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Brief communication (Original)

Provider-initiated HIV counseling and testing of out patients at community hospitals in Thailand: an economic evaluation using the Markov model

Yuwadee Leelukkanaveera, Pornchai Sithisarankul, Narin Hirunsutthikul
Department of Preventive and Social Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok 10330,Thailand

Background: Provider-initiated HIV counseling and testing (PIHIVCT) is an important intervention that improves the access to care to HIV-infected patients and subsequently contributes to the success of national HIV/AIDS control efforts. However, in Thailand, the cost-effectiveness of this program is unknown.
Objective: Determine the incremental cost-effectiveness ratios (ICER) in terms of Thai Baht per Quality Adjusted Life Year (QALY) of PIHIVCT for outpatient department (OPD) patients in community hospitals of Thailand compared with the current practice.
Methods: A model-based health economic evaluation study was conducted based on results from cluster randomized controlled trials in 16 community hospitals of Thailand. The Markov model and the probabilistic sensitivity analysis were used. One-thousand two-hundred seventy-seven HIV-infected patients completed questionnaires on their household expenditure and quality of life using the visual analog scale.
Results: In social perspectives, the PIHIVCT program increased a patient's life span by 5.18 days or 4.15 quality-adjusted days per OPD case and the ICER was 63,588 Baht per QALY gained. The subgroup analysis showed that the PIHIVCT program would be cost-effective for cases younger than 50 years if the ceiling threshold of willing to pay equaled the per capita Gross Domestic Product (GDP). However, this intervention would be cost-effective for all cases of 13-64 year old if the ceiling threshold equaled three times of GDP.
Conclusion: The provider-initiated HIV counseling and testing program for OPD patients is more cost-effective than the current practice and should be implemented in health care setting in Thailand.

Keywords: Community hospital, economic evaluation, HIV/AIDS, provider-initiated testing, quality of life, Markov model

Human immunodeficiency virus (HIV) infection and the acquired immunodeficiency syndrome (AIDS) remain major health problems in Thailand. The HIV prevalence is still higher than the global and South-East Asia prevalence [1]. The prevalence in high-risk groups is very high as well, with 25.6% in injecting drug users [2] and 30 % in men who have sex with men [3].

Voluntary counseling and testing (VCT) and a comprehensive and continuum of care for HIV/AIDS have been implemented at various levels of health care settings since 1997, and the National Antiretroviral Treatment (ART) program has been provided since 2004 [4]. However, only 60% of the estimated number of persons in need of ART has received it by the end of 2008[5]. Most HIV-infected patients have been diagnosed in the late stage with a median $CD4^+$ T-lymphocyte count of less than 50 cell/μL [4, 6, 7].

To improve survival rates of the HIV/AIDS, it is important to detect HIV-infection at the early stage. Those who initiate ART before developing AIDS have substantially better survival than those who started after developing AIDS [8-12]. This requires improvement in the expansion of easily available VCT services.

Correspondence to: Professor Pornchai Sithisarankul, Department of Preventive and Social Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.
E-mail: psithisarankul@gmail.com

According to the United States' Center for Disease Control and Prevention (US-CDC) recommendations for HIV testing of inpatients and outpatients in acute-care hospital settings or pregnant women [13, 14], many studies were done to explore cost-effectiveness of the programs. Routine VCT in the United States was cost-effective for inpatients [15], outpatients [16-18], and pregnant women [19]. Although routine VCT was cost-effective in the United States, there are no data available in Thailand.

Since the US-CDC revised this recommendations in 2006 [20] and the WHO recommended PIHIVCT in 2007 [21], the PIHIVCT for patients in 16 community hospitals in Thailand had been conducted in 2007. It was shown that it could improve the acceptance rate of HIV testing among patients visiting outpatient departments (OPD), leading to a significant improvement of HIV detection rates [22]. However, the cost-effectiveness of the program is still unknown.

In this study, we evaluated the incremental cost-effectiveness ratios (ICER) in terms of Thai Baht (THB) per Quality Adjusted Life Year (QALY) of PIHIVCT for OPD patients in Thai community hospitals compared with the current practice.

Materials and methods

Ethical approval of this study was obtained from the Institutional Review Board of Faculty of Medicine, Chulalongkorn University.

Study population

The study population was clients whose HIV status was unknown. They were recruited at OPD in 16 community hospitals in Thailand where the PIHIVCT program had been conducted (for PIHIVCT program, see **Appendix**).

