

# Results of a Rapid HIV Screening and Diagnostic Testing Program in an Urban Emergency Department

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**Study objective:** We describe outcomes of a rapid HIV testing program integrated into emergency department (ED) services, using existing staff.

**Methods:** From April 2005 through December 2006, triage nurses in an urban ED offered HIV screening to medically stable patients aged 12 years or older. Clinicians could also order diagnostic testing according to presenting signs and symptoms and suspicion of HIV-related illness. Nurses obtained consent, performed rapid testing, and disclosed negative test results. Clinicians disclosed positive test results and arranged follow-up. Outcome measures included number and proportion of visits during which screening was offered, accepted, and completed; number of visits during which diagnostic testing was completed; and number of patients with confirmed new HIV diagnosis and their CD4 counts.

**Results:** HIV screening and diagnostic testing were completed in 9,466 (8%) of the 118,324 ED visits (14.2% of the 60,306 unique patients were tested at least once). Screening was offered 45,159 (38.2%) times, accepted 21,626 (18.3%) times, and completed 7,923 (6.7%) times; diagnostic testing was performed 1,543 (1.3%) times. Fifty-five (0.7%) screened patients and 46 (3.0%) of those completing diagnostic testing had confirmed positive HIV test results. Median CD4 count was 356 cells/ $\mu$ L among screened patients and 99 cells/ $\mu$ L among those who received diagnostic testing.

**Conclusion:** Although existing staff was able to perform HIV screening and diagnostic testing, screening capacity was limited and the HIV prevalence was low in those screened. Diagnostic testing yielded a higher percentage of new HIV diagnoses, but screening identified greater than 50% of those found to be HIV positive, and the median CD4 count was substantially higher among those screened than those completing diagnostic testing. [Ann Emerg Med. 2009;54:56-64.]

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## SEE EDITORIAL, P. 65.

### INTRODUCTION

#### Background

Urban emergency departments (EDs) are logical venues for HIV screening because the ED is often the only source of health care for many low-income, uninsured patients with a high prevalence of undiagnosed HIV infection.<sup>1-5</sup> Since 1993, the Centers for Disease Control and Prevention (CDC) has recommended that HIV screening be offered routinely to all patients in high-prevalence settings, including urban EDs.<sup>6</sup> In 2003, the CDC introduced strategies to make HIV testing a routine part of health care, promoting simplified procedures to make testing more practical.<sup>7</sup>

Despite these recommendations, several studies have subsequently shown that many patients with newly diagnosed HIV infection have made multiple previous visits to EDs, during which their HIV infection was not detected.<sup>8-10</sup> In fact, ED HIV screening is rarely performed outside of research programs, even for high-risk patients,<sup>9,11-13</sup> and a recent national survey demonstrated that only 13% of academic EDs had a policy for HIV screening.<sup>13</sup>

#### Importance

In previous demonstration projects and research studies, ED-based HIV screening programs have successfully detected undiagnosed HIV infection in 0.6% to 14% of patients tested.<sup>4,14-25</sup> To date, these programs have relied exclusively on

### Editor's Capsule Summary

#### *What is already known on this topic*

The Centers for Disease Control and Prevention (CDC) recommends HIV screening in emergency departments (EDs), but this is rarely done.

#### *What question this study addressed*

The feasibility and results of an ED HIV screening program conducted at a busy inner-city ED using existing staff provided supplemental training, and facilitated by abbreviated consent, informational brochures, no-cost testing, a project leader, and a study coordinator.

#### *What this study adds to our knowledge*

One third of patients were offered screening at triage. Half accepted, and one third of them were actually tested (6.6% of total). The prevalence of HIV infection was 0.7%, which exceeds the CDC's 0.1% threshold for recommending routine screening.

#### *How this might change clinical practice*

Although ED HIV testing with existing staff is possible, it is difficult to achieve high screening rates and it is unclear whether benefits exceed the opportunity costs of diverting already strained resources to this activity.

supplemental staff to perform HIV counseling and testing and, often, risk assessment and recordkeeping. Such programs may be difficult to replicate in many EDs because of resource and space limitations. To our knowledge, no previous reports have examined the degree to which HIV screening with rapid tests can be incorporated into routine clinical practice, using existing staff.

### Goals of This Investigation

In April 2005, according to the CDC's 2003 HIV testing guidelines,<sup>7</sup> we developed and implemented a novel, 2-tiered program for providing ED-based HIV testing. The model included opt-in HIV screening, in which patients are routinely offered an HIV test by triage nurses and their assent is required, and diagnostic HIV testing, in which testing is ordered by clinicians according to the patient's presenting signs and symptoms and their suspicion of HIV-related illness. The model used existing ED staff, point-of-care rapid HIV tests, and abbreviated consent and counseling procedures. The objectives of this article are to describe this model and to report the results of its implementation.

## MATERIALS AND METHODS

### Study Design

This is a descriptive report of a CDC-funded demonstration project designed to integrate routine HIV screening into emergency care services. Because we anticipated that providing point-of-care screening in the ED might influence clinicians to order diagnostic HIV tests, we evaluated diagnostic testing separately. The project was determined to be an evaluation of a public health program, and therefore review by the CDC's institutional review board was not required. However, the project received institutional review board approval at the Alameda County Medical Center, with a waiver of written informed consent.

