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Original Contribution

Evaluation of hidden HIV infections in an urban ED with a rapid HIV screening program☆,☆☆,★

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ABSTRACT

Background: To investigate the prevalence of undiagnosed HIV infections in an emergency department (ED) with an established screening program.
Methods: Evaluation of the prevalence and risk factors for HIV from an 8-week (June 24, 2007–August 18, 2007) identity-unlinked HIV serosurvey, conducted at the same time as an ongoing opt-in rapid oral-fluid HIV screening program. Testing facilitators offering 24/7 bedside rapid testing to patients aged 18 to 64 years, with concordant collection of excess sera collected as part of routine clinical procedures. Known HIV positivity was determined by (1) medical record review or self-report from the screening program and/or (2) presence of antiretrovirals in serum specimens.
Results: Among 3207 patients, 1165 (36.3%) patients were offered an HIV test. Among those offered, 567 (48.7%) consented to testing. Concordance identity-unlinked study revealed that the prevalence of undiagnosed infections was as follows: 2.3% in all patients, 1.0% in those offered testing vs 3.0% in those not offered testing ($P < .001$); and 1.3% in those who declined testing compared with 0.4% in those who were tested ($P = .077$). Higher median viral loads were observed in those not offered testing (14255 copies/mL; interquartile range, 1147-64354) vs those offered testing (1865 copies/mL; interquartile range, undetectable-21786), but the difference was not statistically significant.
Conclusions: High undiagnosed HIV prevalence was observed in ED patients who were not offered HIV testing and those who declined testing, compared with those who were tested. This indicates that even with an intensive facilitator-based rapid HIV screening model, significant missed opportunities remain with regard to identifying undiagnosed infections in the ED.

1. Introduction

The Centers for Disease Control and Prevention (CDC) estimates that 14% of 1.2 million HIV-infected individuals in the United States were unaware of their positive serostatus [1]. Numerous previous studies have demonstrated that US emergency departments (EDs) are the leading sites of encounter for "late-testers" and the most common site of "missed opportunities" for HIV testing in medical settings [2,3]. In order to better understand the magnitude of the hidden epidemic, ED investigators pioneered identity unlinked seroprevalence methodologies [4–7] and demonstrated high prevalence of unrecognized HIV infections, both historically and more recently. Since 2006, the CDC revised recommendations for HIV testing in health care settings [8], and numerous US EDs have established organized HIV testing programs to help find those with unrecognized HIV, with some success [9,10].

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☆☆ Declaration of interests: We declare no competing interests.
★ Ethics committee approval: The Johns Hopkins University School of Medicine Institutional Review Board approved the identity-unlinked seroprevalence study as well as the ED-based HIV testing and linkage to care program.
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Unfortunately, despite intensive national efforts, ED HIV screening programs still fail to identify many infected patients. A recent blinded seroprevalence study, conducted in the context of an ongoing nontargeted counselor-based HIV testing program in one ED in Washington, DC, found that the prevalence of undiagnosed HIV infection was 3 times higher among those who declined testing, as compared with those who accepted [11]. Notably, that study was conducted in a setting which used an *opt-out* approach for HIV screening (which in practice may not always be the norm [9], due to state regulations and/or pragmatic issues) and assessed seroprevalence only on the select subset of patients who were considered "eligible" to participate in opt-out screening, namely, those with nonurgent medical conditions, and were deemed able to communicate with "normal" mental status. Thus, gaps remain with regard to defining the full spectrum of potential missed opportunities for HIV testing in EDs (including a more comprehensive assessment of demographic and clinical characteristics of those patients). Further study would be informative for optimizing strategies for HIV detection in ED settings.

Situated in a high HIV prevalence area in Baltimore City, our ED has implemented programmatic rapid HIV screening since 2005 [12]. During the summer of 2007, we conducted an identity-unlinked HIV seroprevalence study, simultaneous with 24/7 dedicated testing facilitator-based HIV testing. Our objectives were to (1) determine the prevalence of undiagnosed HIV infections in the context of an active dedicated testing facilitator driven HIV opt-in nontargeted screening program, and (2) define and compare characteristics of patients with undiagnosed HIV infections, among those who were offered (vs not offered) HIV testing, and among those among who did (vs did not) consent to having an HIV test performed.

2. Methods

Our study was conducted in an academic adult ED in Baltimore City, which in 2007 saw approximately 60 000 visits annually. The ED serves an urban, inner-city population with a historically high HIV prevalence of 11% to 12% and an HIV incidence of 0.56% to 0.94% per year [6].

