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Routine Voluntary HIV Testing in Durban, South Africa: *The Experience From an Outpatient Department*

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Abstract

Objective—To evaluate the yield of a routine voluntary HIV testing program compared with traditional provider-referred voluntary counseling and testing (VCT) in a hospital-affiliated outpatient department (OPD) in Durban, South Africa.

Design and Methods—In a prospective 14-week "standard of care" period, we compared OPD physician logs documenting patient referrals to the hospital VCT site with HIV test registers to measure patient completion of HIV test referral. The standard of care period was followed by a 12-week intervention during which all patients who registered at the OPD were given an educational intervention and offered a rapid HIV test at no charge as part of routine care.

Results—During the standard of care period, OPD physicians referred 435 patients aged ≥18 years for HIV testing; 137 (31.5%) of the referred patients completed testing at the VCT site within 4 weeks. Among those tested, 102 (74.5%) were HIV infected. During the intervention period, 1414 adults accepted HIV testing and 1498 declined. Of those tested, 463 (32.7%, 95% confidence interval: 30.3 to 35.3) were HIV infected. Routine HIV testing in the OPD identified 39 new HIV cases per week compared with 8 new cases per week with standard of care testing based on physician referral to a VCT site ($P < 0.0001$).

Conclusions—Routine voluntary HIV testing in an OPD in South Africa leads to significantly higher rates of detection of HIV disease. This strategy should be implemented more widely in high HIV prevalence areas where treatment is available.

Keywords

Africa; HIV; HIV testing; screening; urgent care

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In the 2 decades since scientists identified HIV, it has arguably become the greatest threat to life and prosperity in the developing world. Sub-Saharan Africa, home to 25.8 million of the 40 million people infected with HIV worldwide, remains the most harshly affected.[1] South Africa, with a population of 44 million, has an estimated 5.3 million citizens infected, with prevalence levels increasing in all age groups.[1,2]

The severity of the HIV epidemic led the South African government to approve and implement a plan for universal access to antiretroviral (ARV) treatment in 2003.[3,4] This prompted the expansion of traditional HIV voluntary counseling and testing (VCT) centers to identify HIV-infected people and facilitate their entry into care. In a sample of clinics and community health centers in South Africa, more than 50% of primary health care facilities provide VCT.[5] Only 1 in 5 South Africans who are even aware of VCT has been tested for HIV infection, however.[6,7] Proposed reasons for poor rates of VCT participation in South Africa include lack of confidentiality, fear of stigmatization by being singled out, inability to enter treatment if infected, and inconvenience of testing sites.[6,8,9]

Even in the United States, where HIV prevalence is a small fraction of what it is in Africa, the Centers for Disease Control and Prevention now recommend a screening approach: making HIV testing a routine part of medical care for people aged 13 to 64 years.[10–12] The rationale for routine testing rather than risk-based testing based on physician referral to VCT is to decrease barriers to testing, to decrease risk-taking behavior among infected individuals, and to identify HIV-infected individuals earlier in their disease course so as to provide maximal benefits of therapy.[10,13–15] Routine testing in the United States has improved acceptance of HIV testing in prenatal clinics,[16] inpatient wards,[17] emergency departments,[18] and urgent care clinics.[19–22] Routine health provider–initiated testing for all people who interact with the health care system is also supported by the World Health Organization (WHO).[23]

Given the enormous stigma surrounding HIV-infected individuals, it is not clear whether broader testing in resource-limited settings would be accepted more readily than VCT by patients seeking medical care for complaints potentially unrelated to underlying HIV infection.[6] Few studies have explored the impact of routine testing in African health care settings on patient uptake, stage at diagnosis, linkage to care, and programmatic costs.[24] Our objective was to compare the HIV testing process before and after establishing a routine HIV testing program at the McCord Hospital outpatient department (OPD) in Durban, South Africa.

