the HIV/STI tests and vaccines were embedded in the BPA screen to facilitate the orders.

Study Population

We identified KPSC Health Plan members who were age 14 years or older and who received at least 1 test for the aforementioned STIs targeted by the BPA at a health care encounter during the preimplementation (January 1, 2008 - June 30, 2012) and postimplementation (January 1, 2013 - June 30, 2015) periods. Data from a 6-month washout period around the roll-out of the BPA (ie, July 2012 - December 2012) were excluded from the analysis. We then determined whether an individual was eligible for an HIV test at each health care encounter according to the BPA criteria. Only the eligible encounters were included in the study sample as the index encounters for analyses. An individual could have multiple index encounters during the study period until s/he either received an HIV-positive test result or disenrolled from the Health Plan, whichever came first.

Outcome Measures

We calculated the encounter-based same-day HIV testing rate, defined by the proportion of the encounters with an HIV test performed on the same day among the STI test encounters when an HIV test was indicated according to the BPA criteria (ie, the index encounter). The same-day HIV testing rate was calculated for the study sample during the pre- and postimplementation periods separately and by age group (14-17, 18-24, 25-39, 40-49, ≥ 50 years) at the encounter. Sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian/Pacific Islander, multiple/other, unknown), insurance type (commercial, Medicaid), type of STI test or tests received at the encounter, and history of previous HIV tests were also captured. Among those who received a same-day HIV test, we calculated the encounter-based HIV-positive test result rate during pre- and postimplementation periods (ie, proportion of positive HIV tests among all encounters with a same-day HIV test). To evaluate the impact of the BPA on early identification of HIV infection, we also calculated the proportion of patients with a baseline $CD4^+$ cell count less than 200 cells/mm^3 (an indication for severely impaired immune function and AIDS) or $CD4^+$ cell count below 350 cells/mm^3 (clinical indication for ART initiation), and patients with a detectable HIV viral load (≥ 200 copies/mL) or a very high viral load (≥ 100,000 copies/mL) at or immediately after the positive HIV test result, during the pre- and postimplementation periods, respectively. The study protocol was reviewed and approved by the KPSC institutional review board with a waiver of requirement for informed consent.

Statistical Analysis

We conducted χ^2 tests to compare the distribution of sex, age (at the first index encounter), and race/ethnicity among the individuals who were eligible for an HIV test during the pre- and postimplementation periods. Because a significance test of p value based on a very large sample may make a very small difference appear statistically significant, we calculated the standardized mean difference (SMD) of the same-day HIV testing rates during the pre- and postimplementation periods. An SMD with an absolute value < 0.1 is considered negligible, an absolute value > 0.2 is considered statistically significant, and an absolute value between 0.1 and 0.2 is considered as a moderate difference.[11-13]

Logistic regression modeling using generalized estimating equations was conducted to estimate the adjusted effects of the BPA implementation on receiving a same-day HIV test at the index encounters (adjusted odds ratio [OR]; and 95% confidence interval [CI]), controlling for patient demographics, type of STI test, Medicaid status, history of previous HIV tests, clinician race/ethnicity, and Medical Centers in the multivariable models. We conducted separate multivariable analyses to evaluate whether those associations differed before and after implementation. To account for potential correlation within individuals (about 44% of the patients had more than 1 index encounter during the study period), we employed Poisson regression models using generalized estimating equations to adjust for intraperson correlation. We conducted χ^2 tests to compare the proportion of patients with a baseline $CD4^+$ cell count below 200 or less than 350 cells/mm^3 and patients with a baseline HIV viral load of at least 200 copies/mL or 100,000 copies/mL or more during the pre- and postimplementation periods. All analyses were performed using SAS Version 9.3 software (SAS Institute, Cary, NC).