### Setting

Expanded HIV screening and on-site rapid testing were conducted at a single urban academic ED that supports an emergency medicine residency and serves predominantly adult patients of racial and ethnic minorities with low socioeconomic status. A 2006 internal review revealed that the annual census is 75,000 visits, and 47% of patients are black, 32% Hispanic, 44% female, and 2% children younger than 12 years. Fifty-three percent of patients did not have health insurance. Patients presenting for emergency care are triaged in a centralized area and designated for treatment in either the main ED (70% of patients) or the affiliated urgent care. The 2 sites, collectively referred to as the ED, share a common staff consisting of physicians, physician assistants, and nurses.

### Selection of Participants

Patients were eligible to be offered HIV screening by the triage nurse or diagnostic testing by clinicians (physicians, physician assistants, and medical students) if they were medically stable, competent to complete written informed consent, and at least 12 years of age (for children <12 years, parental consent was required for HIV testing). Patients were ineligible if they had a known HIV diagnosis, had an acute psychiatric or unstable medical illness, or if a language barrier existed and translation services were unavailable. Although there is no consensus on the frequency of repeated screening for patients without known risks for HIV,<sup>26-28</sup> screening was not recommended for patients who reported completing HIV testing within the past 3 months. The 3-month period was chosen in an attempt to minimize repeated testing by habitual ED users but to allow for follow-up screening in patients with continued HIV risk and those who may have been previously tested during the window period of HIV infection. Eliciting an HIV testing history, however, was not required by triage staff to offer screening.

HIV testing was provided free. The program was funded by a cooperative agreement from the CDC (\$203,000 dollars annually) that supported the cost of the rapid HIV tests, confirmatory Western blot tests, patient information brochures, training materials, 10% salary support for the project leader, and a half-time program coordinator.

Between January 1 and March 31, 2005, 150 ED nurses were trained to provide pretest information, offer screening during triage, obtain written informed consent for the test, perform point-of-care oral fluid rapid HIV testing with the OraQuick Advance Rapid HIV-1/2 Antibody Test (OraSure Technologies, Inc., Bethlehem, PA), disclose negative test results, provide posttest information, and collect confirmatory specimens from patients with preliminary positive test results. Each nurse attended a single 90-minute training session on performing the rapid test that consisted of an educational lecture, testing demonstration, hands-on practice, a written test, and a directly observed competency evaluation.

On April 1, 2005, the full HIV testing program was implemented. Triage nurses were instructed to offer rapid HIV screening to eligible patients 24 hours a day, 7 days a week. The electronic ED record of patients who agreed to screening was flagged, thereby notifying treating nurses that an HIV test should be performed. Clinicians could also offer a diagnostic HIV test to any patient for whom they thought it was indicated. If patients accepted, clinicians ordered the rapid HIV test electronically, as they would any other laboratory test.

All HIV tests were performed by ED nursing staff. Oral fluid specimens were collected at the bedside, the tests were processed in a designated station within the ED and urgent care, and, within 40 minutes, interpreted as negative, preliminary positive, or invalid. Preliminary positive test results required confirmation with Western blot testing, and negative test results were considered definitive. Tests were invalid if they were interpreted outside the 20- to 40-minute window, processed but not interpreted, or otherwise fulfilled criteria for an invalid result according to the manufacturer's package insert<sup>29</sup> (such as absent control line). Test results were recorded in the patient's medical record. The OraQuick test is waived under the Clinical Laboratory Improvements Amendments for use with oral fluid, fingerstick, and venipuncture whole-blood specimens. Nurses followed the manufacturer's instructions, which included maintenance of logs with storage temperatures and test results.<sup>29</sup> Physician assistants completed daily testing of external controls.

All patients offered HIV screening received an informational brochure (printed in English or Spanish) from the triage nurse but no pretest counseling or HIV risk assessment. Clinicians provided information about the HIV test verbally before diagnostic testing. Treating nurses reassessed patients' eligibility and obtained written informed consent (required by state law during this study). The streamlined HIV consent form consisted of an 11-line script read by the nurse, with checkbox areas (which patients were asked to initial to signify their understanding) and a separate signature line.

Nurses disclosed negative test results to patients before discharge and gave them a printed informational handout. The handout documented their negative result and discussed HIV risk reduction and indications for repeated HIV testing. Patients who tested preliminary positive were moved to a private room where emergency physicians disclosed the test result and

arranged for follow-up care and nurses collected specimens for Western blot and CD4 count. Patients testing positive received a printed handout that explained the preliminary nature of the test result, the importance of confirmatory testing and follow-up care, strategies to prevent transmission, and referral for mental health and other support services. HIV counselors who staffed a preexisting, separately funded HIV testing center in the facility were available weekdays from 9 AM to 4 PM to assist with counseling these patients with preliminary positive rapid test results.

