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THE COST OF IMPLEMENTING RAPID HIV TESTING IN SEXUALLY TRANSMITTED DISEASES CLINICS IN THE UNITED STATES

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Abstract

Introduction—Rapid HIV testing in high-risk populations can increase the number of persons who learn their HIV status and avoid spending clinic resources to locate persons identified as HIV-infected.

Methods—We determined the cost to sexually transmitted disease clinics of point-of-care rapid HIV testing using data from 7 public clinics that participated in a randomized trial of rapid testing with and without brief patient-centered risk-reduction counseling in 2010. Costs included counselor and trainer time, supplies, and clinic overhead. We applied national labor rates and test costs. We calculated median clinic start-up costs and mean cost per patient tested, and projected

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Conflict of Interest

None of the authors of the above manuscript has declared any conflict of interest within the last three years which may arise from being named as an author on this manuscript.

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Authors' contributions

AAE and BRS conceptualized the study. AAE, DJF, PCC and LG contributed to data collection. AAE and JAL contributed to the analysis and interpretation of the data. AAE and BRS drafted the initial manuscript and DJF, JAL, MRG, TM, GNC, LRM contributed to critical revision of the manuscript for important intellectual content. All authors contributed to and approved the final manuscript.

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incremental annual costs of implementing universal rapid HIV testing compared to current testing practices.

Results—Criteria for offering rapid HIV testing and methods for delivering non-rapid test results varied among clinics prior to the trial. Rapid HIV testing cost an average of \$22/patient without brief risk-reduction counseling and \$46/patient with counseling in these 7 clinics. Median start-up costs per clinic were \$1,100 and \$16,100 without and with counseling, respectively. Estimated incremental annual costs per clinic of implementing universal rapid HIV testing varied by whether or not brief counseling is conducted and by current clinic testing practices, ranging from a savings of \$19,500 to a cost of \$40,700 without counseling and a cost of \$98,000 to \$153,900 with counseling.

Conclusions—Universal rapid HIV testing in sexually transmitted disease clinics with same day results can be implemented at relatively low cost to STD clinics, if brief risk-reduction counseling is not offered.

Keywords

rapid HIV testing; brief patient-centered risk-reduction counseling; sexually transmitted diseases clinics; cost

Introduction

The Centers for Disease Control and Prevention (CDC) recommends one-time HIV screening of all adolescents and adults under age 65 in health care settings (including sexually transmitted diseases (STD) clinics) and repeated screening for those at risk for HIV to identify and counsel persons with unrecognized HIV infection and link them to clinical and preventive services.^{1–3} This recommendation is further supported by recent revisions to US Preventive Services Task Force guidelines.⁴ In making this recommendation, CDC recognizes that the benefits of offering rapid HIV tests can include substantially decreasing the number of persons who fail to learn their test results and reducing the resources expended to locate persons identified as HIV infected.^{1–3} Normalizing a universal offer of routine rapid HIV testing has been shown to be feasible in at least one busy, urban STD clinic.⁵

The additional cost of purchasing rapid HIV tests is one barrier to implementing universal rapid HIV testing.^{6,7} In a recent survey of 58 state and city health departments receiving direct CDC funding support, more than half indicated a need for assistance in evaluating the cost-effectiveness of implementing rapid HIV testing.⁶

The Project AWARE clinical trial evaluated implementing point-of-care rapid HIV testing with and without brief risk-reduction counseling prior to receiving test results in 9 STD clinics, 7 located at public health departments and 2 located at community-based organizations (CBOs) in the US.⁸ Prior to the trial, use of rapid tests varied among the STD clinics and none used rapid tests with all patients. We used data collected in this trial to determine the cost to STD clinics of implementing rapid HIV testing with and without brief risk-reduction counseling prior to receiving test results.