Table 1. Demographics of patients who received at least 1 STI test at a health care encounter and were eligible for HIV testing per best practices alert criteria

Characteristic	Preimplementation (January 1, 2008 - June 30, 2012), no. (%)	Postimplementation (January 1, 2013 - June 30, 2015), no. (%)	SMD[a]
Total[b]	1,287,187 (100)	885,439 (100)	
Age,[c] y			
14-17	82,631 (6.4)	40,262 (4.5)	-0.08
18-24	255,209 (19.8)	205,224 (23.2)	0.08
25-39	464,086 (36.1)	334,923 (37.8)	0.04
40-49	205,916 (16)	123,893 (14)	-0.06
≥ 50	279,345 (21.7)	181,137 (20.5)	-0.03
Sex[d]			
Female	873,214 (67.8)	610,083 (68.9)	0.02
Male	413,961 (32.2)	275,342 (31.1)	-0.02
Race/ethnicity[e]			
White	386,830 (30.1)	262,171 (29.6)	-0.01
Black	140,667 (10.9)	99,529 (11.2)	0.01
Hispanic	508,898 (39.5)	386,830 (43.7)	0.08
Asian/Pacific Islander	123,190 (9.6)	90,395 (10.2)	0.02
Multiple/other	27,438 (2.1)	19,548 (2.2)	0.01
Unknown	100,164 (7.8)	26,966 (3.0)	-0.21
Medicaid			
No	1,235,025 (95.9)	830,375 (93.8)	-0.1
Yes	52,162 (4.1)	55,064 (6.2)	0.1

[a] Standardized mean difference with an absolute value less than 0.1 is considered negligible.
[b] A total of 371,678 patients (20.4%) had eligible encounters in both pre- and postimplementation periods. The total number of unique patients across the 2 periods was 1,800,948.
[c] Age was calculated at the date of the first STI test performed during each period if there were multiple eligible encounters during pre- and/or postimplementation periods of the HIV screening best practices alert.
[d] Numbers may not total to 100% because some patients reported "other" for sex (n = 12 in preimplementation and n = 14 in postimplementation period).
[e] May not total to 100% because of rounding.
SMD = standardized mean difference; STI = sexually transmitted infection.

RESULTS

We identified 1,800,948 unique patients who made 2,326,701 index health care encounters at which the patients were eligible for an HIV test according to the BPA criteria during the preimplementation period (January 1, 2008 - June 30, 2012) and 1,362,479 index health care encounters during the postimplementation period (January 1, 2013 - June 30, 2015). Among those, 371,678 patients (20.6%) had index encounters during both pre- and postimplementation periods. There were 153,688 patients (11.9%) in the preimplementation period and 84,212 patients (9.5%) in the postimplementation period who had multiple index encounters. Most of the study population were female and Hispanic or white. The distribution of sex, age, race/ethnicity, and proportion of patients with Medicaid coverage was similar during the pre- and postimplementation periods (SMD < 0.1; Table 1).

The same-day HIV testing rate increased from 36.7% to 44.1% (SMD = 0.15, moderate difference) in the overall cohort after the BPA implementation (Table 2). The increase was observed across all patient sex and race/ethnicity groups, whereas the same-day HIV testing rates varied by different medical centers (statistically significant). The magnitude of the increase was significant among males (SMD = 0.27), Asian/Pacific Islanders (SMD = 0.20), patients who received care from a Hispanic clinician (SMD = 0.26), and those who received a syphilis test (SMD = 0.38) at the index health care encounter. The same-day HIV testing rate remained similar among patients younger than age 25 years old, whereas the rate increased by more than 10% in patients older than age 25 years. The increase was more prominent in the patients who had only 1 index encounter, rising from 36.8% to 48.1%, and among those who received care from a Hispanic clinician (up by 12.8%, SMD = 0.26). Although the baseline same-day HIV testing rate was much higher before the BPA implementation among those who had multiple index encounters, the same-day HIV testing rate remained stable among those patients after the implementation (66.9% vs 69.8%).

We found that implementation of the BPA was associated with a moderate and statistically significant increase in the same-day HIV testing rate (adjusted OR = 1.17, 95% CI = 1.16 - 1.18, Table 3). Other factors associated with a greater likelihood of receiving a same-day HIV test included male sex (adjusted OR = 1.52, 95% CI = 1.51 - 1.54), being a minority (black: adjusted OR = 1.27, 95% CI = 1.25 - 1.29; Hispanic: adjusted OR = 1.08, 95% CI = 1.07 - 1.09; multiple/other races: adjusted OR = 1.11, 95% CI = 1.08 - 1.14 vs white), and received care from a clinician of Hispanic ethnicity (adjusted OR = 1.14, 95% CI = 1.13 - 1.16 vs white race), after adjusting for medical centers. Eligible patients who received an STI test in the Infectious Disease Department were more likely to receive HIV testing than those in primary care (crude OR = 2.13, 95% CI = 1.98 - 2.29), but the estimate

