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BRIEF RESEARCH REPORT

Infectious Disease

Missed opportunities for diagnosis of HIV in the emergency department using non–risk-based testing strategy

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Abstract

Objectives: The objective of this study was to identify the number of missed opportunities (MO) for human immunodeficiency virus (HIV) diagnoses within our emergency departments (EDs) and assess any significant associated patient characteristics. Following current Centers for Disease Control guidelines, an opt-out HIV screening program was implemented in 2 of 7 EDs within a large Southern healthcare system. This study sought to differentiate the risk of MO in opt-out compared to clinician-initiated, risk-based ED screening protocols.

Methods: A retrospective analysis was conducted from August 2019 to March 2022 of adult patients (≥18 years old) screened for HIV, comparing the ED screening method and characterization of all MOs. MO was defined as any ED visit, before HIV seropositivity, that included sexually transmitted infection screening and/or treatment with no HIV screening. Two EDs implemented generalized opt-out screening for all adult patients (>18 years old); whereas, the remaining 5 sites relied on clinician-initiated screening. Patient characteristics associated with an MO were evaluated by χ^2, *t* tests, and multivariable logistic regression.

Results: In total, 19,423 patients were screened for HIV, 142 of who tested positive. Of the 142 HIV-positive individuals, 12 (8.5%) had 1 MO and 3 of 12 (25%) had 2. The proportion of patients with a MO was significantly higher at clinician-initiated EDs as compared opt-out EDs (41.7% vs 13.9%, $P = 0.01$). After adjusting for demographics, individuals seen at clinician-initiated EDs were more likely to have a MO compared opt-out EDs (adjusted odds ratio, 4.64; 95% confidence interval, 1.18–18.27; $P = 0.02$).

Conclusion: This novel study highlights the success and overall high positivity (0.7%) of an ED-based opt-out screening program. Taken together, the implementation of generalized opt-out screening within a large Southern healthcare system can rapidly increase overall screening, uncover a surprisingly high positivity rate, and decrease MOs for HIV diagnosis.

KEYWORDS
human immunodeficiency virus (HIV), missed opportunity, screening, sexually transmitted infections (STI)

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1 | INTRODUCTION

1.1 | Background

Human immunodeficiency virus (HIV) remains a national epidemic. The number and rate of individuals living with HIV have increased across the United States from 2015 to 2019, especially in the South, with approximately 1,061,482 individuals living with HIV.[1] The South now represents the epicenter of the US HIV epidemic with roughly 51% of new infections despite having only 38% of the US population.[2] The lack of overall screening and overall missed opportunities for HIV diagnoses are allowing the HIV epidemic to continue and spread in the South.[1]

1.2 | Importance

The emergency department (ED) has been emphasized as an effective venue for HIV screening due to greater access to high-risk populations that often do not seek care in other venues, often secondary to both rising costs and an overall lack of access.[3] EDs in various large urban centers have demonstrated success in increasing HIV screening efforts through opt-out programs, which screen all patients for HIV independent of risk factors. Opt-out screening is recommended by both the Infectious Disease Society of America and the Centers for Disease Control (CDC) as part of the strategy to end the epidemic in the United States in areas where the positivity rate of generalized screening is above 0.1%.[4] The success of ED-based opt-out screening goes beyond just screening and includes encouraging rates of successful linkage-to-care. A recent systematic review determined that the combined linkage-to-care rate from 37 ED-based programs was approximately 74.4%.[4]

1.3 | Objective

Although academic EDs in large urban centers in the North and West United States have published on the successful implementation of opt-out screening programs, few publications have highlighted successful implementation within a Southern community healthcare system. Moreover, only a few of these established programs have begun to address the concept of a "missed opportunity" (MO) for HIV diagnosis.[3,5,6] None have assessed MOs during the initial implementation of an opt-out screening program within a large Southern healthcare system. Our objectives include the overall reporting of initial positivity rates of opt-out screening versus clinician-initiated screening within these EDs and the assessment of MOs. The term clinician in this setting includes all ED physicians, physician assistants, and nurse practitioners in the healthcare system's group. We assessed the overall rate, odds, and patient characteristics associated with an MO and further investigated the relationship between ED screening method (opt-out vs clinician-initiated) and MOs.