METHODS

Study Setting

McCord Hospital in Durban, South Africa is an urban medical center located in KwaZulu Natal, the South African province with the highest HIV prevalence.[2] The hospital's OPD population is approximately 70% black African Zulu speakers, with a substantial minority of Indian patients (~20%) and a smaller number of white patients (~10%). Approximately 40% of patients are repeat visitors to the OPD and receive their regular outpatient care there; the rest of the patients present episodically or for a single visit. Patients pay a fee for medical care in the OPD; during the study period, this fee was 140 ZAR (~$19.26 in 2005 US dollars). McCord Hospital has an HIV treatment clinic that became a President's Emergency Plan for AIDS Relief (PEPFAR)-funded ARV treatment site in July 2004; ARV availability did not change significantly over the course of the study.

We received project approval from the McCord Hospital Ethics Committee (Durban, South Africa) and the Partners Institutional Review Board (Boston, MA).

HIV Testing During "Standard of Care" Period

From September to December 2004, the "standard of care" period, OPD physicians directed patients to the VCT center at McCord Hospital to be tested if a patient requested the test or, more commonly, if the physician suspected HIV. The VCT site, within the hospital complex but in a physically different location about 300 yards from the OPD, offered counseling and testing after patients reregistered from a new queue and paid a small fee (25 Rand [~$3.60 in 2005 US dollars] if referred from the OPD or 50 Rand [~$7.10 in 2005 US dollars] if self-referred). The VCT site is also where patients undergo counseling regarding CD4 cell count results and psychosocial assessment before referral for ARV treatment. Patients paid 80 Rand (~$11.00 in 2005 US dollars) to obtain a CD4 cell count. Data collected during the preintervention period included (1) the number of adult patients seen daily in the OPD, (2) the identity of patients referred by OPD physicians for an HIV test as indicated by physician logs, (3) the number of adult patients seen at the VCT center and their referral source (ie, self-referred, from the OPD), (4) the number testing HIV-positive, and (5) the identity of patients who tested HIV-positive and returned to the McCord Hospital HIV clinic for a CD4 cell count.

We estimated the cost of the 14-week standard of care period using the cost of (1) the screening rapid HIV test kit, (2) the confirmatory rapid HIV test kit for those with a positive screening test result, (3) the salaries for 5 HIV counselors multiplied by the percentage of time the 5 counselors spent on VCT, and (4) the cost of space in the VCT site for 3 counseling rooms. We used the total cost to calculate the cost per patient tested for HIV and the cost per HIV-infected patient identified by the routine testing program.[17]

Routine Voluntary HIV Testing During Intervention Period

Beginning in January 2005, the intervention in the OPD began offering routine voluntary HIV testing to all adult patients (age ≥18 years); the current analysis includes data from this 12-week intervention period. HIV tests were offered at no extra charge to all patients registered for care in the OPD, regardless of chief complaint or demographics. Patients received a handout at daytime registration in English and Zulu informing them that they would be offered an HIV test during their visit; this handout included the HIV test/study consent form. Three trained HIV counselors led educational activities in the waiting room twice daily to reach most patients. Education sessions included information about HIV transmission, prevention, and testing and were given in English and Zulu.

Counselors approached individual patients seated in the doctor's queue on the "urgent care" side of the OPD because they were capable of consenting to participate in the study and of ambulating into a private counseling room. Consenting patients were taken to 1 of 2 private counseling rooms, where they received brief pretest counseling and underwent a rapid HIV 1/2 test (Determine HIV-1/2 Assay; Abbott Laboratories, Abbott Park, IL). Positive rapid test results were immediately confirmed with a second rapid test kit (Smart Check HIV-1/2 Assay; World Diagnostics, Alexandria, VA) as per McCord Hospital protocol and South African rapid testing guidelines.[25] Counselors advised patients with indeterminate rapid test results to undergo an enzyme-linked immunosorbent assay (ELISA); HIV ELISAs were performed in batches at least weekly by the McCord Hospital laboratory. Patients who tested positive by 2 rapid testing kits were provided with information about HIV infection and the HIV-related services at McCord Hospital, with referral to the HIV clinic at the hospital. If patients were interested, counselors escorted them to the HIV clinic about 400 yards away, where they could have blood drawn for a self-paid CD4 cell count, with results available approximately 1 week later. As in the standard of care phase, the data collected during the intervention phase included (1) the total number of patients seen in the OPD, (2) the number of patients who agreed to receive an HIV test, (3) the number who tested HIV-positive, and (4) the number who tested HIV-positive and who proceeded to the McCord Hospital HIV clinic for a CD4 cell count.