of an adjusted OR could not be obtained in the multivariable model because of a model convergence issue caused by many encounters with the care setting uncoded. Compared with patients who were age 25 to 39 years at the encounter, patients of other age groups were less likely to receive a same-day HIV test (statistically significant). Patients with Medicaid coverage were slightly less likely to receive a same-day HIV test (adjusted OR = 0.91, 95% CI = 0.90 - 0.92). Compared with patients who were tested for multiple types of STI infections at the index encounter, those who received a single STI test were less likely to receive a same-day HIV test (Table 3). Patients with a history of previous HIV tests were more likely to receive a same-day HIV test at the index encounter (adjusted OR = 1.93, 95% CI = 1.91 - 1.94).

Results of separate multivariable analyses in the pre- and postimplementation periods indicated that associations between the patient and clinician characteristics and the likelihood of receiving a same-day HIV test were similar across time. The likelihood of the same-day HIV testing increased after the BPA implementation among patients who were age 40 to 49 years (preimplementation: OR = 0.44, 95% CI = 0.43 - 0.45; postimplementation: OR = 0.61, 95% CI = 0.59-0.62) and those age 50 years or older (preimplementation: OR = 0.18, 95% CI = 0.18-0.19; postimplementation: OR = 0.33, 95% CI = 0.32-0.34), compared with those age 25 to 39 years.

Among the 854,925 and 600,719 HIV tests performed among the study sample during the pre- and postimplementation periods, 141 patients and 245 patients tested HIV positive, respectively, resulting in an encounter-based HIV positive test result rate of 0.02% and 0.04% respectively ($p < 0.001$). During the postimplementation period, fewer patients who tested HIV positive had a baseline $CD4^+$ cell count below 200 cells/mm^3 (ie, meets AIDS definition) or less than 350 cells/mm^3, and fewer patients had a detectable (≥ 200 copies/mL) or very high (≥ 100,000 copies/mL) baseline HIV viral load ($p < 0.05$, Table 4).

Table 2. Same-day HIV testing rate among patients who received at least one STI test at a health care encounter and were eligible for HIV testing per best practices alert criteria

	Preimplementation, no. (%)		Postimplementation, no. (%)		Comparison of same-day testing rates	
Characteristic	Encounters	Same-day HIV testing rate	Encounters (%)	Same-day HIV testing rate	Percentage difference in testing rate	SMD[a]
Overall	2,326,701	854,925 (36.7)	1,362,479	600,719 (44.1)	7.4	0.15
Age, y						
14-17	120,202 (5.2)	38,589 (32.1)	53,837 (4.0)	17,362 (32.2)	0.1	0.00
18-24	571,344 (24.6)	202,960 (35.5)	390,830 (28.7)	134,890 (34.5)	-1.0	-0.02
25-39	922,518 (39.6)	414,585 (44.9)	524,312 (38.5)	291,833 (55.7)	10.7	**0.22**
40-49	328,484 (14.1)	112,478 (34.2)	169,005 (12.4)	77,596 (45.9)	11.7	**0.24**
≥ 50	384,153 (16.5)	86,313 (22.5)	224,495 (16.5)	79,038 (35.2)	12.7	**0.28**
Sex						
Female	1,756,883 (75.5)	570,861 (32.5)	1,010,998 (74.2)	379,388 (37.5)	5.0	0.11
Male	569,800 (24.5)	284,060 (49.9)	351,464 (25.8)	221,324 (63.0)	13.1	**0.27**
Race/ethnicity						
White	654,557 (28.1)	219,858 (33.6)	381,606 (28.0)	163,285 (42.8)	9.2	0.19
Black	311,829 (13.4)	120,972 (38.8)	177,553 (13.0)	79,372 (44.7)	5.9	0.12
Hispanic	963,686 (41.4)	363,454 (37.7)	610,018 (44.8)	267660 (43.9)	6.2	0.13
Asian/Pacific Islander	207,999 (8.9)	74,476 (35.8)	127,686 (9.4)	58,316 (45.7)	9.9	**0.20**
Multiple/Other	51,507 (2.2)	20,967 (40.7)	29,623 (2.2)	14,218 (48.0)	7.3	0.15
Unknown	137,123 (5.9)	55,198 (40.3)	35,993 (2.6)	17,868 (49.6)	9.3	0.19
Medicaid						
No	2,202,827 (94.7)	811,549 (36.8)	1,257,111 (92.3)	559,712 (44.5)	7.7	0.16
Yes	123,874 (5.3)	43,376 (35.0)	105,368 (7.7)	41,007 (38.9)	3.9	0.08
STI test type						
Multiple STI tests	571,754 (24.6)	544,693 (95.3)	448,446 (32.9)	439,275 (98.0)	2.7	0.15
Chlamydia and gonorrhea	1,144,970 (49.2)	99,540 (8.7)	633,727 (46.5)	58,265 (9.2)	0.5	0.02
Hepatitis B and C	402,077 (17.3)	143,835 (35.8)	205,210 (15.1)	65,274 (31.8)	-4.0	-0.08
Syphilis	207,900 (8.9)	66857 (32.2)	75,096 (5.5)	37,905 (50.5)	18.3	**0.38**
HIV test history						
No	1,574,507 (67.7)	548,606 (34.8)	729,061 (53.5)	303,515 (41.6)	6.8	0.14
Yes	752,194 (32.3)	306,319 (40.7)	633,418 (46.5)	297,204 (46.9)	6.2	0.13