Methods

Overview

Cost data were collected between June 2010 and September 2010 from 7 STD clinics located at public health departments participating in the Project AWARE study,⁸ costs for the 2 STD clinics located at CBOs were not included due to differences in setting. Adults seeking medical or health services at the STD clinic who reported being HIV-uninfected or not knowing their HIV infection status, were 18 years or older and could communicate in English were recruited at the time of their STD clinic appointment. One third of enrolled participants reported having been tested for HIV in the previous 6 months and approximately half reported having been tested in the previous year. Participants received a rapid HIV test from a counselor and were randomized to receive either: 1) information that describes the test being used and the testing procedure, but no counseling about risk-reduction behaviors or 2) brief, participant-tailored, risk-reduction counseling prior to receiving their HIV test result from counselors trained to deliver the risk-reduction counseling. The public health department STD clinics were located in California, Florida, Oregon, Pennsylvania, South Carolina and Washington. Patient volume varied by clinic with 2 clinics having fewer than 5,000 patient visits per year, 3 clinics having between 5,000 and 10,000 patient visits per year and 2 clinics having more than 10,000 patient visits per year.

Prior to the study, 1 clinic reported offering no rapid HIV testing, 1 clinic reported rarely offering rapid HIV testing based on clinician discretion only, and 5 clinics reported offering targeted rapid HIV testing based on a variety of criteria. Most clinics performed an enzyme immunoassay (EIA) test instead of, or sometimes in addition to, a rapid HIV test; 3 clinics did not universally test all STD clinic patients for HIV. Four clinics required patients to return to the clinic to receive their HIV test results, 2 clinics provided patients with a call-in service, and 1 clinic allowed patients to log-in online to check HIV test results. Four clinics reported also using pooled RNA testing for a subset of the clinic population; however, we did not consider the costs and benefits of detecting additional cases by pooled RNA testing in this analysis due to data limitations.

We applied micro-costing methods⁹ similar to those used in our previous economic analysis of HIV testing in substance abuse treatment programs¹⁰ to determine the cost of either rapid HIV testing program in each clinic. Costs were designated as start-up, variable, or time-dependent. Start-up costs included costs for equipment and for training activities including labor for relevant portions of centralized training conducted prior to initiating the clinical trial. Variable costs were labor and materials costs for conducting each Ora-Quick Advance Rapid HIV-1/2 Antibody fingerstick rapid HIV test and time-dependent costs were labor and materials costs for inventory management, quality control, and ongoing training. Costs of conducting research activities or training to conduct these activities were excluded.¹¹ All costs are reported in 2010 US dollars¹² from the STD clinic perspective and analyses were performed in Microsoft Excel 2010 (Microsoft, Redmond, WA).

Cost Calculations and Analysis

Start-up costs varied between the information only and brief risk-reduction counseling strategies. Information only start-up costs included trainer time¹³ to create a rapid testing manual; counselor time¹³ for on-line training, state-required training on HIV test administration, and HIV counselor certification (which varied by state); counselor and trainer time on start-up calls relevant to HIV rapid testing; a training conducted via conference call on how to link newly identified HIV-infected individuals to care based on the Antiretroviral Treatment Access Study¹⁴ intervention; and equipment purchases. Start-up costs for brief risk-reduction counseling included these costs as well as the following: counselor and trainer time and meeting expenses for in-person centralized training; in-person booster training sessions at 2 clinics; additional time on start-up conference calls related to brief risk-reduction counseling training; and clinic staff time to practice counseling sessions. Variable, time-dependent and overhead time inputs can be found in Table 1 and costing methods are described in greater detail in the Technical Appendix (online only, Supplemental Digital Content, available at: URL).

