A cost-effectiveness analysis of the use of a mechanical barrier system to reduce the risk of mistransfusion

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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
A mechanical barrier system in the reduction of risk of mistransfusion.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
A hypothetical cohort of patients designated for blood transfusion. Other characteristics of the patient population studied were not given.

Setting
Hospital. The economic study was carried out in New Hampshire, USA.

Dates to which data relate
The main effectiveness data related to 1994. Resource and cost data were mainly derived from 1991-94 sources. Resources were measured in 1994 values.

Source of effectiveness data
The reduction of the risk of a fatal mistransfusion and the number of extended years of a patient's life were derived from a review of previous studies.

Modelling
A decision analysis model was used to determine the cost-effectiveness of the barrier system in terms of cost per year of life saved and lives saved per million transfusions.

Outcomes assessed in the review
The outcomes assessed were the frequency of misidentification, incompatibility (given that there was mistransfusion), morbidity and mortality (given that the transfusion was incompatible), and transfusion per unit of red cells.

Study designs and other criteria for inclusion in the review
No specific study designs were stipulated by the authors as inclusion criteria.
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
9 primary studies were included in the review.

Methods of combining primary studies
Combined analysis.

Investigation of differences between primary studies
Not stated.

Results of the review
The frequency of misidentification was 1/24,000. The frequency of incompatibility was 0.36. The morbidity and mortality frequency were 0.3 and 0.33 respectively. The transfusion per unit of red cell was 200.

Measure of benefits used in the economic analysis
The measure of benefits were the number of extended years of a patient's life and the reduction of the risk of a fatal mistransfusion.

Direct costs
Direct costs included the costs of transfusion, costs of recollecting pretransfusion specimens that failed to include the barrier system's code, costs of transfusion reaction work-up, costs of care for a patient with transfusion reaction-related morbidity, costs of treatment of the complications arising from transfusion and costs of potential legal ramifications of a mistransfusion. Quantities/costs were not analysed separately. The quantity/cost boundary adopted was both the transfusing hospital and the societal perspective. The costs were discounted at a rate of 5%. 1994 price data were used. Incremental costs were not discounted.

Currency
US dollars ($).

Sensitivity analysis
A one-way sensitivity analysis was carried out on legal costs, reaction outcomes and the probability of mistransfusion.

Estimated benefits used in the economic analysis
The barrier system was estimated to reduce the risk of a fatal mistransfusion from 1 in 665,000 red cell transfusion to 1 in 7.98 billion, thus saving 1.5 lives per million transfusions when used as intended. The barrier system was estimated to
extend a patient's life by 1 year for every 60,000 uses of the system.

Cost results
The direct cost of the barrier system was estimated to be $3.25 per lock. A discount rate of 5% was applied.

Synthesis of costs and benefits
If the cost-effectiveness analysis was based on an average damage award for a fatality of more than $725,000 and a chance of mistransfusion exceeding 1 in 16,700, use of the system results in reduced healthcare expenditure. If no legal costs are included in the cost-effectiveness calculations, use of the system costs $197,000 per year of life saved.

Authors' conclusions
A barrier device could improve the transfusion system with an expenditure of resources which is, at least, in line with the cost-effectiveness of many other medical interventions and which may actually reduce overall costs for a hospital. The barrier system both reduces the risk of mistransfusion and increases life years for patients undergoing transfusions.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator was clear. Mechanical barrier systems are widely used to prevent mistransfusion. You, as a user of this database, should consider whether these are widely used health technologies in your setting.

Validity of estimate of measure of benefit
The estimate of measure of benefit used in the economic analysis is likely to be internally valid. The data have not been used selectively, although the principal benefit emphasised by the study was that of saved litigation costs.

Validity of estimate of costs
The resource quantities were reported separately from the prices. Adequate details of methods of quantity/cost estimation were given. No important cost items appear to have been omitted.

Other issues
The authors' conclusions were justified, given the uncertainties in the data. The issue of generalisability to other settings or countries was not addressed. Appropriate comparisons with other studies were made. The results were not presented selectively.

Implications of the study
Note added in proof: Mercuriali et al recently reported that a barrier system prevented one potential fatal transfusion error per 2748 red cell transfusion (frequency = 3.6 x 10^-4). This indicates that mistransfusion may be more common than the estimate given in the modelled solution reported in the present study, which would make the barrier system more cost-effective.

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**Other publications of related interest**


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