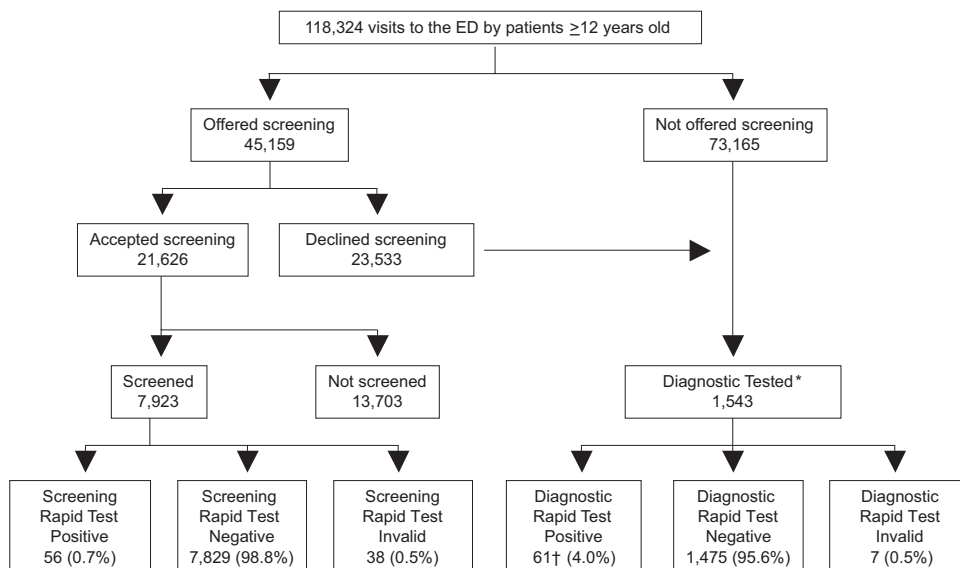
Follow-up appointments were scheduled at one of 2 hospital-affiliated HIV clinics during time slots reserved each week for patients who had positive HIV test results in the ED. Patients received their confirmatory test result at these appointments. If patients failed to attend their scheduled appointment to receive confirmatory test results, a nurse administrator at the HIV clinic attempted to contact them.

### Data Collection and Processing

At the visit, nurses recorded the following information in specific HIV testing fields that were incorporated into the ED electronic medical record (Wellsoft Corporation, Somerset, NJ): whether HIV screening was offered, accepted, and completed; whether diagnostic testing was performed; HIV test results (preliminary positive, negative, or invalid); and whether test results were verbally disclosed to the patient. These data, as well as data routinely collected during an ED visit, including demographic information (age, sex, race and ethnicity) and disposition status (admitted or discharged), were exported to spreadsheets (Microsoft Excel 2003; Microsoft Corporation, Redmond, WA) from which identifying information was removed. Patients who made repeated visits during the period of observation and who were tested more than once were identified retrospectively. CD4 counts, Western blot test results, and follow-up information were obtained from review of the hospital laboratory and HIV clinic intake records and entered into the spreadsheets by the program coordinator.

### Outcome Measures

The primary outcome measure was to describe the number and proportion of age-eligible patient visits in which HIV screening was completed. Secondary outcome measures were the number and proportion of age-eligible patient visits in which HIV screening was offered and accepted, the number and proportion of visits in which diagnostic testing was performed, and the number and percentage of patients who received their test result who were confirmed to have a new diagnosis of HIV infection. Additional outcome measures for patients found to be HIV positive were the number and proportion who met the definition for immunologic AIDS (CD4 count  $<200$  cells/ $\mu$ L), were admitted to the hospital, and received follow-up care for HIV infection and the median time in days to successful follow-up, defined as making at least 1 visit for care at the medical center HIV clinic. We also assessed the number of unique patients who were offered and received HIV tests and the



\*Clinicians selected patients for diagnostic testing because of clinical signs and symptoms suspected to be due to HIV infection.  
†Includes 14 tests in patients previously diagnosed with HIV.

**Figure.** Results of HIV screening and diagnostic testing, April 2005-December 2006.

median number of tests and median time in months between tests for patients who were tested more than once during the project period.

### Primary Data Analysis

Unless otherwise specified, each patient visit was analyzed as a separate encounter. Patients who had preliminary positive test results but were later determined to have a previous diagnosis of HIV were excluded from the analysis because their infection was not diagnosed as a result of the ED program. Patients who left before triage were excluded from analyses. Descriptive statistics (proportions, medians, ranges) are reported.