[a] Boldface = statistically significant difference.

CI = confidence interval; SMD = standardized mean difference; STI = sexually transmitted infection.

DISCUSSION

Our findings suggest that implementing a targeted electronic alert embedded in a comprehensive EHR system of a large health care organization has a moderate and statistically significant effect on the same-day HIV testing rate among patients who received an STI test. Late diagnosis and poor HIV/AIDS prognosis affect racial/ethnic minorities (ie, blacks and Hispanics) and older adults (ie, aged ≥ 50 years) disproportionately. Although the overall increase in the same-day HIV testing was moderate (adjusted OR = 1.17), we observed a greater increase in patients age 50 years and older (by 12.7%) after implementing the BPA, suggesting that this CDS tool has potential to address HIV testing disparity among high-risk older adults.

Our findings support that an evidence-based, targeted HIV screening CDS tool improved HIV cotesting rate among patients who received an STI test and increased the positivity rate of HIV testing (from 0.02% to 0.04%), which suggests that this approach also improved efficiency of HIV screening. Late presentation for treatment is associated with higher early mortality rates, higher direct health care costs, and poor retention in care.[14-16] On the basis of evidence from clinical trials[17,18] and recent observational studies[19-21] showing that earlier use of ART results in better clinical outcomes for people living with HIV compared with delayed treatment and better prevention of HIV transmission, the World Health Organization recommends that ART should be initiated in everyone living with HIV at any $CD4^+$ cell count.[22] Although the median $CD4^+$ cell count at the time of ART initiation is increasing, it remains lower than 350 cells/mm^3 in many settings, including in high-income countries. We hypothesized that the implementation of the BPA would likely facilitate early identification of HIV infection because it promotes frequent HIV testing among high-risk populations. Our findings supported our initial hypotheses because we observed fewer patients had a $CD4^+$ cell count below 200 cells/mm^3 or less than 350 cells/mm^3 or a very high HIV viral load (> 100,000 copies/mL) at the diagnosis during the postimplementation period.

Table 3. Factors associated with receiving same-day HIV testing among patients who received at least 1 STI test at a health care encounter and were eligible for HIV testing per BPA criteria