One-thousand two-hundred seventy-seven HIV-infected patients in OPDs of the hospital were asked to complete their expenditure resulting from HIV infection and their health utility score in visual analog scale.

Economic model

A model-based cost-utility analysis was carried out to estimate the health benefits and expenditures of performing PIHIVCT compared with the current practice in Thai health care settings. The focus of interest was total lifetime costs, QALY gained, and ICER in THB per QALY gained.

The Markov model was developed on Excel Microsoft Office to follow a cohort of clients over their lifetime starting at OPD visits in health care settings [23]. It was constructed to estimate relevant costs and health outcomes. The lifetime horizons from the societal and provider's perspective were used and the cycle length in the model was one year.

Two mutually exclusive HIV counseling and testing options were compared as follows: 1) PIHIVCT for all clients at OPDs, and 2) the current practice, consisting of not offering testing. The differences between these options were the HIV test acceptance rate, which equals the number of HIV-test cases in a specified period divided by the total number of OPD cases in the same period, the rate of returning for the test result and the rate of linkage to care of patients. The HIV-infected patient could link to care in a different health status, vary by $CD4^+$ T-lymphocyte level, which followed by the sero-conversion interval. A one-year cycle length and 3% discount rate for future costs and outcomes were used in the model.

Figure 1 shows the direction of changing from one health state to others.

Results

Baseline analysis

The acceptance rate of HIV testing increased from 0.38% in the current practice to 5.12% after offering the test to OPD clients with an average age of 38 years. The PIHIVCT program increased life expectancy by 5.18 days, or 4.15 quality-adjusted days, at an incremental cost-effectiveness ratio of 50,884 baht per LY gained and 63,588 Baht per QALY gained for the social perspective and 45,148 Baht per LY gained and 56,420 Baht per QALY gained for the provider perspective.

Subgroup analysis

In the case of a shortage of budgetary funds, it was not possible to offer the age group 13-64 years all the facilities that should be offered. Indeed, factors associated with age and cost-effectiveness of the program included death rate, prevalence, and the incidence rate of HIV infection. Although causes of death due to HIV-infection were not associated with age in this model, the death rate from general causes of HIV-infected patients was higher in older ages. However, the prevalence and the incidence rate of HIV infection varied according to age, being higher in young adults, lower in middle adulthood, and very low