We administered a detailed survey to a convenience sample of approximately every other tested patient. This sampling technique was chosen so that more counselor time could be dedicated to HIV testing rather than to conducting surveys. The surveys, available in English and Zulu, inquired about demographic information such as age, ethnicity, education, employment, and 4 specific HIV knowledge statements. These statements were answered "yes," "no," or "don't know" and included the following: (1) all pregnant women infected with HIV will have babies born with AIDS, (2) a person with HIV can look and feel healthy, (3) there is a vaccine that can stop people from getting HIV, and (4) there are medicines available to help people with HIV/AIDS live longer. Knowledge question scores were dichotomized to low (≤3 questions answered correctly) or perfect (4 questions answered correctly) for the analysis. For patients who declined HIV testing, age and gender were noted whenever possible, and a convenience sample of these patients was also surveyed.

We estimated the cost of the 12-week intervention period using the cost of (1) the screening rapid HIV test kit, (2) the confirmatory rapid HIV test kit for those with a positive screening test result, (3) the salaries for 3 HIV counselors, (4) the salary of a project manager, and (5) the cost of space in the OPD for 2 counseling rooms. We used the total cost to calculate the cost per patient tested for HIV and the cost per HIV-infected patient identified by the routine testing program.[17]

Statistical Analysis

We compared patient demographic data and HIV knowledge questions from the standard of care period and intervention periods using the χ^2 test for categoric data and the Student *t* test for continuous variables. Median CD4 cell counts between the preintervention and intervention groups were compared using the Wilcoxon rank sum test. Associations were examined at a level of significance of $P < 0.05$ with a 2-sided test. All data from the intervention period were doubled-entered into a Microsoft ACCESS database (Redmond, WA). All analyses were performed using SAS software (version 9.1; SAS Institute, Cary, NC).

RESULTS

Standard of Care Period

During the 14-week standard of care period, 162 adults were seen on average per day in the OPD. During this period, OPD physicians referred 435 adults for HIV testing. Of the 435 patients referred for testing, 137 (31.5%) were actually tested at the hospital VCT site within 4 weeks of referral (Table 1). Fifty-four patients (12.4%) of the 435 patients referred for testing declined testing immediately during the physician encounter. Of those tested, 102 (74.5%) were found to be HIV infected. This prevalence is significantly higher than the HIV prevalence of 63.7% (212 of 333 patients) for all other patients at the VCT site during this period ($P = 0.02$). Women comprised ~70% of the OPD population: 50.5% of those referred for testing, 54.0% of those tested, and 52.3% of those found to be infected. Of the 102 patients found to be HIV infected during this period, 58 (56.9%) of 102 underwent CD4 cell count testing at the VCT site; the median CD4 count was 123 cells/mm^3 (interquartile range: 48 to 247 cells/mm^3).

Intervention Period

During the 12-week intervention period, 166 adult patients were seen on average per day in the OPD. During this period, we offered 2912 HIV tests; 1414 patients (48.6%) aged 18 years and older accepted HIV testing. Among those tested, 463 (32.7%) of 1414 were HIV infected. Compared with the standard of care period, there was a significantly increased rate of case identification during the intervention period (~39 vs. ~8 new cases per week; $P < 0.0001$; see Table 1). Of the 463 patients found to be HIV infected during this period, 150 (32.4%) of 463

underwent self-paid CD4 cell count testing at the VCT site and 137 (91.3%) of 150 returned for the results. The median CD4 count was 140 cells/mm^3 (interquartile range: 50 to 302 cells/mm^3; $P = 0.41$ compared with the standard of care period). The average age of those who were HIV infected was 37 years compared with 44 years for patients who tested negative ($P < 0.0001$).