We calculated the costs of the two different rapid HIV testing strategies as implemented in the clinical trial. Start-up training costs were reported as median (range) start-up costs per clinic due to differences among clinics in start-up activities. Start-up costs included the following cost components: training materials; in-person training including any state-required HIV screening training, a one-time national training, booster risk-reduction counseling trainings for three clinics; distance training including weekly conference calls, three on-line training sessions for risk-reduction counseling training, one conference call and two on-line training sessions for conducting HIV screening; and equipment for storing rapid HIV tests and conducting risk-reduction counseling sessions. Variable and time-dependent costs were reported as mean costs per patient tested with pooled standard deviations because clinics followed standardized testing procedures specified in the study protocol.¹⁵ To calculate mean time-dependent costs per patient, we divided the weekly time-dependent cost to the clinic by the average weekly number of patient visits for each of the 7 clinics. We then calculated the weighted average of these results based on the clinics' proportions of total trial enrollment. In these calculations, 100% of patients tested received their results at the same visit, as occurred in the clinical trial, and 0.94% of rapid tests would have reactive results based on the newly detected HIV prevalence in the trial at these 7 clinics. In sensitivity analyses we varied labor rates and reduced the cost of the rapid test from \$12.00 to \$9.50, and also considered a lower cost of \$4.75 reflecting potential savings from substituting for a rapid laboratory test.¹⁶

To project annual incremental costs to implement universal rapid HIV testing compared to the cost of current HIV testing practices, we applied the clinic labor and overhead rates from the trial to previously reported time estimates for non-rapid EIA HIV testing (including administrative time): 24 minutes for pre-test counseling (offered at 3 clinics only prior to the trial; \$12.06); 48 minutes for follow-up appointments for those with a positive EIA test (\$18.60); and 26 minutes for those with a negative EIA test (\$10.07).¹⁷ We then estimated the additional cost that would be required to implement either rapid testing strategy for an average clinic conducting 8,000 HIV tests annually assuming universal rapid testing of all

clinic patients. To simplify this analysis, we considered only time-dependent and variable costs of testing excluding overhead costs, and did not include start-up costs. For patients tested with non-rapid tests, we assumed return rates to receive results in-person would be 45% among HIV-positive patients,^{18,19} 31% among HIV-negative patients,²⁰ and for those offered a telephone service 94% among HIV-positive and 95% among HIV-negative patients.²¹ In sensitivity analyses we varied the proportion of patients currently receiving EIA tests versus rapid tests, whether patients were receiving EIA follow-up results in person or by telephone (15 minutes for a positive EIA test result and 2 minutes for a negative EIA test result),²¹ whether clinics were conducting brief risk-reduction counseling with all of their patients or none of their patients, and whether overhead costs were included.

Results

Start-up Costs and Cost per Person Tested

The median start-up cost per STD clinic was \$1,100 for rapid HIV testing with information only and \$16,100 for rapid HIV testing with brief risk-reduction counseling (Table 2). In the base case, the mean (standard deviation) cost per patient tested was \$22.04 (\$2.84) for information only (Table 3), consisting of \$13.11 for a rapid HIV test and testing supplies and \$7.72 for labor and overhead to provide test information and conduct the test. The remaining \$1.22 consisted of time-dependent costs for checking test temperatures and restocking inventory, running HIV test external control kits, and on-going local training. The mean (standard deviation) cost per patient tested was \$46.39 (\$4.32) for rapid HIV testing with brief risk-reduction counseling, consisting of \$14.74 for a rapid HIV test and testing supplies, \$29.62 for labor and overhead to conduct counseling and testing, and \$2.04 for time-dependent costs. Labor costs were approximately four times higher for brief risk-reduction counseling versus information only, reflecting the greater amount of time required both before and after conducting the rapid test for individuals with HIV-negative results. Time-dependent costs were more than one and a half times as high for brief risk-reduction counseling versus information only due to weekly costs for brief risk-reduction counseling fidelity assessment, counselor training calls, and ongoing practice sessions.

When we lowered the HIV rapid test cost to \$9.50, the lowest price reported by any clinic, the cost per patient tested with information only was \$19.53, and when we substituted the cost per test for \$4.75, the cost estimate for a new point-of-care 4th generation test,¹⁶ the cost per person tested was \$14.74. When we varied labor costs to reflect the local wage rate at each clinic the mean cost per person tested was similar to the cost using a national wage rate (\$20.46 versus \$22.05 with information only). When we increased labor costs to reflect 20% “downtime” the mean cost per tested was \$23.00.

