The cost-effectiveness of introducing nucleic acid testing to test for hepatitis B, hepatitis C, and human immunodeficiency virus among blood donors in Sweden

Davidson T, Ekermo B, Gaines H, Lesko B, Akerlind B

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 adding individual-donor nucleic acid testing (ID-NAT) to the serologic tests for hepatitis B virus, hepatitis C virus, and HIV in blood donations. The authors concluded that adding ID-NAT was unlikely to be cost-effective, mainly because the risk of disease transmission was very low in Sweden. The cost-effectiveness methods were valid and the authors’ conclusions appear to be valid, but more extensive reporting of the cost analysis would have helped in judging these conclusions.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
This study assessed the cost-effectiveness of adding individual-donor nucleic acid testing (ID-NAT) to the serologic tests for hepatitis B virus (HBV), hepatitis C virus (HCV), and HIV in blood donations.

Interventions
ID-NAT plus serologic tests was compared with serologic tests alone. Serologic testing was the usual practice in Sweden and consisted of antibody, antigen, or a combination of antibody and antigen testing.

Location/setting
Sweden/clinical laboratory.

Methods
Analytical approach:
The analysis was based on a decision-tree model with a lifetime horizon, for blood recipients aged 73 years. The authors stated that a societal perspective was adopted.

Effectiveness data:
The effectiveness data were mainly from published studies and expert opinion. The mortality from HBV, HCV, and HIV was estimated by experts. The infectious window period (IWP) was the time when the tests were unable to identify an infected individual. This was used to estimate the risk of blood recipients becoming infected; these estimates were from published studies. The main clinical effectiveness estimate was the risk of viral transmission by blood transfusion and these data were from published studies.

Monetary benefit and utility valuations:
The utility values were reduced for patients with HBV by 0.1, HCV by 0.15, and HIV by 0.2, and were based on age- and sex-adjusted population utility weights derived using the European Quality of life (EQ-5D) questionnaire.

Measure of benefit:
Quality-adjusted life-years (QALYs) and infections avoided were the summary benefit measures and they were discounted at an annual rate of 3%.

Cost data:
The economic analysis included the costs of ID-NAT, serologic tests, and the management of HBV, HCV, and HIV.
The costs of serologic tests were based on Swedish data, while the other costs were based on published studies from Denmark, Germany, Canada, the USA, and Sweden. Productivity lost due to disease was included. All costs were in Swedish kronor (SEK) and US dollars ($). The price year was 2009 and a 3% annual discount rate was applied.

Analysis of uncertainty:
One-way sensitivity analysis was conducted by varying the risk of viral transmission, the costs of ID-NAT, and the ratio of transfusions to donations. Additional analyses were undertaken for two blood-recipient populations of 30-year-old females and of newborn babies.

Results
In the base case (73-year-olds), adding ID-NAT to the serologic tests avoided 0.00134 viral transmissions and saved 0.00624 QALYs, at an incremental cost of SEK 135,618 or $16,952, compared with serologic tests alone. The incremental cost per infection avoided was SEK 101,397,000 or $12,675,000 and the cost per QALY gained was SEK 21,734,000 or $2,717,000.

For 30-year-old females, the incremental cost per infection avoided was SEK 100,892,000 or $12,611,000 and the cost per QALY gained was SEK 16,346,000 or $2,043,000.

For newborn babies, the incremental cost per infection avoided was SEK 100,590,000 or $12,574,000 and the cost per QALY gained was SEK 14,164,000 or $1,770,000.

Authors’ conclusions
The authors concluded that adding ID-NAT to serologic testing produced a cost-effectiveness ratio that exceeded the usual threshold for medical interventions, mainly because the risk of disease transmission was very low in Sweden.

CRD commentary
Interventions:
The selection of the comparators was justified and included the usual practice, which was serologic testing. ID-NAT was the proposed addition to testing in Sweden. These comparators might not be generalisable beyond Sweden, Denmark, and Finland.

Effectiveness/benefits:
The effectiveness data were from published studies, but it was unclear if a systematic review was used to identify these studies. This makes it unclear if all the best available evidence was used. The methods used to combine the data from the studies were not provided. The authors made several assumptions for the utility values. The key model inputs were varied in the sensitivity analysis, which improves the validity of the results. The measure of benefit appears to have been appropriate and was appropriately discounted.

Costs:
The perspective was stated and it appears that the cost categories were consistent with this perspective. The unit costs for the test strategies were provided and were from Swedish sources. The costs of managing the infectious diseases were reported as category totals and were from studies in various countries. The methods used to derive the productivity losses were not provided and the justification for some of the cost estimates was unclear. Details, such as the price year and discounting, were clearly reported.

Analysis and results:
The analytic approach was appropriate; it was described and a diagram was given. The costs and benefits were synthesised in an incremental cost-effectiveness analysis and the results were fully reported. A deterministic analysis was performed to investigate the uncertainty in selected inputs. Justifications were given for not undertaking a probabilistic sensitivity analysis, but it would have been helpful to assess the overall uncertainty in the results. The results were validated externally by comparing them with those of other published studies.

Concluding remarks:
The cost-effectiveness methods were valid and the authors’ conclusions appear to be valid, but more extensive reporting
of the cost analysis would have helped in judging these conclusions.

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