Nine female patients (0.6%) had indeterminate rapid HIV test results in which the first test had a faint positive line and the confirmatory test was negative. Eight of these women agreed to an ELISA and returned for results; 5 (62.5%) of 8 tested positive and 3 (37.5%) of 8 tested negative by ELISA from samples drawn during the initial visit. The ELISA results were the results included in the final analysis.

Detailed Sample Analysis

We sampled 54% (766 of 1414) of patients tested during the intervention period by means of survey. Thirty-two patients reported testing HIV-positive previously. These patients were excluded from the analysis of the survey data. Of the remaining respondents for whom complete data were available, 465 (64.2%) of 724 were female. Among those tested and surveyed, 464 (64.9%) of 715 had never been tested before. We used survey results to estimate the prevalence of HIV in subgroups of patients (Table 2). A greater proportion of surveyed male patients were HIV infected compared with female patients (86 [33.2%] of 259 male patients, 95% confidence interval [CI]: 27.5 to 38.9 vs. 108 [23.3%] of 465 female patients, 95% CI: 19.4 to 27.1; $P = 0.073$). Patients in the 30- to 39-year-old age group had the highest prevalence (76 [40.4%] of 188, 95% CI: 33.4 to 47.4; $P < 0.0001$), whereas those ≥50 years old had the lowest prevalence (28/210 or 13.3%, 95% CI: 8.7 to 17.9; $P < 0.0001$). Single patients had the highest HIV prevalence (124 [42.6%] of 291, 95% CI: 36.9 to 48.3; $P < 0.0001$); those married without children had the lowest prevalence (1 [7.1%] of 14, 95% CI: 0.0 to 20.6; $P < 0.0001$). Those who scored 4 of 4 on the test of HIV knowledge had a lower HIV prevalence compared with those who scored less than perfect; this nearly reached statistical significance (17 [18.5%] of 92 patients, 95% CI: 10.6 to 27.4 vs. 177 [28.0%] of 633 patients, 95% CI: 24.5 to 31.5; $P = 0.055$). There was no difference in HIV prevalence based on employment status, previous HIV testing, or knowing someone with HIV or on HIV treatment (see Table 2).

The average age of the patients who declined HIV testing was 46.3 years compared with 41.5 years for those who accepted ($P < 0.0001$). Eleven percent (163 of 1498) of patients who declined testing were surveyed. The most common basis (66%) for declining was that patients did not view themselves at risk for HIV, citing the following specific reasons: “not at risk,” “tested before,” and “I am too old.”

Costs

The direct cost of the 3.5-month standard of care period, during which 470 patients were tested, was 27,800 ZAR ($3825 converted to 2005 US dollars). The cost per person tested in HIV clinic during this period was $8.13. The cost per HIV-infected patient identified was $12.18.

The direct cost of the routine HIV testing program for a 3-month period, which tested 1414 patients, was 79,500 ZAR ($10,941 converted to 2005 US dollars). The cost per person tested in the OPD during the program was $7.74. The cost per HIV-infected patient identified was $23.33.

DISCUSSION

Routine HIV testing at the point of care in an OPD in Durban, South Africa identified nearly 5 times as many new cases per week as HIV testing by physician referral to an adjacent hospital-

affiliated VCT site (39 vs. 8 new cases per week). During the standard of care period, only 31.5% of referred patients were actually tested at the VCT site in the subsequent 4 weeks. During the intervention period, almost half of patients offered HIV testing in the OPD accepted testing through the routine testing program and more than 32% of those tested during the routine testing program were found to be HIV infected. The median CD4 cell counts for those tested based on physician referral and those tested by routine testing were not significantly different, suggesting that routine testing in this setting did not find patients at an earlier stage of illness.