The Bottom Line

Opt-out screening for human immunodeficiency virus (HIV) leads to significantly decreased rates of missed opportunities for diagnosis of HIV in comparison to clinician-initiated, risk-based HIV screening.

2 | METHODS

2.1 | Study design and setting

This retrospective cohort study was conducted between August 1, 2019 and March 30, 2022, and included data from 7 EDs comprising a Southern community healthcare system. This project was reviewed and deemed exempt by the Prisma Health institutional review board (1892784-1). These community EDs served a total of 709,214 patients during the study period.

2.2 | Selection of participants

Eligible patients included all adult ED patients (18 years and older) newly diagnosed with HIV during the study period. MOs were defined as any ED visit where a patient was screened for a sexually transmitted infection (STI) without also being screened for HIV. STIs in the study included gonorrhea, chlamydia, trichomonas, syphilis, and herpes simplex viruses.

2.3 | Interventions

Two of 7 total EDs within this healthcare system implemented an opt-out screening program for HIV. Initial HIV screening used a 4th Generation HIV p24 Ag/HIV Ab combination screening test (Abbott). Positive results were then subjected to confirmation testing using: (1) Geenius HIV-1/HIV-2 assay (Bio-Rad) and (2) nucleic acid quantification (BioQuest). The opt-out program offers screening for all adult patients 18 years or older and is described previously.[8] The other 5 EDs rely on clinician-initiated screening, based on the review of a patient's medical and social history and ultimate risk for HIV infection. Thus, screening for HIV at these sites relies exclusively on the ability of the clinician to recognize and initiate screening for eligible patients based on clinical gestalt and/or current CDC and the United States Preventative Services Taskforce (USPSTF) guidelines. The reason a patient was not screened, whether secondary to physician discretion, lack of recognition, or patient refusal, was not the focus of this evaluation. We sought to initially identify the scope of this problem and identify EDs that would represent the best next sites for the expansion of opt-out screening.

TABLE 1 Demographic characteristics by missed opportunity for HIV test among individuals positive for HIV 2019–2022 (N = 142)

Variable	Total (N = 142, 100%)	No MO (N = 130, 91.6%)	MO (N = 12, 8.5%)	*P*
Age, years[a]	43.4 (14.6)	43.0 (14.7)	35 (12.6)	0.068
Sex				
Male	100 (70.4)	91 (70.0)	9 (75.0)	0.7165
Female	42 (29.6)	39 (30.0)	3 (25.0)	
Race				
White	66 (46.5)	**64 (49.2)**	**2 (16.7)**	**0.0305**
Non-White	76 (53.5)	**66 (50.8)**	**10 (83.3)**	
Insurance				
Private	35 (24.7)	31 (23.9)	4 (33.3)	0.5949
Public	40 (28.2)	38 (29.2)	2 (16.7)	
Self-pay/other	67 (47.2)	61 (46.9)	6 (50.0)	
Prisma Health ED				
Opt-out	119 (83.8)	**112 (86.2)**	**7 (58.3)**	**0.0123**
Clinician-initiated	23 (16.2)	**18 (13.9)**	**5 (41.7)**	

Abbreviations: ED, Emergency department; MO, Missed opportunity.
[a]Mean, SD.

2.4 | Measurements

Regardless of the reason, each ED visit where a patient was screened and/or treated for an STI and did not have an HIV screening test represents a MO secondary to their high risk for contracting HIV following both CDC and USPSTF guidelines. The visits considered were those before HIV seropositivity. We collectively assigned these as MOs. Regardless of screening location, all HIV-positive individuals within the healthcare system were given post-test counseling and linked-to-care.

2.5 | Outcomes

Our primary outcomes included the overall seropositivity obtained from either generalized opt-out screening or clinician-initiated screening with an additional assessment of MOs. Our primary exposure was the ED screening method, "opt-out" versus "clinician-initiated."

2.6 | Data analysis

Chi-square analyses and *t* tests were used to assess differences in the distribution of patient demographic characteristics by MO status. Unadjusted logistic regression was used to assess characteristics significantly associated with a MO. Multivariable logistic regression was used to assess the relationship between the ED screening method (opt-out vs clinician-initiated) and MO, adjusting for patient age, sex, race, and insurance status. All statistics were performed using SAS Enterprise (Cary, NC).