## RESULTS

From April 1, 2005, to December 31, 2006, the medical center recorded 118,324 visits to the ED by patients aged 12 years or older. The **Figure** outlines the respective outcomes of screening and diagnostic testing. Overall, 8.0% of the age-eligible ED population received an HIV test during the project period. HIV screening was offered during 45,159 (38.2%), accepted in 21,626 (18.3%), and completed in 7,923 (6.7%) of the 118,324 ED visits. Diagnostic testing was performed in 1,543 (1.2%) ED visits. HIV screening was accepted by patients in 47.9% of the visits in which it was offered, and screening tests were performed in 36.6% of the visits during which patients accepted screening. Fourteen patients with preliminary positive test results on diagnostic testing were found to have a previous HIV diagnosis and were excluded from further analysis. Of the 9,452 HIV tests performed in patients without a previous HIV diagnosis, 103 (1.1%) had preliminary positive

results, of which 101 (98%) were confirmed positive by Western blot; 9,304 (98.4%) had negative results, and 45 (0.5%) had invalid results. Reasons recorded for invalid test results were that nurses forgot to interpret the results for 15 tests, results were interpreted outside the time window for 9 tests, and the control line was absent for 3 tests; reasons were not documented for 18 tests. Nine of the invalid tests were repeated (including all 7 of the invalid diagnostic tests), of which 8 were interpreted to be negative and 1 remained invalid.

Of the 7,923 screening tests conducted, 55 (0.7%) were confirmed positive for HIV infection compared with 46 (3.0%) of the 1,529 diagnostic tests performed. The proportion of new HIV diagnoses among those screened exceeded 0.1% across all demographic characteristics except for Native Americans, who composed only 0.2% of the tested population (**Table**). The diagnostic yield of screening was greatest in men, non-Hispanic blacks, and persons aged 35 to 54 years. The yield of diagnostic testing was greater than or equal to 0.7% for all groups except Native Americans and, as with screening, was greatest in men, non-Hispanic blacks, and persons aged 35 to 54 years.

CD4 counts were available for 100 of the 101 patients newly diagnosed with HIV, of whom 43 had immunologic AIDS (CD4 <200 cells/ $\mu$ L) at HIV diagnosis: 15 (27.8%) of 54 screened patients and 28 (60.9%) of 46 patients who underwent diagnostic testing. The median CD4 count was 356 (range 4 to 1,020) cells/ $\mu$ L for screened patients and 99 (range 9 to 1,224) cells/ $\mu$ L for those identified by diagnostic testing.

Disclosure of test results was documented for 8,638 (91.4%) of the 9,452 completed tests, including all 103 preliminary



**Table.** HIV prevalence among patients who had screening and diagnostic testing.

Demographics	Screening (n=7,069)* No. Positive/ No. Screened (%)	Diagnostic Testing (n=1,475) <sup>†</sup> No. Positive/ No. Tested (%)	Total Tested (n=8,544) No. Positive/ No. Tested (%)
<b>Sex</b>			
Male	41/3,928 (1.0)	42/893 (4.7)	83/4,821 (1.7)
Female	14/3,141 (0.4)	4/582 (0.7)	18/3,723 (0.5)
<b>Race/ethnicity</b>			
Black	39/3,630 (1.1)	29/731 (4.0)	68/4,369 (1.6)
Hispanic	7/1,953 (0.4)	11/438 (2.5)	18/2,391 (0.8)
White	8/1,173 (0.7)	5/216 (2.3)	13/1,389 (0.9)
Asian	1/253 (0.4)	1/75 (1.3)	2/328 (0.6)
Native American	0/17 (0)	0/4 (0)	0/21 (0)
Unknown	0/35 (0)	0/11 (0)	0/46 (0)
<b>Age, y</b>			
12–24	6/1,619 (0.4)	4/329 (1.2)	10/1,948 (0.5)
25–34	13/1,772 (0.7)	10/360 (2.8)	13/2,132 (0.6)
35–44	19/1,517 (1.3)	12/324 (3.7)	31/1,841 (1.7)
45–54	14/1,469 (1.0)	16/305 (5.2)	30/1,774 (1.7)
55–64	2/590 (0.3)	4/130 (3.1)	6/720 (0.8)
≥65	1/102 (1.0)	0/27 (0)	1/129 (0.8)

\*Seven thousand sixty-nine unique patients who underwent HIV screening one or more times; does not include unique patients who also underwent diagnostic testing on a separate visit.  
<sup>†</sup>One thousand four hundred seventy-five unique patients who underwent diagnostic testing one or more times; includes 208 patients who also completed screening on a separate visit.

positive test results. Emergency physicians disclosed results, provided counseling, and arranged follow-up care for 73 (70.9%) patients with preliminary positive tests; HIV counselors from the hospital's HIV services department provided these services for 30 patients (29.1%).

Overall, 41 (40.6%) patients with new HIV diagnoses were admitted to the hospital: 16 (29.6%) of the 54 patients identified by screening and 25 (54.3%) of the 46 patients identified by diagnostic testing. Linkage to follow-up HIV care was documented for 90 (89.1%) patients with newly diagnosed HIV infection. The median length of time between diagnosis and initiation of HIV care was 14 days (range 0 to 251 days). Of the 11 patients not linked to care, 3 died from AIDS-related illnesses (2 while hospitalized after their preliminary positive HIV test result in the ED), 1 moved to another country, 1 was incarcerated, 1 refused to enter care, and 5 were homeless and lost to follow-up.