Factor	Crude OR (95% CI)	Adjusted OR (95% CI)
BPA implementation		
Preimplementation	Reference	Reference
Postimplementation	1.36 (1.35-1.36)	1.17 (1.16-1.18)
Age, y		
25-39	Reference	Reference
14-17	0.50 (0.49-0.50)	0.84 (0.82-0.85)
18-24	0.57 (0.57-0.58)	0.91 (0.91-0.92)
40-49	0.64 (0.64-0.65)	0.45 (0.45-0.46)
≥ 50	0.39 (0.38-0.39)	0.21 (0.21-0.22)
Sex		
Female	Reference	Reference
Male	2.30 (2.29-2.32)	1.52 (1.51-1.54)
Patient race/ethnicity		
White	Reference	Reference
Asian/Pacific Islander	0.88 (0.87-0.89)	0.88 (0.87-0.89)
Black	1.27 (1.25-1.29)	1.27 (1.25-1.29)
Hispanic	1.08 (1.07-1.09)	1.08 (1.07-1.09)
Multiple/other	1.11 (1.08-1.14)	1.11 (1.08-1.14)
Unknown	0.99 (0.97-1.01)	0.99 (0.97-1.01)
Medicaid		
No	Reference	Reference
Yes	0.90 (0.89-0.91)	0.91 (0.9-0.92)
Provider race/ethnicity		
White	Reference	Reference
Asian	1.08 (1.08-1.09)	0.88 (0.87-0.89)
Black	0.72 (0.71-0.73)	0.77 (0.76-0.79)
Hispanic	1.25 (1.24-1.26)	1.14 (1.13-1.16)
Other/missing	0.97 (0.96-0.98)	0.96 (0.94-0.98)
Provider specialty		
Family medicine	Reference	Reference
Infectious disease	2.13 (1.98-2.29)	NA[a]
Unknown	0.75 (0.74-0.75)	NA[a]
Other	0.82 (0.82-0.83)	NA[a]
STI test category		
Multiple STIs	Reference	Reference
Chlamydia and gonorrhea	0 (0-0)	0 (0-0)
Hepatitis B and C	0.02 (0.02-0.02)	0.03 (0.03-0.03)
Syphilis	0.03 (0.03-0.03)	0.04 (0.04-0.05)
HIV testing history		
No	Reference	Reference
Yes	1.14 (1.13-1.15)	1.93 (1.91-1.94)

[a] Multivariable model did not converge.
BPA = best practices alert; CI = confidence interval; NA = not applicable; OR = odds ratio; STI = sexually transmitted infection.

Table 4. Baseline $CD4^+$ count and HIV viral load among patients with a positive test result during pre- and postimplementation periods

Measure	Preimplementation	Postimplementation	p value
$CD4^+$ counts, no. (%)			
Number of patients	135	236	
Median no. of counts (Q1, Q3)	364 (184, 567)	539 (384, 771)	< 0.0001
< 200 cells/mm^3	37 (27.4)	23 (9.8)	0.0001
≥ 200 cells/mm^3	98 (72.6)	213 (90.3)	
< 350 cells/mm^3	64 (47.4)	54 (22.9)	0.0001
≥ 350 cells/mm^3	71 (52.6)	182 (77.1)	
Viral load, no. (%)			
Number of patients	134	239	
Median no. of copies (Q1, Q3)	32,898 (8981, 126,254)	75 (0, 56,205)	< 0.0001
< 200 copies/mL	6 (4.5)	125 (52.3)	0.0001
≥ 200 copies/mL	128 (95.5)	114 (47.7)	
< 100,000 copies/mL	97 (72.4)	196 (82.0)	0.0299
≥ 100,000 copies/mL	37 (27.6)	43 (18.0)	

Q1 = 25th percentile; Q3 =75th percentile.

This study took advantage of a comprehensive EHR system of an integrated, large health care organization to examine the real-world effectiveness of an embedded electronic alert on the same-day HIV cotest rate targeting patients at increased risk of HIV infection. However, there are certain limitations in this study. We did not collect data on the reason for patients receiving an order for STIs test on the index date. A certain percentage of the patients may have received the STI tests as a routine screening; for instance, the CDC recommends annual chlamydia screening of all sexually active females younger than age 25 years. Clinicians might have chosen not to order a same-day HIV screening test for those persons who received routine STI screening if they did not present with STI symptoms. About 76% of the study population were women age 18 to 24 years, and 59% of these women received a same-day HIV test during the study period, higher than the overall same-day HIV testing rate. Therefore, routine STI screening practice among women age 18 to 24 years seemed unlikely to have influenced the effect of the BPA. In addition, we did not collect data on whether there were other clinician and patient education programs to enhance the awareness of HIV testing that might have influenced HIV screening practice during our study period.

CONCLUSION

There are missed opportunities in health care settings in early identification of HIV infection. This targeted, clinician-level, systematic intervention has shown potential of facilitating frequent screening and early identification of HIV infection in high-risk populations in ambulatory care settings. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose. Dr Hechter, Ms Bider-Canfield, and Dr Towner are employed by Kaiser Permanente Southern California Department of Research and Evaluation and have received internal funding to conduct this study. The study sponsor had no role in study design, data collection, analysis, interpretation, writing of the report, or decision to submit for publication.

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