The South African government has made major strides in expanding access to VCT sites as part of its national HIV operational plan.[4,26] This study suggests that VCT sites fail to capture a large number of HIV-infected patients who are making contact with the health system and are not being referred for testing by physicians or are not following through with the referral.

Early diagnosis and entry into care in developed countries are associated with improved prognosis and survival[27,28] and may prove essential to stabilizing South Africa's HIV epidemic and its impact on the socioeconomic situation. In addition, awareness of HIV status has been shown in Zambia, Kenya, Tanzania, and Trinidad to reduce high -risk sexual behaviors in serodiscordant couples,[29,30] and may thereby lead to improved epidemic control.

Provision of VCT centers, where patients can seek out an HIV test, is helpful for those who are self-motivated to get tested for HIV infection. VCT sites in South Africa are often physically separate from hospitals or clinics or housed in areas remote from patient care. Pilot programs integrating VCT into rural primary health facilities in Kenya and South Africa have been proposed and implemented as a means of improving access to testing, but these programs remain underused, despite the increasing availability of ARV medication.[9,31]

Routine HIV testing to increase knowledge of serostatus has been advocated by policy makers in Africa, particularly now that ARV therapy has become more widely available.[32–34] The notion of offering HIV testing as part of routine medical care has been extended further by Botswana, where the government promotes "opt out" HIV testing. In this approach, all patients are tested at point of contact with the medical community unless they specifically decline, without the extensive counseling typical of VCT.[35,36] This policy has been successfully implemented in 4 prenatal centers in Botswana, with improvement of testing uptake rates from 76% to 92%.[24] Lesotho, with the third highest HIV infection rate in the world, has announced plans to offer testing to all 1.9 million citizens in an effort to curb stigma.[37] The current study supports the position that HIV testing offered routinely to all adults in the health care setting rather than testing based exclusively on physician assessment or pregnancy status significantly improves case finding. This acceptance may reflect a normalization of testing, because all patients are offered the test regardless of age, ethnicity, or chief complaint as part of the package of care in the OPD. Although more patients tested by means of routine HIV testing are found to be HIV-negative compared with physician-based VCT referral because of a lower pretest probability of disease, the high HIV prevalence justifies expanded testing; indeed, the counseling session offers an opportunity to educate patients and to reinforce prevention messages.[7]

The cost per patient tested was the same during the standard of care and the routine testing periods; although the cost per HIV case identified was twice as high during the routine testing study, it was still less than $25 per HIV case identified. In the United States, where HIV is an order of magnitude less prevalent than in South Africa, the cost of HIV testing is significantly lower than the cost of care and treatment of patients once they are identified.[20,38] As ARV treatment with CD4 cell count and viral load monitoring becomes available in South Africa, the cost of HIV care is likely to be driven by treatment costs rather than by the relatively low cost of offering routine testing in this setting as well. Cost-effectiveness analyses have

demonstrated that ARV therapy is cost-effective in resource-limited countries;[39] although further studies are needed, the current study suggests that routine testing is also likely to prove cost-effective.

This study has several limitations. The patients routinely tested in the OPD were typically healthier and ambulatory patients on the urgent side of the department (as opposed to the "emergent" side), who could independently enter a private counseling room. As a result, we did not reach sicker patients, possibly underestimating the overall prevalence of disease and failing to diagnose those who could benefit most immediately from ARV treatment. Older chronically ill patients who were repeat visitors make up a significant minority of patients in the OPD, which may limit the number of new HIV cases that can be identified at McCord Hospital in the long term. Expanding the routine testing effort to the inpatient setting, where more acutely ill patients are located, might help to overcome some of these limitations.