Record review revealed that 60,306 unique patients accounted for the 118,324 visits. Of these patients, 30,875 (51.2%) were offered HIV screening at least once and 17,386 (28.8%) agreed to screening on one or more occasions. Among unique patients, 8,581 (14.2%) received screening or diagnostic testing; 7,896 (92.0%) were tested once and 685 (8.0%) were tested more than once. For patients who were tested more than once, the median number of tests was 2 (range 2 to 8 tests),

with a median of 5 months (range <1 to 20 months) between tests.

## LIMITATIONS

This demonstration project was intended to explore clinical outcomes of an integrated HIV screening program and thus minimized data collection that might interfere with clinical activities. This imposed several limitations. There was no systematic assessment of reasons why triage nurses did not offer HIV screening to some patients, why patients declined screening, or why nurses did not perform tests on all patients who consented. Although nurses offered several anecdotal explanations for failing to offer screening or complete testing, including time constraints, language barriers, concerns about patient confidentiality, and competing clinical duties, we cannot determine the relative importance of these factors. It is also difficult to assess how much systematic bias influenced screening outcomes, but some nurses stated they did not test patients who they perceived were at low risk for infection. As a result, nurses may have actually implemented targeted screening (in which patients at increased HIV risk were more likely to be screened) instead of universal screening. This possibility is supported by the finding that nearly one third of the screened patients found to be HIV positive were admitted to the hospital and many had immunologic AIDS. Such bias may have inflated the observed yield of HIV screening.

We refer to diagnostic tests as those ordered by clinicians according to the patient's presenting signs and symptoms and their suspicion of HIV-related illness. The actual selection criteria implemented by clinicians, however, was likely broader and included some targeted testing (such as testing patients with sexually transmitted infections or those with injection drug use histories who were thought to be at increased risk compared with the base population). Practically speaking, clinician-directed testing was performed as opposed to pure diagnostic testing, which may influence the yield of testing.

The data collected do not allow us to evaluate the effect of the HIV screening program on other ED processes, such as patient flow, patient care, clinical outcomes, and length of stay, or staff productivity and satisfaction, which are important measures of feasibility. We were able to analyze only patient-level (as opposed to visit-level) data retrospectively in this clinical program, and nearly half of presenting patients made more than one visit during the observation period. Thus, we could not accurately determine whether some patients might have accepted testing at one visit and declined it at another. The data also do not provide patient-level clinical information, and we were unable to determine what proportion of patients identified through screening had clinical findings that may have led to their diagnosis through clinician diagnostic testing alone. Further, we had no comparison group to determine the extent to which diagnostic HIV testing may have occurred in the absence of point-of-care rapid testing. Finally, no cost analyses were conducted to assess the cost-effectiveness of the program.

## DISCUSSION

This demonstration project offers an illustration of what might be expected when an HIV testing program that includes screening and diagnostic testing is introduced into routine ED practice, using existing staff to perform point-of-care rapid testing. Approximately 14% of the 60,306 unique patients aged 12 years or older who presented to the ED in a 21-month period received a rapid HIV test. More than 9,400 tests were performed, 101 new HIV diagnoses were made, and the majority of patients found to be HIV positive were successfully linked to care. Although the diagnostic yield of screening was lower than that for diagnostic testing, screening nonetheless identified greater than 50% of those found to be HIV positive. Screened patients found to be HIV positive also tended to be at an earlier stage of disease, which is important both because early treatment is more effective<sup>30,31</sup> and because many persons who learn they are infected with HIV reduce their risk behavior, which may further reduce HIV transmission.<sup>32</sup> Our results demonstrate that universal HIV screening using existing ED staff, however, was not possible. Of the 118,324 age-eligible patient visits, HIV screening was offered 38.2% of the time, accepted 18.3% of the time, and completed 6.7% of the time.

The overall prevalence of HIV among tested patients was 1.1%, with prevalences of 0.7% among screened patients and 3.0% among persons who underwent diagnostic testing. The prevalence among screened patients was above the minimum threshold prevalence of 0.1% recently recommended for continued HIV screening according to the 2006 CDC guidelines.<sup>26</sup> Targeted screening of subpopulations of patients thought to be at higher risk may be a more efficient use of testing resources. We found that targeted screening based on demographic characteristics readily available at the time of triage (race, age, sex) would have identified specific groups, such as men, non-Hispanic blacks, and persons aged between 35 and 54 years, with a higher diagnostic yield. However, our data also show that no major demographic group had less than 0.1% HIV prevalence, thereby justifying continued screening across all groups according to CDC guidelines.<sup>26</sup> If a strategy of screening only patients who were admitted from the ED had been used, 59% of the patients diagnosed with HIV in our program would have been missed.

