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A BUDGET IMPACT ANALYSIS OF RAPID HUMAN IMMUNODEFICIENCY VIRUS SCREENING IN VETERANS ADMINISTRATION EMERGENCY DEPARTMENTS

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□ **Abstract—Background: Human immunodeficiency virus (HIV) screening is cost-effective and recommended in populations with low disease prevalence. However, because screening is not cost-saving, its financial feasibility must be understood. Study Objectives: We forecast the costs of two Emergency Department-based HIV testing programs in the Veterans Administration: 1) implementing a non-targeted screening program and providing treatment for all patients thusly identified (Rapid Testing); and 2) treating patients identified due to late-stage symptoms (Usual Care); to determine which program was the most financially feasible. Methods: Using a dynamic decision-analysis model, we estimated the financial impact of each program over a 7-year period. Costs were driven by patient disease-severity at diagnosis, measured by CD4+ category, and the proportion of patients in each disease-severity category. Cost per CD4+ category was modeled from chart review and database analysis of treatment-naïve HIV-positive patients. Distributions of CD4+ counts differed in patients across the Rapid Testing and Usual Care arms. Results: A non-targeted Rapid Testing program was not significantly more costly than Usual Care. Although Rapid Testing had substantial screening costs, they were offset by lower inpatient expenses associated with earlier identification of disease. Assuming an HIV prevalence of 1% and 80% test acceptance, the cost of Rapid Testing was $1,418,088, vs. $1,320,338 for Usual Care ($p = 0.5854$). Results support implementation of non-targeted rapid HIV screening in integrated systems. Conclusions: This analysis adds a new component of support for HIV screening by demonstrating that rapid, non-targeted testing does not cost significantly more than a diagnostic testing approach.** © 2012 Elsevier Inc.

□ **Keywords—HIV; screening; budget impact; Rapid Testing; Emergency Department**

INTRODUCTION

It is estimated that there are 1–1.2 million people living in the United States with human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS), with 21% of them unaware of their disease status (1,2). Many HIV-positive persons are identified only when they develop symptoms, indicating that they are severely immunosuppressed and less likely to respond optimally to antiretroviral therapy. Screening programs that diagnose patients early and offer them treatment can therefore substantially improve health outcomes (3).

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Recently, four separate analyses have indicated that HIV screening is cost-effective from a societal perspective compared to no screening and compared to current practice, prompting the Centers for Disease Control and Prevention (CDC) and the American College of Physicians to encourage routine HIV screening as a part of normal medical practice (4–9). However, although HIV screening has been found to be cost-effective, it is not cost-saving. Therefore, even though HIV screening is economically justifiable, it may not be a financially viable option for an organization. A Budget Impact Analysis (BIA) can provide information about the financial feasibility of a program by examining the economic value of the health investment and the resources needed for its implementation (10).

This study examines the budget impact of implementing a new HIV testing program in a Veterans Health Administration (VA) Emergency Department (ED) vs. the financial impact of following standard care. The standard care program examined is Usual Care, which in the ED setting involves blood-based diagnostic testing, or testing a patient when (s)he presents with symptoms suggestive of HIV/AIDS. The new program examined is Rapid Testing, or offering an HIV test to any previously untested patient in the ED, regardless of risk factors or symptoms (non-targeted testing). The rapid test in question is the OraQuick Advance HIV-1/2 Oral Specimen Collection Device (OraSure Technologies, Bethlehem, PA), a Food and Drug Administration-approved point-of-care test. Of particular interest for ED settings, the results of HIV rapid tests are available within 1 h, compared to the 24–48 h turnaround for blood-based testing.

This analysis estimates the number of people who would be identified as disease-positive through Rapid Testing at various levels of program intensity and HIV prevalence rates. The model forecasts treatment costs for patients in the Rapid Test program and compares them to the expenses incurred by these same patients were they to be identified at later stages of disease through Usual Care. The program with the lowest overall costs, both in terms of implementation costs and cost offsets, represents the most economically-efficient strategy.

MATERIALS AND METHODS

We built a first-order stochastic decision-analysis model to determine the costs of treating a hypothetical cohort of patients identified due to a Rapid Testing screening program vs. costs of treating this same cohort of patients were they identified due to symptoms of disease (Usual Care). Cohort size indicates the number of HIV-positive persons identified by the screening programs in the ED. The ED was chosen as the screening site due to its ability to access an otherwise difficult-to-reach population and its predicted higher prevalence of HIV infection compared to primary care locations (11,12). This analysis used cost and economic data from an urban VA ED and Infectious Disease clinic located in a major metropolitan area. The VA was chosen due to the extensive data available from its cost databases and electronic medical records. Institutional Review Board approval was obtained from the VA system.

Due to the fact that the VA generally keeps patients for life, this analysis assumed all patients would be identified at some point in the system due to their symptoms. Therefore, sizes for the Rapid Test and Usual Care cohorts were identical. We modeled a variety of cohort sizes to reflect uncertainty in the number of patients offered testing, the percentage of patients accepting testing, and the prevalence of HIV (Table 1). This analysis evaluated the financial impact of three different offer rates: five per business day, 10 per business day, or universal. The former two rates were used to reflect realistic levels of testing that can occur in environments with existing capacity constraints; the latter was used in accordance with CDC

Table 1. Cohort Sizes*

Offer Rate	Acceptance Rate	HIV Prevalence	Cohort Size
5/day	55%	0.5%	4
5/day	80%	0.5%	6
5/day	55%	1.0%	8
5/day	80%	1.0%	11
5/day	55%	3.0%	22
5/day	80%	3.0%	32
5/day	55%	5.4%	39
5/day	80%	5.4%	57
10/day	55%	0.5%	8
10/day	80%	0.5%	11
10/day	55%	1.0%	15
10/day	80%	1.0%	21
10/day	55%	3.0%	43
10/day	80%	3.0%	63
10/day	55%	5.4%	78
10/day	80%	5.4%	113
Universal	55%	0.5%	11
Universal	80%	0.5%	16
Universal	55%	1.0%	21
Universal	80%	1.0%	31
Universal	55%	3.0%	63
Universal	80%	3.0%	91
Universal	55%	5.4%	113
Universal	80%	5.4%	164

HIV = human immunodeficiency virus.

* Cohort size is dependent on four factors: the number of people visiting the Emergency Department annually, the percentage of patients offered testing, the percentage of patients accepting testing, and the prevalence of HIV. Due to uncertainty regarding the latter three rates, a variety of cohort sizes were modeled. Cohort size is calculated in the following manner: at an offer rate of 10 tests per business day, 2600 tests would be offered annually. If 55% of patients accept testing, 1430 tests would be conducted. At a 1% prevalence of disease, 14.3 patients would be identified as disease positive. Rounding up to the next whole person results in a cohort size of 15.