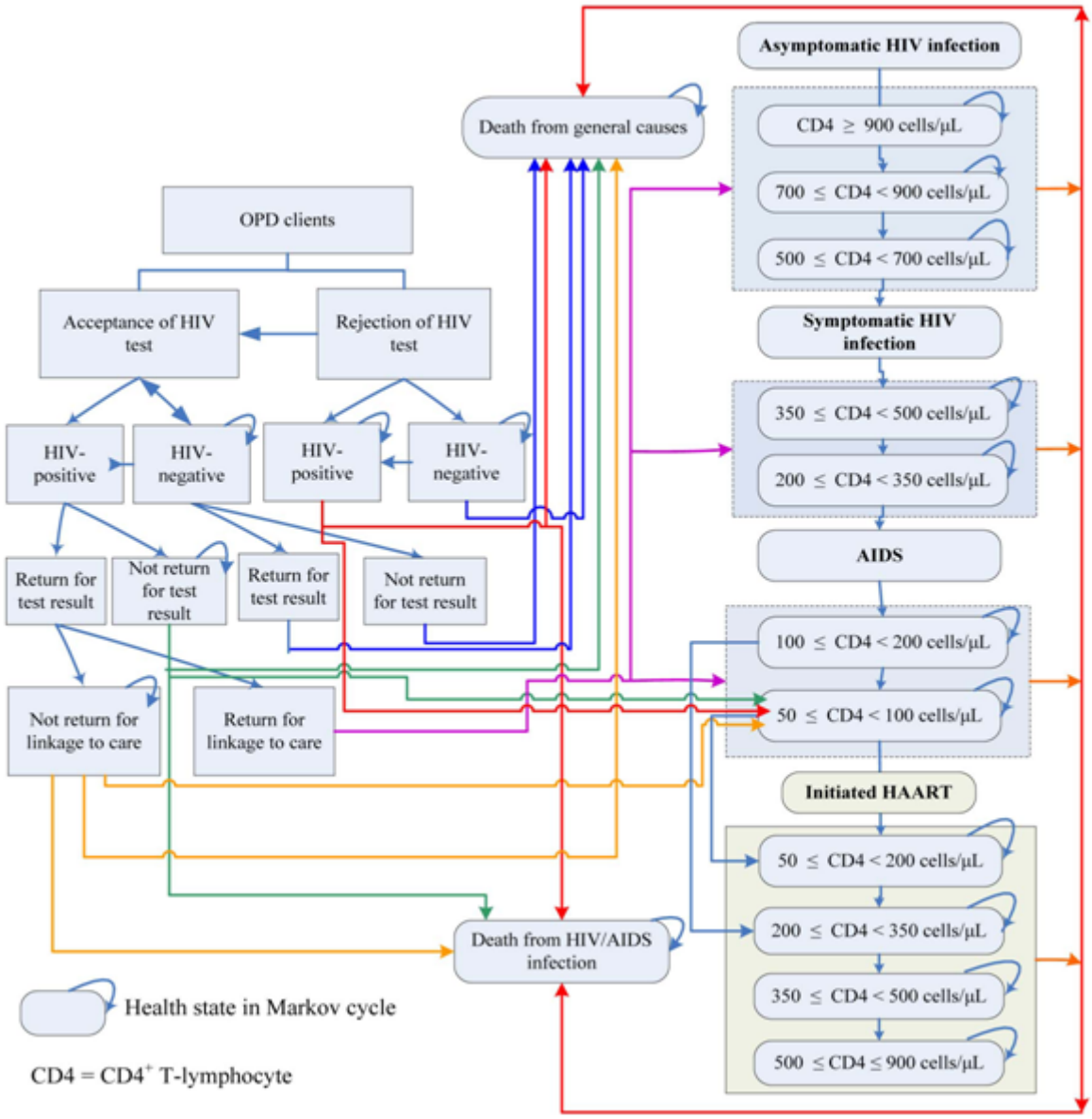

Fig. 1 Schematic diagram of the model illustrating the two main processes, 'screening' and 'treatment', starting in the Out-Patient Department for 'screening'. CD4 counts usually correlate well with HIV/AIDS stages and determine the 'treatment'.

in the elderly. Considering these parameters, this program was cost-effective not only by providing for clients between the ages of 13 and 15 years old, but it is more cost effective for 15-44 years old, with the most cost-effective age being 25 years old with a high prevalence rate of 1.96% and an incidence rate of 0.090%. The incremental cost-effective ratio remained less than 100,000 THB/QALY gained for a 49 years old client with a prevalence rate of 0.678%, and an incidence rate of 0.005%. Nevertheless, this intervention does not seem to be cost-effective for the older group due to low prevalence and incidence of HIV/AIDS rates and high death rate from general causes.

As shown in **Fig. 2** at a 'willing to pay' threshold of 100,000 THB per QALY gained, the probability is that the PIHIVCT program would be cost-effective at 64%, 70%, 84%, 92-93%, 85%, 64%, and less than 10% for clients aged 13, 15, 20, 25-35, 40, 45, and ≥50 years, respectively. At a willing to pay threshold of 300,000 THB per QALY gained, the probability is that the PIHIVCT program would be cost-effective at 80% or higher for all 13-64 years old clients.

Table 1. Health and economic outcomes. All survival, cost, outcome, and cost-effectiveness ratios were reported on a present-value basis with an annual discount rate of three percent.

	Provider perspective		Social perspectives	
	Current practice	PIHIVCT program	Current practice	PIHIVCT program
Cost (THB)	2,685	3,326	3,271	3,994
Incremental cost (THB)		641		723
Life years gained	20.8444	20.8586	20.8444	20.8586
Incremental Life years gained (days)		0.0142 (5.18)		0.0142 (5.18)
ICER (Baht per life year gained †)		45,148		50,884
QALY gained	20.8079	20.8192	20.8079	20.8192
Incremental QALY gained (days)		0.0114 (4.15)		0.0114 (4.15)
ICER (THB per QALY gained)		56,420		63,588

†ICER is the difference in cost divided by the difference in outcome, life years gained, or quality adjusted life years gained, between PIHIVCT and current practice

