Cost-effectiveness of HIV screening in STD clinics, emergency departments, and inpatient units: a model-based analysis

Prabhu VS, Farnham PG, Hutchinson AB, Soorapanth S, Heffelfinger JD, Golden MR, Brooks JT, Rimland D, Sansom SL

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
This study assessed the cost-effectiveness of HIV screening in sexually transmitted disease (STD) clinics, emergency departments, or hospital in-patients with clinical symptoms. The authors concluded that identifying HIV patients when their cluster of differentiation (CD4) cell count was high was cost-effective or cost-saving. Testing should occur in STD clinics and emergency departments, with the provision of treatment at an early stage of infection, when the CD4 count was high. The methods were valid and the authors’ conclusions are robust.

Type of economic evaluation
Cost-utility analysis

Study objective
This study assessed the cost-effectiveness of HIV screening in three settings: sexually transmitted disease (STD) clinics, hospital emergency departments, and in hospital as an in-patient with clinical symptoms.

Interventions
The three screening settings were STD clinics in areas with a high population of men who have sex with men, hospital emergency departments where all patients were tested and so the disease could be identified at an early stage, and hospital in-patient wards if patients displayed clinical symptoms. The rapid HIV test was assumed to be conducted in STD clinics and emergency departments, while in-patients were tested conventionally using an HIV enzyme immunoassay on blood serum.

Location/setting
USA/hospital, emergency department, and primary care.

Methods
Analytical approach:
The analysis used the Progression and Transmission of HIV/AIDS (PATH) model, which was an individual Monte Carlo simulation, health-state transition model, with a lifetime horizon. Two scenarios were considered: initiating highly active antiretroviral treatment (HAART) at a cluster of differentiation (CD4) count of 350 cells per microlitre (μL); and initiating HAART at a CD4 count of 500 cells per μL. The model included the transmission to and follow-up of infected partners of initial patients until death. The authors stated that the analysis was carried out from the perspective of the health care provider.

Effectiveness data:
The clinical inputs were from a selection of relevant sources. The screening methods and patients’ characteristics for each setting were from reports of the implementation of local programmes. These also provided the average CD4 cell count at diagnosis that indicated whether antiretroviral treatment should be started or not. The efficacy of treatment and disease progression were from several published sources and some assumptions were required. The key input was the proportion of undiagnosed seropositive patients in each setting.

Monetary benefit and utility valuations:
The utility values were linked to the individual’s CD4 cell count or to the presence of opportunistic illness. These estimates were from published studies.
Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and they were discounted at an annual rate of 3%.

Cost data:
The economic analysis included the costs of the screening programme and the lifetime costs of treatment. The programme costs focused on the costs that differed between strategies, such as rapid or conventional HIV testing and post-test counselling for those infected. The treatment costs included antiretroviral therapy, laboratory monitoring, diagnosis and treatment of opportunistic illnesses, and care for the last month of life. The costs were mainly from published sources. All costs were in US dollars ($) and were discounted at an annual rate of 3%. The price year was 2009.

Analysis of uncertainty:
The simulation produced 10,000 iterations, varying all the inputs of the model within published ranges of values. One-way sensitivity analyses were performed on selected variables. A probabilistic sensitivity analysis was carried out by assigning conventional distributions to the key inputs.

Results
HAART initiated at a CD4 count of 350 cells per μL: Excluding transmission, the projected costs were $313,655 for in-patients, $398,833 in the emergency department, and $399,844 in STD clinics. The QALYs lost were 7.313 for in-patients, 4.851 in the emergency department, and 4.851 in STD clinics. The incremental cost per QALY gained by testing in the emergency department versus the in-patient setting was $34,597. Testing in STD clinics was as effective as in the emergency department, and slightly more expensive.

Including disease transmission, emergency department screening was dominant as it was more effective and less expensive compared with in-patient screening, and STD clinics dominated emergency department screening.

HAART initiated at 500 cells per μL: Excluding transmission, the incremental cost per QALY gained was $34,594 in the emergency department compared with in-patient setting and $59,997 in STD clinics compared with the emergency department.

Including disease transmission, testing in the emergency department was dominant over in-patient testing, and STD clinic testing was dominant over emergency department testing.

These base-case findings were robust to changes in the key inputs for the model. Similar results were observed in the probabilistic analysis, except with initiation at 350 cells per μL in STD clinics compared with the emergency department, where the incremental cost per QALY gained was no longer undefined and was $43,790. In general, assumptions on disease transmission were key inputs for the model.

Authors’ conclusions
The authors concluded that identifying HIV patients when their CD4 counts were high was cost-effective or cost-saving. The results supported testing in STD clinics and emergency departments to identify these patients and the provision of treatment at an early stage of infection when the CD4 cell count was high.

CRD commentary
Interventions:
The selection of the comparators was appropriate as three settings for HIV screening, and two CD4 cell count thresholds for starting treatment were considered.

Effectiveness/benefits:
The clinical inputs for screening were generally from local programmes, which should have reflected the real situation in the authors’ setting. Little information was provided on the published studies that provided the disease progression and treatment efficacy. Extensive sensitivity analysis was conducted on the clinical parameters to assess variations in these inputs. QALYs were a valid benefit measure, as HIV has an impact both on quality of life and survival. They also
allow comparisons with other disease areas. No information was given on the instruments used to elicit preferences, nor on the population studied.

Costs:
The cost categories were consistent with the perspective stated. The unit costs and resource quantities were not reported as most of the costs were presented as three-month category totals. The authors stated that the programme costs did not include fixed and start-up costs, because it was assumed that the sites had already HIV testing ability. This might have underestimated the screening costs. The calculation of costs for those who were tested and were not HIV infected was reported. The data sources were US sources, but they were not fully described, reducing the transparency of the analysis. The price year was reported, allowing reflation exercises for other time periods.

Analysis and results:
The results were extensively presented for a variety of scenarios. An appropriate incremental approach was used to synthesise the costs and benefits of the alternative strategies. Appropriate sensitivity analyses were carried out to assess the uncertainty in the base-case findings and the results were clearly presented and discussed. A full description of the decision model was provided in an online appendix. The authors acknowledged some limitations of their analysis, such as the scarcity of data for some model inputs and the need to collect data from few locations. They stated that their findings could not be generalised to all emergency departments, STD clinics, and hospitals.

Concluding remarks:
The methods were valid and the authors’ conclusions are robust.

Funding
No funding received.

Bibliographic details

PubMedID
21625489

DOI
10.1371/journal.pone.0019936

Original Paper URL
http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0019936

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Cost-Benefit Analysis; Emergency Service, Hospital /economics; HIV /pathogenicity; HIV Infections /diagnosis /economics /prevention & control; Humans; Inpatients /statistics & numerical data; Male; Mass Screening; Models, Statistical; Quality-Adjusted Life Years; Sexually Transmitted Diseases /diagnosis /economics /prevention & control

AccessionNumber
22011001036

Date abstract record published
28/09/2011