3 | RESULTS

Of the 19,423 patients who were screened for HIV in the ED during the study period, a total of 142 were confirmed seropositive. Of the total number of screening tests, 18,136 (93%) were obtained through opt-out screening with 119 HIV-positives (0.7%). Clinician-initiated HIV screening totaled 1287 with 23 positives (1.8%). Twelve of the 142 total HIV-positive patients (8.5%) had at least 1 previous MO and 3 of 12 (25%) had 2 MOs (Table 1). There were no statistically significant differences in the distribution of demographic and clinical characteristics by MO status. The proportion of individuals with a MO was significantly higher for individuals visiting an ED that relied on clinician-initiated screening compared to 1 with generalized opt-out screening (41.7% vs 13.9%, $P = 0.0123$).

Unadjusted and adjusted odds ratios (aOR) for characteristics associated with having a MO for HIV diagnosis are presented in Table 2. Individuals who were seen in a clinician-initiated ED were significantly more likely to experience a MO compared to those seen in a facility with an opt-out program (odds ratio [OR], 4.44; 95% confidence interval [CI], 1.27–15.53; $P = 0.0194$). Non-White individuals were nearly 5 times more likely to experience a MO compared to individuals who were White (aOR, 4.85; 95% CI, 1.02–23.00; $P = 0.0468$). After adjusting for age, sex, race, and insurance status, individuals seen at a clinician-initiated ED were still 4.64 times more likely to experience a

TABLE 2 Odds Ratios of characteristics associated with missed opportunities for HIV diagnosis (N = 142)

Variable	Unadjusted OR (95% CI)	*P*	Adjusted OR (95% CI)	*P*
Age, years	0.96 (0.91–1.01)	0.0758	0.96 (0.90–1.03)	0.2289
Sex				
Male	1.29 (0.33–5.01)	0.7172	0.42 (0.07–2.51)	0.3422
Female	Referent		Referent	
Race				
White	Referent		Referent	
Non-White	**4.85 (1.02–23.00)**	**0.0468**	**5.93 (1.10–32.00)**	**0.0386**
Insurance				
Private	Referent		Referent	
Public	0.41 (0.07–2.38)	0.3425	0.33 (0.05–2.38)	0.3173
Self-pay/other	0.76 (0.20–2.90)	0.7756	0.69 (0.16–3.04)	0.8024
Prisma Health ED				
Opt-out	Referent		Referent	
Clinician-initiated	**4.44 (1.27–15.53)**	**0.0194**	**4.64 (1.18–18.27)**	**0.0284**

Abbreviations: 95% CI, 95% confidence interval; ED, emergency department; OR, odds ratio.

MO compared to those seen at an ED with an opt-out program (OR, 464; 95% CI, 1.18–18.27; $P = 0.0284$).

3.1 | Limitations

This analysis is subject to several limitations. This retrospective analysis is limited in the ability to account for all potential confounders. Additionally, although these results are from 1 large community healthcare system, it is limited to 1 Southern state. Similar success or positivity rates may not be generalizable to other healthcare systems in other states. A new HIV diagnosis was based on self-report and could not be confirmed beyond the medical records available. Finally, small sample sizes limited our ability to assess differences between different racial groups and likely limited the statistical power of our analyses.

4 | DISCUSSION

This novel study has several interesting results. First, we report on a surprisingly high HIV positivity rate (0.7%) from a newly implemented ED-based opt-out HIV screening program within a large Southern healthcare system that covers a large rural catchment area, where the positivity rate is closer to 0.2% in the rest of the state. Second, the additional assessment of MOs demonstrated that clinician-initiated screening increased the odds of having a MO by 4.44 times compared to opt-out screening. Additionally, there was a significant difference in missed opportunities in minority non-White populations, who were nearly 5 times more likely than the White population to experience a MO.