To our knowledge, this is the first report on a program using existing staff to provide HIV screening and diagnostic testing in an ED. Previous reports have described parallel models of providing HIV screening,<sup>17,21-23,33</sup> in which supplemental counselors offer and complete screening, disclose results, and link newly identified HIV-positive patients to care. Clinicians were directly involved in HIV screening in only 1 previous study, and their role was limited to recommending HIV testing to urgent care patients during a 24-week period.<sup>20</sup> Comparisons between HIV screening programs using supplemental staff and the existing-staff model we used are difficult to make because of differences in patient eligibility, outcome measures, and lack of standardized reporting of the data. However, programs that

have relied on supplemental testing staff report offering HIV screening to less than 10% of the overall ED census,<sup>17,21-23</sup> compared to our model using triage nursing staff that offered screening 38% of the time. We report an acceptance rate of nearly 50% when HIV screening is offered by triage nurses, similar to acceptance rates reported in large-scale screening programs using opt-in methodology and supplemental testing staff.<sup>17,22,23</sup>

This project gives one estimate of the ability of nurses to incorporate testing into their existing clinical care duties. We found that nursing staff completed screening in only 36.6% of the patient visits during which screening was accepted. In comparison, studies using supplemental HIV testers report a near 100% test completion rate.<sup>17,21-23</sup> In these studies, however, the number of tests performed was considerably lower than in our series. Despite the fact that nurses were unable to test all patients who agreed to screening, the total number of patients tested by nursing staff in this project is approximately 2 to 4 times higher than the numbers tested in studies that have used supplemental testing staff during a comparable period.<sup>21-23</sup>

Using existing staff to provide HIV screening and diagnostic testing has advantages and disadvantages. Because existing staff were used, HIV testing services were available 24 hours a day, seven days per week, and supplemental HIV testing staff did not need to be hired. Clinicians integrated diagnostic testing into their practice and ordered tests in a similar manner to other tests. Emergency physicians, accustomed to disclosing sensitive findings to patients, did not need to rely on HIV counselors to disclose preliminary positive HIV test results to the majority of patients. The disadvantages of using existing staff included the inability of existing staff to complete screening in a large proportion of patients and the significant administrative responsibility required to oversee staff. Nursing staff needed frequent reminders to offer screening and conduct testing, new personnel required training, and oversight of the point-of-care quality control procedures was time consuming. In this project, many of the duties to ensure the success of the program were performed by the project lead and program coordinator. Although we used existing ED staff and took advantage of available hospital resources, such as HIV clinic and counseling staff, this model still relied on external funding for rapid test kits, a part-time program coordinator, and partial salary support for the project leader. Without supplemental funding, the program could not have been implemented or sustained, even with significant "in-kind" contributions.

Modifications to the existing model that might increase the proportion of patients who are successfully tested for HIV using existing staff include performing point-of-care testing during or shortly after triage and eliminating the requirement for separate written informed consent. In 2006, near the conclusion of our demonstration project, the CDC published revised recommendations advocating for routine, opt-out HIV screening (notifying patients that HIV testing will be performed unless they decline) for all patients between the ages of 13 and

64 years when the prevalence of infection exceeds 0.1%.<sup>26</sup> These recommendations suggest novel strategies aimed to make testing more practical.<sup>26</sup> Suggested strategies, some of which were used in this project, include removing requirements for pretest counseling and separate written informed consent, integrating consent for HIV screening into the general consent process for medical care, and communicating negative test results in a manner similar to the disclosure of results of other routinely performed tests. Although experience in EDs is limited,<sup>33,34</sup> opt-out screening has been shown in other clinical settings to improve acceptance rates<sup>26,35,36</sup> and may facilitate ED-based screening.<sup>26</sup>

Other models exist for providing ED HIV screening that may prove to be more feasible than the existing-staff model. Some HIV testing experts believe that ED-based screening is most easily achieved by establishing parallel, independent programs that are funded by other departments or agencies and that do not interfere directly with ED practice.<sup>37</sup> Such parallel programs<sup>17,22,23,33</sup> still pose logistic challenges for integration into busy EDs, require some involvement and cooperation from ED staff, and may be more costly because additional staff must be hired. Partnering with public health departments has been shown to be helpful in setting up parallel programs.<sup>17,38</sup> Laboratory-based HIV testing is another approach that may prove feasible. The advantages of a laboratory-based testing approach include the following: a substantial proportion of ED patients have blood drawn as part of their clinical evaluation, the burden on ED staff of conducting point-of-care testing is avoided, and test results can be entered into the laboratory reporting system, making them readily accessible. Disadvantages of using a laboratory-based testing strategy include long turnaround times,<sup>39</sup> additional work required of laboratory personnel to process specimens, and the costs involved.

Regardless of the methodology used, universal HIV screening may not be possible in the ED setting. It is realistic, therefore, to expect that only a small proportion of an available ED population will undergo screening. Furthermore, HIV screening programs require some outside funding, a program leader, and multidisciplinary approval. Although reimbursement for HIV screening is complicated,<sup>40</sup> third-party reimbursement is reasonable because identifying HIV infection early in the course of infection is likely to yield downstream cost savings.<sup>41,42</sup> For long-term sustainability, HIV testing procedures must be written into laboratory, ED, and HIV clinical policy guidelines to ensure that testing and linkage to care are successful. Achieving buy-in from these departments requires an institution-wide commitment to public health and may require monetary support from the medical center administration.