Annual Clinic Cost

The estimated annual cost of universal rapid HIV testing for an average STD clinic excluding overhead costs is \$47,300 for rapid HIV testing with the information only strategy and \$160,800 for rapid HIV testing with the brief risk-reduction counseling strategy. For a clinic that does not currently conduct any rapid testing, that conducts pre-test counseling for all patients and delivers all non-rapid test results at an in-person follow-up visit, there is an

estimated incremental annual savings of \$19,500 by moving to universal rapid testing with information only and an estimated incremental annual cost of \$93,700 associated with moving to universal rapid testing with brief risk-reduction counseling. The savings are associated with less time for pre-test counseling and the incremental cost is associated with more individuals receiving post-test counseling. If the clinic is delivering all non-rapid test results by telephone, the savings from moving to universal rapid testing with information only is \$15,300 and the cost of moving to universal rapid testing with risk reduction counseling at the time of testing is \$97,900. For clinics currently not conducting any rapid HIV testing and not conducting pre-test counseling for any patients, incremental costs ranged from \$36,500 to \$149,700 with results currently delivered in person and \$40,700 to \$153,900 with results currently delivered by telephone (Figure 1). Incremental savings and costs would be lower if clinics are already conducting some rapid HIV testing; for example, where 20% of patients are already receiving a rapid test, pre-test counseling is conducted for all patients, and non-rapid test results are delivered in person, incremental annual savings are \$18,200 for universal rapid testing with information only (versus \$19,500 if no rapid testing is currently conducted) and incremental annual costs are \$82,200 for universal rapid testing with brief risk-reduction counseling (versus \$93,700 if no rapid testing is currently conducted).

When we took into account overhead costs, incremental costs for rapid testing with information only were lower, especially if clinics were currently delivering non-rapid test results in-person, due to savings in overhead associated with scheduling follow-up visits and registering patients at these visits. Conversely, incremental costs for rapid testing with brief risk-reduction counseling were higher because of the additional overhead costs associated with conducting brief risk-reduction counseling.

Discussion

We used data collected in a randomized trial of rapid HIV testing to determine the cost to STD clinics of implementing universal, point-of-care rapid HIV testing with and without brief risk-reduction counseling. We estimated the cost of rapid testing was \$22 per patient tested without brief risk-reduction counseling and \$46 with brief risk-reduction counseling including overhead costs. For a clinic performing 8,000 EIA tests per year, choosing to implement rapid testing with information only rather than rapid testing with risk-reduction counseling would save approximately \$113,500 before considering overhead savings. Changing from current practice to universal rapid testing without brief risk-reduction counseling would result in cost savings under some scenarios. In other scenarios the incremental annual cost could be approximately \$40,000, although this additional cost is associated with a benefit because patients who would have failed to obtain their HIV results at follow-up would now receive their HIV test results on-site. A median of 12 days has been reported for the time to locate an individual found to be HIV infected after testing in an STD clinic and who fails to return.¹⁹ Additionally, STD clinics may need to monitor information only sessions to ensure staff members stay on topic and within time limits in order to maintain cost savings.

Adding brief risk-reduction counseling more than doubled the cost per patient tested with a rapid HIV test, although this higher cost is still comparable to some other STD tests,²² and start-up costs were also substantially higher. Current CDC guidelines suggest that counseling not be required as part of HIV testing in health care settings; although the guidelines encourage prevention counseling for persons at high risk of HIV infection in settings where risk behaviors are routinely assessed (such as STD clinics).² A 2008 systematic review conducted for the US Preventive Services Task Force²³ cited only one study (Project Respect²⁴) of moderate intensity counseling with HIV testing to show an effect on subsequent sexually-transmitted disease acquisition; however, Project RESPECT was conducted almost 20 years ago, before the advent of rapid HIV testing and highly effective antiretroviral therapy. In this randomized trial conducted in STD clinics, brief risk-reduction counseling was not associated with changes in sexual risk behavior or incidence of sexually-transmitted diseases after 6 months.⁸ Similar results for sexual risk behavior were observed in a randomized trial of HIV testing with and without risk-reduction counseling conducted in substance abuse treatment programs.²⁵ Three of the 7 STD clinics participating in the Project AWARE study were providing pre-test, risk-reduction counseling either formally (by an counselor in an office) or informally (by the nurse who was collecting samples in the examination room) prior to the study. Public STD clinics may be able to shift resources from conducting pre-test, risk-reduction counseling to providing more rapid HIV screening of patients in their clinic population.