Previous studies have focused on large urban academic EDs in Northern and Western United States. The EDs in the current study are community EDs in the South that serves a large rural geographic area including a medium-sized city and more than 8 counties. The area stretches from the Tennessee, Georgia, and North Carolina borders of South Carolina all the way to the middle of the state. The total number of ED patients served across this study period was ~709,000, with 50% from the 2 "opt-out" EDs and 50% from the remaining 5 EDs. Overall, although 19,423 HIV screening tests were obtained, 18,137 (93.4%) were part of opt-out screening. A higher percentage of HIV-positive individuals with screening performed at a risk-based institution was found to have a missed opportunity at 23 of 1287 (1.8%) as compared to 119 of 18,136 (0.7%) in opt-out screening sites, which comprised 84% of the total diagnoses of HIV during the study period. Our overall 0.7% (119 of 18,136) positivity rate from opt-out screening is well above the suggested level of 0.1% from the CDC to continue generalized HIV screening.[6]

The findings of the current study demonstrate that community EDs in the South may represent a key untapped venue for the implementation of generalized opt-out HIV screening programs. Our overall prevalence of MOs was relatively low as compared to previous studies. For example, a study of Baltimore HIV patients reported that 75% of those testing positive for HIV had at least 1 documented visit to an ED in the Baltimore metropolitan area within 2 years preceding their diagnosis.[3] It is possible that the comparatively low prevalence of MOs in the current study is due to the high proportion (83.8%) of individuals who received care at a hospital with an opt-out and linkage-to-care program, compared to the 60% who visited a hospital with an opt-out program in the Baltimore study.[3] This is further supported by our finding that individuals treated at a hospital relying on clinician-initiated screening were 4.4 times more likely to experience an MO. Overall

these results support the implementation and expansion of opt-out screening programs to other hospitals, to prevent MOs and ensure timely diagnosis of HIV.

Individuals who were non-White showed greater odds of experiencing a MO for HIV diagnosis. This is an important finding given the context of recent trends in HIV diagnosis and prevalence in non-White populations. Based on CDC data from 2019, rates of HIV are higher in non-Hispanic Black patients, and incidence in less represented minorities has also been increasing.[1] Screening patterns also reflect this trend, and the highest percentage of those having ever been tested for HIV was found in the non-Hispanic Black population at 66%.[7] These data represent capitalization of the time frame where these patients intersect with the healthcare system, who have traditionally had less access to care. One study in South Carolina reported that an ED-based program increased screening for Black patients by 49%, finding approximately 79% of all newly diagnosed HIV-positive patients within the entire healthcare system were Black.[8] These findings support the importance of implementing strategies to increase screening and diagnosis within under-represented minority patient populations.

Although our findings do demonstrate the superiority of opt-out screening in the reduction of MOs, missed cases were still present. This highlights an area for potential growth in education with clinical bedside support. This screening strategy is in line with the revised recommendations via the CDC by Branson et al,[9] who recommended routine screening of all patients regardless of individual risk factors, especially in areas like ours with positivity rates of generalized screening above 0.1%. Further research is needed to examine the relationship between race and missed opportunities.

Overall, this study demonstrates the successful implementation of opt-out HIV screening programs within community EDs in a large Southern healthcare system. These programs can rapidly increase screening, uncover a surprisingly high positivity rate, and reduce the chance for a MO. These programs may be necessary to limit MOs for minority populations and may represent a superior strategy as compared to traditional clinician-initiated testing. Individuals who received care at a hospital with an opt-out screening program were far less likely to have a MO compared to those who did not. Further analysis on full implementation across all EDs within this healthcare system, alongside other education interventions to assess individual screening patterns of EDs clinicians may also serve to increase recognition of the critical need for HIV screening to end the epidemic.

AUTHOR CONTRIBUTIONS

Dr. Sarah Guess developed the research queshion, assisted with designing the statistical plan, interpreted the results and wrote the majority of the article. Dr. Mirinda Ann Gormley performed data acquisition, statistical analysis and contributed to the majority of the results sections. Dr. Phil Moschella performed data aquisition, result analysis and editorial assistance. Drs. Alain Litwin and Prerana Roth contributed clinical expertise and editorial assistance.

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CONFLICTS OF INTEREST

Alain H. Litwin served on the advisory board for Merck Pharmaceuticals, AbbVie, and Gilead Sciences. He has received research grants from Merck Pharmaceuticals and Gilead Sciences. Phillip Moschella has received research grants from Gilead Sciences. No other authors declared any conflict of interest related to this work.

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