Cost-effectiveness of expanded human immunodeficiency protocols for donated blood

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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.

Health technology
Additional HIV-detection tests for donor screening.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Patients in the USA undergoing transfusion (about 3.5 million persons).

Setting
Medical and blood centres, New Hampshire and California, USA.

Dates to which data relate
Data on the collection and transfusion of blood were extrapolated from studies performed in 1989 and 1992. Data on costs were extrapolated from a study published in 1993. Survival data were collected from studies published in 1989, 1990, 1993, 1994 and 1996.

Source of effectiveness data
Effectiveness data were derived from a single study, a review/synthesis of previously completed studies and an estimate.

Modelling
A modified version of a previously published Markov decision analysis model was used in estimating benefits and costs.

Outcomes assessed in the review
The outcomes assessed were HIV transmission risk from blood transfusion, survival in transfusion recipients and quality of life adjustments for patients infected.

Study designs and other criteria for inclusion in the review
Survival data were extrapolated from a cross-section study. Health states in HIV infection derive from three different studies one of which has a cohort design. Inclusion criteria were not stated.
Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
Risk of infection data were obtained from two combined studies. Survival data were extrapolated from one study.
Health states data were derived from four different studies and quality-of-life adjustments were derived from three published sources.

Methods of combining primary studies
The method of combination was not explicitly given other than by clinical consensus.

Investigation of differences between primary studies
Not stated.

Results of the review
Survival rates in transfusion recipients were:

- 76% (1-year post-transfusion);
- 70% (2 years post-transfusion) and
- 48% (10-years post-transfusion).

HIV transmission risk (per unit transfused) was:

- for HIV antibody only 1/493,000;
- for p24 antigen 1/676,000;
- for RNA PRC 1/990,000 and
- for a theoretical test 1/100,000,000.

Quality of life adjustments were:

- asymptomatic HIV infection: mean, 4.6 years; quality of life, 1.0;
- symptomatic infection: mean 5.2 years; quality of life, 0.7;
- AIDS: mean, 2.0 years; quality of life, 0.5.

Methods used to derive estimates of effectiveness
Clinical consensus was used to estimate quality-of-life adjustments for patients infected with HIV.

Estimates of effectiveness and key assumptions
Not stated.

Measure of benefits used in the economic analysis
Quality-Adjusted-Life-Years (QALYs) gained using a Markov model. Valuation of health states was derived from a review of previous studies followed by clinical consensus. The valuation tool used was not stated.

Direct costs
Costs were estimated from a health care provider perspective and discounted at 5% per year. Costs and quantities were reported separately. Costs for different tests, treatment of HIV infection symptoms and treatment of AIDS were measured. It was not stated how costs for different tests were estimated. Quantities and costs for treatments were based on information from a previous study published in 1993 and estimated by using a Markov model adapted from a previous study published in 1989. All costs were expressed in 1995 dollars.

Statistical analysis of costs
Costs were not treated stochastically.

Indirect Costs
Not stated.

Currency
US dollars ($).

Sensitivity analysis
A one-way simple sensitivity analysis was carried out to investigate variability in data. The following variables were considered: the expected longevity after transfusion, the rapidity of progression from HIV infection to AIDS, the cost of caring for HIV-infected recipients, the cost and window-period reduction efficacy of the additional test, and the risk of transmitting HIV through a transfusion.

Estimated benefits used in the economic analysis
The annual net benefits were:

- HIV antibody only: 6,222 QALYS,
- expanded HIV screening with p24 antigen: 35 QALYS,
- with RNA PRC: 66 QALYS,
- a theoretical test: 130 QALYS.

Cost results
The total annual cost was

- HIV antibody testing: $60.9 million,
additional p24 antigen: $120.65 million,
additional RNA PRC: $156.4 million,
theoretical test: $120 million

**Synthesis of costs and benefits**
Costs and benefits were combined by calculating a cost/QALY ratio. Costs and benefits were discounted at 5% per year. An incremental analysis was performed. p24 antigen, RNA PRC and theoretical test have a marginal cost-effectiveness of 2,281,000, 1,966,000 and 614,000, respectively, compared with HIV antibody only. Sensitivity analysis included the expected longevity after transfusion, the rapidity of progression from HIV infection to AIDS, the cost of caring for HIV-infected recipients, the cost and window-period reduction efficacy of the additional test, and the risk of transmitting HIV through a transfusion. The cost-effectiveness of expanded HIV testing was very dependent on the cost and window-period reduction efficacy of the additional test and on the risk of transmitting HIV through a transfusion.

**Authors’ conclusions**
The cost-effectiveness of expanded p24 antigen and RNA PRC testing for blood donor HIV-screening did not compare favourably with a $50,000-per QALY threshold and most other accepted health practices. However, since additional tests may be cost-effective in countries with high HIV incidence rates, the selection of tests should be based on the risk of infection among blood donors.

**CRD COMMENTARY - Selection of comparators**
The study design was appropriate since the current practice was used as a comparator. However, the method used for extrapolating data from the literature was not clear.

Validity of estimate of benefits:
The combined measure used by the authors (Quality-Adjusted-Life-Years) was appropriate since HIV infection implies some consideration of quality of life. The authors conducted a cost-minimisation analysis. However, the provider perspective adopted by the authors may not capture the intensity of public concerns about HIV, the safety of blood supply and the pressure on blood collection. A societal perspective would probably be more effective from this point of view.

Validity of estimate of costs
Since the authors adopted a provider perspective, only direct costs were considered. The addition of indirect costs (e.g. loss of salary) would probably reinforce the analysis.

**Implications of the study**
Since the cost-effectiveness of expanded HIV-testing for blood donation does not compare favourably with that of most other health practices in countries with low HIV incidence rates in the donor population, the study suggests that health care providers should carefully consider any alternative allocation of resources other than implementation of additional HIV tests.

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