Importantly, this analysis was conducted from the clinic perspective and focused on financial costs to the clinic only. Rapid HIV testing has important benefits to patients including savings in transportation cost and lost work hours associated with not having to return for a follow-up appointment if required to do so by the clinic. There are also non-financial benefits to patients such as reduced stress due to the much shorter waiting period for results. Potential disadvantages include the risk of a false positive rapid test results, which is very low for fingerstick rapid tests, and the need for a separate blood draw for confirmatory testing after a reactive result. Appropriate confirmatory testing and post-test counseling remains critical for patients with a preliminary positive result to address immediate psychological needs and ensure follow through with medical care and support, and the cost of providing this confirmatory testing and counseling was included in our cost estimates. Subsequently linking preliminary HIV-positive patients to care is essential, but linkage activities are similar whether a patient is identified through a rapid test or EIA and therefore linkage costs are not included in the analysis.

This study is subject to several limitations. All time estimates were collected directly from clinic staff or from study records and may be specific to these 7 public STD clinics; however, the clinics were located across the US and most reported similar time estimates. Some costs may have been underestimated and others may have been overestimated by using trial data. For example, we assumed that all rapid HIV test results were received and that no patients left the clinic without receiving their results, as occurred in the trial, which could result in an underestimate of follow-up costs. Start-up costs may also be higher in non-trial settings because of additional personnel time required to establish and implement changes in clinic procedures. On the other hand, the level of training, monitoring and supervision that occurred during the trial may have exceeded usual practice at STD clinics,

resulting in higher cost estimates. This would particularly affect start-up costs and the costs of brief risk-reduction counseling. Also, if staff providing rapid tests do unrelated activities when not providing those tests, such as during rapid test processing if patients are not receiving brief risk-reduction counseling, the labor cost for these unrelated activities was excluded. This level of efficiency may not be achievable in all settings but was explored in sensitivity analyses. We also assumed that all patients would receive their rapid test results during their clinic visit, which may not always be feasible and per clinic costs assume no differences in acceptance of rapid and non-rapid testing. Finally, our analysis did not address the fact that current point-of-care rapid tests are less sensitive than laboratory tests.²⁶ Using new, more sensitive rapid tests, or rapid laboratory tests, instead of EIA tests could diminish the risk of missed acute HIV diagnoses for a clinic not doing pooled RNA testing,^{27,28} and we considered the costs of tests in sensitivity analyses. The costs of missed diagnoses are not included in our analysis, but should be considered in making the decision about which HIV test a clinic elects to employ.

In summary, we found that the estimated incremental annual cost of implementing universal rapid HIV testing without brief risk-reduction counseling in STD clinics ranges from cost saving to a cost of approximately \$40,000, and is over \$100,000 higher if brief risk-reduction counseling is provided. STD clinics may be able to reallocate savings from less case finding for newly identified HIV-positive individuals lost to follow-up to offset some of these incremental costs. The benefits to patients may be substantial including more rapid identification and linkage to care of HIV-infected individuals, avoiding return visits to receive results, and less emotional stress waiting for results.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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List of abbreviations

CBOs	community-based organizations
CDC	Centers for Disease Control and Prevention
EIA	enzyme immunoassay
HIV	human immunodeficiency virus

RNA	ribonucleic acid
STD	sexually transmitted diseases

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Figure 1.
Annual incremental cost to STD clinics of conducting rapid HIV testing instead of EIA testing (2010 US dollars)
EIA = enzyme immunoassay