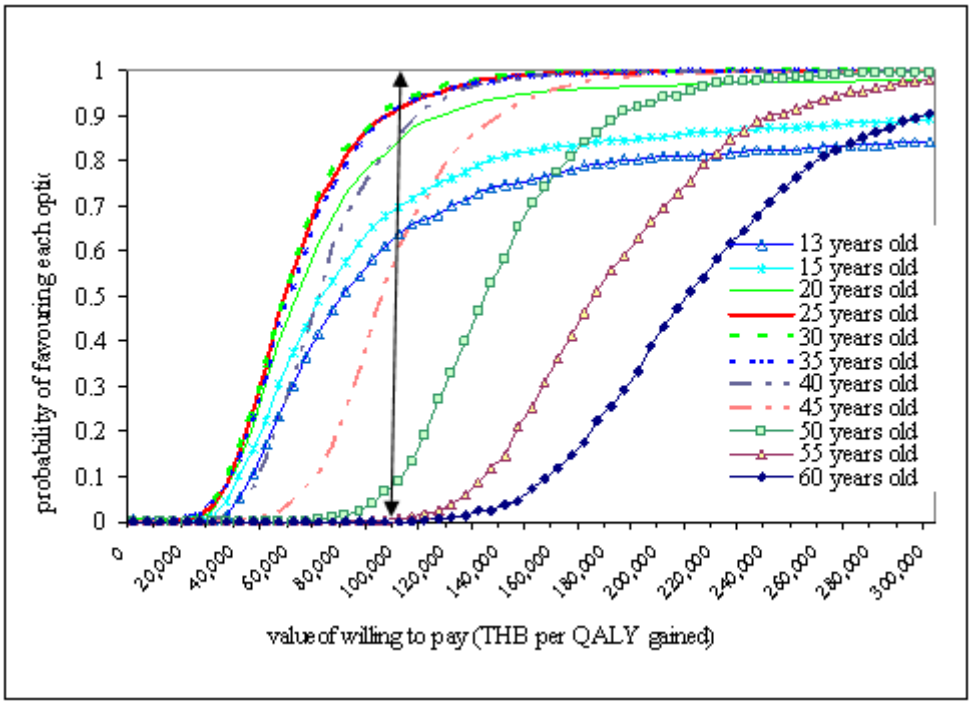

Fig. 2 Cost-effectiveness acceptability curves for PIHIVCT program.

Discussion

This is the first study to evaluate 'provider-initiated HIV counseling and testing' in Thailand. Offering annual HIV counseling and testing for all OPD cases is not only viable, but also extremely cost-effective. It is possible that this intervention, offering pre-test counseling information via the video and free service, increases the awareness of being HIV-infected and testing among OPD cases. It tends to be more attractive to high-risk group to have HIV test than those of low-risk group. As with the early studies, factors affecting the number of people seeking VCT are self-perceived risk of being HIV-infected, increased mobilization and access for VCT, reducing costs of VCT, and linking of VCT with care [24-26].

Our results agree with previous studies to indicate that routine VCT is a more cost-effective in high prevalence than in low prevalence cases of HIV [15-17], but disagree with many studies [15-18] to report that annual screening is not likely to be cost-effective compared with one time or once every three to five years screening. This may be explained by different parameters used in our model that includes the HIV-test acceptance rate, rate of receipt the test result, and rate of linkage to health care. In fact, Walensky et al. [27] showed that these parameters affected the cost-effectiveness of HIV screening program. The HIV-test acceptance rate may be the most important parameter. In the present study, the rate was only 5%, likely to test only high risk clients. This is in contrast with assumed 100% assumed in the others.

Other studies [15-17] show that more frequent screening in the population increased quality-adjusted survival and increased the costs of testing and counseling for HIV-uninfected clients. This incremental benefit is less than the incremental cost, thus, not cost-effective in annual screening.

The high rate of return for test result (>95%) and rate of linkage to care (>90%) in our study may add up the cost-effectiveness of our result. Walensky et al. [27] concluded that the programs in which the rate of linkage to medical care is higher than the rate of test acceptance are more cost-effective in limited screening resources area. Increasing the rate of return for results and linkage to care among those identified as HIV positive will gain more benefit than offering the testing to people.

In conclusion, provider-initiated HIV counseling and testing program for OPD patients is more cost-effective than the current practice, and should be implemented in health care setting in Thailand.

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There is no conflict of interest to report.

Appendix

PIHIVCT service operational definition

PIHIVCT service was integrated into OPD service. It is offered as a free package that includes VDO pretest counseling for all individuals visiting OPD with an opportunity to discuss with health care providers plus anonymous HIV testing with written inform consent and individual post-test counseling. Patients felt free to decline the test without affecting their access to service. The current practice was that HIV counseling and testing occurred only when requested by the clients or when the physicians prescribed it because of signs or symptoms consistent with HIV infection or an opportunistic illness characteristic of AIDS or with sexually transmitted diseases and having a risk of HIV infection. The patients paid themselves if they wanted to take the test without the physicians' prescriptions and they would get individual both pre- and post-test counseling.

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