Our nontargeted, rapid, oral fluid (OraQuick Advanced, OraSure Technologies, Bethlehem, PA) opt-in HIV screening program aimed to offer free HIV testing to as many as possible ED patients who met the following criteria: ages 18 to 64 years, not critically ill, no previous diagnosis of HIV, no HIV test in the past 3 months, and able to provide informed consent. The operational model of screening program evolved over time based on the staffing model used and varied logistical considerations, including level of funding to support our supplementary staff [12]. In the summer of 2007 (concordant with the time that this study was carried out), the screening program operated with trained facilitators who offered HIV testing to eligible ED patients, 24 hours a day, 7 days a week. These facilitators performed abbreviated pretest and posttest counseling, consent for HIV testing, and collected oral swab specimens which were tested in the ED satellite laboratory by dedicated laboratorians. One full-time dedicated HIV program coordinator was responsible for linkage to care for any newly diagnosed HIV-infected patients. Details of the testing program have been described elsewhere [12].

An identity-unlinked HIV seroprevalence study was carried out during the summer of 2007 (8-week duration). All ED patients 18 years or older who had blood drawn for clinical purposes (and in whom excess sample was available for HIV testing) were included and evaluated using an identity-unlinked seroprevalence methodology [5]. Briefly, basic demographic and clinical data including HIV relevant information were extracted prior to sample de-identification. De-identified samples were then tested for HIV by third-generation enzyme immunoassays (enzyme-linked immunosorbent assay); all positives were confirmed by Western blot followed by RNA viral load (VL) testing using Roche Amplicor v1.5, which has a limit of detection of 400 copies/mL (Roche, Indianapolis, IN). Antiretrovirals (ARVs) in serum specimens were detected using ultraperformance liquid chromatography–tandem mass spectrometry by the Clinical Pharmacology Laboratory at our institution. Known HIV positivity was determined by (1) both medical record review and review of self-report from the HIV screening program (as applicable) and/or (2) presence of ARVs in serum specimens. The study was approved by the Johns Hopkins University School of Medicine Institutional Review Board. Use of an identity-unlinked methodology for determining HIV seroprevalence is permitted via a consent waiver [5,13] and involves accessing excess waste clinical blood specimens and paring that with de-identified demographic and administrative data, for purposes of understanding HIV epidemiology in the population.

Two-sided $P < .05$ was considered statistically significant. χ^2 Tests or Fisher exact tests were performed to determine prevalence ratio or relative differences in proportion of undiagnosed HIV cases by their status in the screening program. Nonparametric Wilcoxon rank sum tests were performed to determine the differences in HIV RNA VLs by screening program group using SAS version 9.3 (SAS Institute Inc, Cary, NC).

3. Results

During the 8-week study period, there were 9179 ED visits and 4475 serum specimens collected from 7254 unique patients. After excluding multiple specimens from the same visits and repeat visits, 3399 unique patients were included. After excluding 192 known positive patients, there were 3207 unique patients remaining, whom were included for the analysis. Among those patients, 1165 (36.3%) patients were offered an HIV test during their ED visits, whereas 2042 (63.7%) were not. Of those offered a test, 598 (51.3%) patients declined, whereas 567 (48.7%) accepted the test. There were 22 patients who accepted the test but were not tested, and another (ie, distinct group of) 22 patients who initially declined the test, but were later tested as part of their care in the ED. The overall prevalence of undiagnosed HIV infection was 2.3% (73/3207; Figure).

Significant differences were observed when comparing those who were offered HIV testing vs those who were not, with regard to age, sex, race, and payor type (Table 1). After excluding patients older than 64 years (ie, outside of 2006 CDC-recommended age group for HIV testing), age was not found to be significantly associated with whether a test was offered or not. Patients who were offered an HIV test were more likely to be African American but less likely to be publicly insured compared with those who were not offered an HIV test.

The prevalence of undiagnosed HIV was 3 times higher in those who were not offered vs those who were offered (3.0% vs 1.0%, respectively; prevalence ratio, 2.90; 95% confidence interval, 1.57-5.36; $P < .001$). Furthermore, after excluding those older than 64 years, the undiagnosed prevalence of HIV was even higher at 3.8%, among those not offered testing. No statistically significant differences were observed with regard to age, sex, race, triage acuity level, or medical insurance payor type among patients with undiagnosed HIV infection, according to whether or not they were offered a test (Table 2). However, a significant difference was observed in the distribution of types of chief complaint when comparing those who were offered vs not offered, an HIV test ($P = .004$, Fisher exact test; Table 3).

Among those who were offered an HIV test, marginally significant differences in the prevalence of undiagnosed HIV infection were observed according to patient's acceptance status. Eight (1.3%) of 576 patients who declined the testing (and were not tested) were HIV infected vs 2 (0.4%) of 545 patients who accepted and were tested for HIV (prevalence ratio, 3.79; 95% confidence interval, 0.81-17.74; $P = .077$). Two (9.1%) of 22 patients who initially accepted the test (but were ultimately not tested during their ED visit) and none of the 22 patients who initially declined testing (but were later testing as part of their clinical care) were HIV infected.

The average mean HIV RNA VLs among the 73 undiagnosed HIV-infected patients was 110 340 copies/mL (range, undetectable-3 396 395); the median VLs was 10 814 copies/mL (interquartile range