From a broader perspective, controversy exists about whether EDs should carry out public health initiatives such as HIV screening.<sup>37,40,43-45</sup> Opponents express concern that when programs such as HIV screening are implemented, the primary, acute care mission of EDs is compromised. The costs involved and resource shifting required to provide these services may

negatively affect overall clinical care and patient safety.<sup>37,40,43,45</sup> Proponents argue that EDs are the only safety net providers for underserved patients who have no access to primary care and that EDs are uniquely positioned to provide important preventive care services, such as HIV testing, where it is most needed.<sup>44</sup> ED rapid HIV testing is also clinically useful. ED providers can use rapid HIV test results to guide decisions about immediate clinical care,<sup>22</sup> and one study showed that HIV-infected patients who were hospitalized after rapid testing in the ED had a shorter (mean 7 days) length of stay and less morbidity than patients whose HIV infection was diagnosed with conventional tests after hospital admission.<sup>46</sup> Studies evaluating the effect on acute care, public health effect, and cost-effectiveness of providing HIV screening in EDs are needed to convince clinicians and decisionmakers to offer testing in EDs routinely.

In summary, our results demonstrate that using existing staff to provide HIV screening and diagnostic testing identified a substantial number of persons with undiagnosed HIV infection and successfully linked most of them to follow-up care. External funding is required to support testing programs, even in models that rely on existing staff.

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## REFERENCES

- Kelen GD, Fritz S, Qaish B, et al. Unrecognized human immunodeficiency virus infection in emergency department patients. *N Engl J Med*. 1988;318:1645-1650.
- Kelen GD, Hexter DA, Hansen KN, et al. Trends in human immunodeficiency virus (HIV) infection among a patient population of an inner-city emergency department: implications for emergency department-based screening programs for HIV infection. *Clin Infect Dis*. 1995;21:867-875.
- Kelen GD, DiGiovanna T, Bisson L, et al. Human immunodeficiency virus infection in emergency department patients. Epidemiology, clinical presentations, and risk to health care workers: the Johns Hopkins experience. *JAMA*. 1989;262:516-522.
- Alpert PL, Shuter J, DeShaw MG, et al. Factors associated with unrecognized HIV-1 infection in an inner-city emergency department. *Ann Emerg Med*. 1996;28:159-164.
- Grumbach K, Keane D, Bindman A. Primary care and public emergency department overcrowding. *Am J Public Health*. 1993;83:372-378.
- Centers for Disease Control and Prevention. Recommendations for HIV testing services for inpatients and outpatients in acute-care hospital settings. *MMWR Recomm Rep*. 1993;42:1-6.
- Advancing HIV prevention: new strategies for a changing epidemic—United States, 2003. *MMWR Morb Mortal Wkly Rep*. 2003; 52:329-332.
- Duffus WKL, Stephens T, Gibson J, et al. Missed opportunities for earlier diagnosis of HIV infection—South Carolina, 1997-2005. *MMWR Morb Mortal Wkly Rep*. 2006;55:1269-1272.
- Liddicoat RV, Horton NJ, Urban R, et al. Assessing missed opportunities for HIV testing in medical settings. *J Gen Intern Med*. 2004;19:349-356.
- Kuo AM, Haukoos JS, Witt MD, et al. Recognition of undiagnosed HIV infection: an evaluation of missed opportunities in a predominantly urban minority population. *AIDS Patient Care STDS*. 2005;19:239-246.
- Fincher-Mergi M, Cartone KJ, Mischler J, et al. Assessment of emergency department health care professionals' behaviors regarding HIV testing and referral for patients with STDs. *AIDS Patient Care STDS*. 2002;16:549-553.
- Wilson SR, Mitchell C, Bradbury DR, et al. Testing for HIV: current practices in the academic ED. *Am J Emerg Med*. 1999;17:354-356.
- Ehrenkranz PD, Ahn CJ, Metlay JP, et al. Availability of rapid human immunodeficiency virus testing in academic emergency departments. *Acad Emerg Med*. 2008;15:144-150.
- Kroc K. Rapid HIV testing in an emergency department [abstract]. Presented at the National STD Prevention Conference, March 2002, San Diego, CA.
- Goggin MA, Davidson AJ, Cantril SV, et al. The extent of undiagnosed HIV infection among emergency department patients: results of a blinded seroprevalence survey and a pilot HIV testing program. *J Emerg Med*. 2000;19:13-19.
- Kelen GD, Shahan JB, Quinn TC. Emergency department-based HIV screening and counseling: experience with rapid and standard serologic testing. *Ann Emerg Med*. 1999;33:147-155.
- Lyons MS, Lindsell CJ, Ledyard HK, et al. Emergency department HIV testing and counseling: an ongoing experience in a low-prevalence area. *Ann Emerg Med*. 2005;46:22-28.
- Kendrick SR, Kroc KA, Couture E, et al. Comparison of point-of-care rapid HIV testing in three clinical venues. *AIDS*. 2004;18:2208-2210.
- Kelen GD, Hexter DA, Hansen KN, et al. Feasibility of an emergency department-based, risk-targeted voluntary HIV screening program. *Ann Emerg Med*. 1996;27:687-692.
- Routinely recommended HIV testing at an urban urgent-care clinic—Atlanta, Georgia, 2000. *MMWR Morb Mortal Wkly Rep*. 2001;50:538-541.
- Rapid HIV testing in emergency departments—three US sites, January 2005–March 2006. *MMWR Morb Mortal Wkly Rep*. 2007; 56:597-601.
- Lyss SB, Branson BM, Kroc KA, et al. Detecting unsuspected HIV infection with a rapid whole-blood HIV test in an urban emergency department. *J Acquir Immune Defic Syndr*. 2007;44:435-442.
- Silva A, Glick NR, Lyss SB, et al. Implementing an HIV and sexually transmitted disease screening program in an emergency department. *Ann Emerg Med*. 2007;49:564-572.
- Voluntary HIV testing as part of routine medical care—Massachusetts, 2002. *MMWR Morb Mortal Wkly Rep*. 2004;53:523-526.
- Lyss S, Couture E, Kroc K, et al. Influence of point-of-care HIV tests with supplemental testing staff on ordering of HIV tests by providers in a large, urban emergency department [abstract]. Presented at the American College of Emergency Physicians annual meeting, October 2004, San Francisco, CA.
- Branson BM, Handsfield HH, Lampe MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *MMWR Recomm Rep*. 2006;55:1-17; quiz CE11-14.
- Paltiel AD, Weinstein MC, Kimmel AD, et al. Expanded screening for HIV in the United States—an analysis of cost-effectiveness. *N Engl J Med*. 2005;352:586-595.
- Sanders GD, Bayoumi AM, Sundaram V, et al. Cost-effectiveness of screening for HIV in the era of highly active antiretroviral therapy. *N Engl J Med*. 2005;352:570-585.
- OraQuick ADVANCE HIV 1/2 Antibody Test Package Insert. Available at: [http://www.abbottdiagnostics.com/Support/Package\\_Inserts/pdf/oraquick/30011215\\_10\\_07.pdf](http://www.abbottdiagnostics.com/Support/Package_Inserts/pdf/oraquick/30011215_10_07.pdf). Accessed January 1, 2005.
- Palella FJ Jr, Deloria-Knoll M, Chmiel JS, et al. Survival benefit of initiating antiretroviral therapy in HIV-infected persons in different CD4+ cell strata. *Ann Intern Med*. 2003;138:620-626.
- Hill A. Progression to AIDS and death in the era of HAART. *AIDS*. 2006;20:1067-1068.
- Marks G, Crepaz N, Senterfitt JW, et al. Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: implications for HIV prevention programs. *J Acquir Immune Defic Syndr*. 2005;39:446-453.
- Brown J, Shesser R, Simon G, et al. Routine HIV screening in the emergency department using the new US Centers for Disease Control and Prevention guidelines: results from a high-prevalence area. *J Acquir Immune Defic Syndr*. 2007;46:395-401.
- Haukoos JS, Hopkins E, Byyny RL. Patient acceptance of rapid HIV testing practices in an urban emergency department: assessment of the 2006 CDC recommendations for HIV screening in health care settings. *Ann Emerg Med*. 2008;51:303-309.
- Simpson WM, Johnstone FD, Boyd FM, et al. Uptake and acceptability of antenatal HIV testing: randomised controlled trial of different methods of offering the test. *BMJ*. 1998;316:262-267.