In addition, McCord Hospital is a semiprivate hospital; results from this study may not be generalizable to the public sector, where many HIV-infected patients seek care free of charge and HIV prevalence is likely to be higher. Patients referred from the OPD for HIV testing during the standard of care period were charged 25 Rand (~$3.60 in 2005 US dollars) for an HIV test; during the routine testing intervention, patients were not charged for HIV testing. We do not know the degree to which the removal of the charge influenced patients' decision to test; however, the charge for the visit to the OPD was 140 Rand (~$19.26 in 2005 US dollars); thus, the HIV test was only a small additional cost. In a large South African household survey, the most frequently cited reasons for not having tested for HIV related to confidentiality and not being at risk.[7] The routine testing intervention required a team of dedicated HIV counseling staff to accommodate the high volume of patients seen in the OPD; this level of staff investment may not be feasible in all health care settings. In light of current WHO and PEPFAR initiatives to improve identification of HIV-infected individuals in areas where appropriate linkage to care is available, however, a commitment to testing is warranted.[23,40]

Routine HIV testing can more than quadruple HIV case identification in outpatient settings. Integrating HIV testing into routine health care in South Africa has the potential to improve HIV case finding by minimizing logistic barriers to testing and normalizing the diagnosis and treatment of HIV infection. Early diagnosis of HIV-infected individuals and linkage to care are critical to improving individual health and to secondary prevention efforts aimed at slowing the HIV epidemic. New approaches to facilitate HIV testing in South Africa and other countries with high prevalence, where access to HIV care is increasing, are of paramount importance for improving individual patient outcomes and public health.

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TABLE 1

Summary of Standard of Care and Intervention Periods in a Routine HIV Testing Cohort in an OPD in Durban, South Africa

	Standard of Care (14 Weeks)	Intervention (12 Weeks)
No. patients tested/no. offered	137/435 (31.5%)	1414/2912 (48.6%)
No. HIV-infected patients (%)	102/137 (74.5%)*	463/1414 (32.8%)*
Average no. cases of HIV infection identified per week	8	39

* $P < 0.0001$.

TABLE 2

HIV Prevalence by Selected Characteristics of Participants in Routine HIV Testing Intervention (N = 725 Surveyed Patients With Complete Information*)

Variable Name	HIV+/Total (% Prevalence)	95% CI	P
Overall surveyed patients	194/725 (26.8)	23.5 to 30.0	
Gender			0.0073
Male	86/259 (33.2)	27.5 to 38.9	
Female	108/465 (23.2)	19.4 to 27.1	
Age (y)			<0.0001
18 to 29	46/147 (31.3)	23.8 to 39.9	
30 to 39	76/188 (40.4)	33.4 to 47.4	
40 to 49	44/180 (24.4)	18.2 to 30.7	
≥50	28/210 (13.3)	8.7 to 17.9	
Marital status			<0.0001
Single	124/291 (42.6)	36.9 to 48.3	
Living with partner	7/21 (33.3)	13.2 to 53.5	
Other	6/47 (12.8)	3.2 to 22.3	
Married with children	54/341 (15.8)	12.0 to 19.7	
Married without children	1/14 (7.1)	0.0 to 20.6	
Education			0.091
<High school	164/581 (28.2)	24.6 to 31.9	
≥College course	27/129 (20.9)	13.9 to 28.0	
Employment status			0.055
Employed	129/441 (29.3)	25.01 to 33.5	
Unemployed	62/273 (22.7)	17.7 to 27.7	
Previous HIV testing			0.028
Never tested	137/464 (29.5)	25.4 to 33.7	
Previously tested for HIV	20/113 (17.7)	10.7 to 24.7	
Tested in the previous year	32/134 (23.9)	16.7 to 31.1	
Know someone with HIV			0.561
Yes	83/298 (27.9)	22.8 to 32.9	
No/don't know	108/417 (25.9)	21.7 to 30.1	
Know someone on HIV treatment			0.186
Yes	48/157 (30.6)	23.4 to 37.8	
No/don't know	137/542 (25.3)	21.6 to 28.9	
Knowledge score			0.055
Perfect†	17/92 (18.5)	10.6 to 26.4	
Low	177/633 (28.0)	24.5 to 31.5	

*Denominators vary slightly because of missing data.

†Four of 4 on knowledge questions (see section on methods for details).