Table 1

Labor time and materials costs (2010 US dollars)

Input	Base case	Source
Counselor time (min)		Project AWARE
HIV test set-up	2	
Pre-test session		
Information only	2	
Counseling	27	
Rapid HIV test administration	3	
Post-test nonreactive results session		
Information only	1	
Counseling	6	
Labor (\$/hour)		
Administrative assistant	16.07	13
Disease intervention specialist	23.85	13
Counselor *	16.33	13
Registered nurse	34.56	13
Trainer	24.73	13
Testing supplies (\$/unit)		
Rapid HIV test	12.00	6
Western Blot confirmatory test kit **	37.98	7,12
Rapid HIV test external control kit	15.25	10
Other testing supplies (gloves, gauze, alcohol pad, bandage)	0.49	Project AWARE
Counseling tools (\$/unit)		
Male condom	0.06	Project AWARE
Female condom	0.82	Project AWARE
Lubricant packets	0.17	Project AWARE
Male condom demonstrator	19.74	Project AWARE

* The range of local labor rates reported by the clinics was \$15.93–\$21.63.

** The labor cost of performing the blood draw and Western Blot confirmatory test and delivering confirmatory results was \$18.60 and is included in the cost of confirmatory testing.^{7,12}

Table 2

Median (Range) start-up cost per clinic (2010 US dollars)

Cost component	Information only	Brief risk-reduction counseling
Training materials and study staff training		
Trainer time	50 (40–60)	300 (290–410)
DVD	N/A	0 (0–30)
In-person training		
Trainer time and travel	N/A	4,400 (4,400–6,700)
Counselor time and travel	600 (0–1,200)	4,300 (3,400–5,100)
Distance training		
Trainer time	30 (30–30)	170 (150–200)
Counselor time	400 (300–700)	1,500 (800–1,700)
Counselor practice and fidelity review sessions		
Trainer time	N/A	600 (400–900)
Counselor time	N/A	4,000 (3,000–14,500)
Equipment	0 (0–100)	300 (60–500)
Total*	1,100 (460–2,100)	16,100 (14,800–24,800)

* Median (range) per counselor trainee cost was approximately \$360 (\$150–\$690) for information only and \$4,950 (\$3,970–\$7,900) for brief risk-reduction counseling.

N/A = not applicable

Table 3
Per-patient cost of rapid HIV testing with information only or brief risk-reduction counseling (2010 US dollars)

Cost Component	Information only		Brief risk-reduction counseling	
	Mean	Pooled SD	Mean	Pooled SD
Variable Costs				
Labor				
Set-up	0.43	0.31	0.51	0.46
Pre-results counseling	0.89	0.17	10.82	1.26
Rapid HIV test	2.12	1.37	2.14	1.41
Nonreactive-results counseling	0.67	0.19	2.56	0.97
Overhead	3.61	1.08	13.60	1.94
Total labor and overhead cost	7.72	2.64	29.62	4.73
Materials				
Rapid HIV test and supplies	12.49	0.00	12.49	0.00
Testing and counseling supplies	0.14	0.10	1.81	1.45
Reactive-results counseling and confirmatory test	0.47	0.03	0.43	0.06
Total materials cost	13.11	0.21	14.74	1.41
Total variable cost	20.82	2.62	44.35	6.17
Time-dependent Costs				
Inventory management	0.90	0.40	0.90	0.40
Running HIV test control kits *	0.22	0.05	0.22	0.05
Counseling fidelity assessment	N/A	N/A	0.15	0.01
On-going local training time	N/A	N/A	0.13	0.02
Counselor training calls	N/A	N/A	0.32	0.07
Overhead	0.09	0.08	0.31	0.38
Total time-dependent cost	1.22	0.82	2.04	1.36
Total variable and time-dependent cost	22.04	2.84	46.39	4.32

* Based on previously reported costs, some clinics may have purchased tests and control kits at lower cost; assumes same frequency of running test control kits as occurred during the trial.

N/A = not applicable