36. Stanley B, Fraser J, Cox NH. Uptake of HIV screening in genitourinary medicine after change to "opt-out" consent. *BMJ*. 2003;326:1174.
37. Kelen GD. Public health initiatives in the emergency department: not so good for the public health? *Acad Emerg Med*. 2008;15:194-197.
38. Lyons MS, Lindsell CJ, Ledyard HK, et al. Health department collaboration with emergency departments as a model for public health programs among at-risk populations. *Public Health Rep*. 2005;120:259-265.
39. Bulterys M, Jamieson DJ, O'Sullivan MJ, et al. Rapid HIV-1 testing during labor: a multicenter study. *JAMA*. 2004;292:219-223.
40. Rothman RE, Merchant RC. Update on emerging infections from the Centers for Disease Control and Prevention. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *Ann Emerg Med*. 2007;49:575-579.
41. Fisher M. Late diagnosis of HIV infection: major consequences and missed opportunities. *Curr Opin Infect Dis*. 2008;21:1-3.
42. Krentz HB, Auld MC, Gill MJ. The high cost of medical care for patients who present late (CD4 <200 cells/microL) with HIV infection. *HIV Med*. 2004;5:93-98.
43. Irvin CB, Flagel BT, Fox JM. The emergency department is not the ideal place for routine HIV testing. *Ann Emerg Med*. 2007;49:722.
44. Bernstein SL, Haukoos JS. Public health, prevention, and emergency medicine: a critical juxtaposition. *Acad Emerg Med*. 2008;15:190-193.
45. Borg KT. To test or not to test? HIV, emergency departments, and the new Centers for Disease Control and Prevention guidelines. *Ann Emerg Med*. 2007;49:573-574.
46. Lubelchek R, Kroc K, Hota B, et al. The role of rapid vs conventional human immunodeficiency virus testing for inpatients: effects on quality of care. *Arch Intern Med*. 2005;165:1956-1960.

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