The cost effectiveness of preoperative autologous blood donations

Etchason J, Petz L, Keeler E, Calhoun L, Kleinman S, Snider C, Fink A, Brook R

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
Preoperative blood donation using either autologous blood or allogeneic blood.

Type of intervention
Primary prevention

Economic study type
Cost-utility analysis.

Study population
Patients at risk of transfusion undergoing (a) total hip replacement; (b) coronary artery bypass grafting; (c) abdominal hysterectomy; and (d) transurethral prostatectomy. Mean age was 62, 67, 49 and 68 years in the four groups respectively.

Setting
University of California Los Angeles (UCLA) Medical Center, USA.

Dates to which data relate
Effectiveness data taken from sources published between 1989-93. Cost data collected in 1992. 1992 prices were used.

Source of effectiveness data
Review of previously-completed studies.

Modelling
Decision-analysis techniques were used to model likely effects and treatment costs of diseases from infected allogeneic blood.

Outcomes assessed in the review
Probabilities, per allogeneic blood unit, of contracting transfusion-associated infections (Hepatitis B and C, HIV, and HTLV-I and HTVL-II) and probabilities, per unit of infected blood transfused, of alternative disease outcomes associated with each virus.

Study designs and other criteria for inclusion in the review
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
Values were assigned to effectiveness variables based on 'best estimates available'. Where these were equivocal, the authors assigned values that biased results in favour of autologous donation, although it is not clear how these were derived.

Number of primary studies included
Nine studies were cited as the source of: probabilities for infection; probabilities of various disease outcomes; life expectancies in alternative disease states. In addition, base-line life-expectancies were obtained from published life tables and the effect of transfusion complications on discounted life expectancies was calculated using information from a further published source.

Methods of combining primary studies
Each primary study provided the value for a single variable of the decision-analysis model, although published estimates were adjusted by the authors in some cases.

Investigation of differences between primary studies
Not applicable.

Results of the review
Probability of infection per allogeneic unit: (1) hepatitis C=0.0003; (2) hepatitis B=0.000005; (3) HIV=0.0000067; and (4) HTVL-I and HTLV-II=0.000017. Probability of disease per unit of infected blood: (1)hepatitis C virus: (a) persistent hepatitis =0.28; (b) active hepatitis=0.13; (c) cirrhosis=0.10; (d) fulminant hepatitis=0.01; (2) hepatitis B virus: (a) carrier status=0.04; (b) persistent hepatitis=0.02; (c) cirrhosis or cancer=0.01; (3) HIV: (a) AIDS=1.00; and (4) HTVL-I and HTLV-II: (a) ATL or HAM=0.04.

Measure of benefits used in the economic analysis
QALYs. Values assigned to health states (tabulated in the paper) represent authors' consensus after reviewing existing studies.

Direct costs
Costs were considered from a social perspective. Costs and quantities were not reported separately. Costs of: collecting blood; infectious-disease and compatibility testing; processing; and inventory management were individually reported and aggregated to derive total cost per unit collected, for each type of blood. Costs data were mainly derived from observation of transfusion practice. Costs of treating complications of transfusion were in part based on data reported in the literature. Costs were discounted at 5% per annum. Final total costs were calculated using a model. 1992 prices were used.

Currency
US dollars ($).
Sensitivity analysis
One-way sensitivity analysis investigated isolated effects upon incremental cost-QALY ratio of: varying probabilities of infection and quality-of-life weights from their base-line estimates; halving the annual discount rate; reducing the difference in direct costs; adopting cost-lowering strategies; adding unused autologous units to allogeneic blood supply; and adopting a published ‘schedule of optimal preoperative collection of autologous blood’. Generalisation of results analysed was done by recalculating cost-QALY ratio for hypothetical patients of various ages undergoing procedures with differing percentages of discarded blood.

Estimated benefits used in the economic analysis
Incremental QALYs saved per autologous blood unit transfused, relative to an allogeneic blood unit, reported by procedure: (a) total hip replacement=0.00029; (b) coronary artery bypass grafting=0.00022; (c) abdominal hysterectomy=0.00044; and (d) transurethral prostatectomy=0.00020. Intervention and comparator benefits were discounted at a rate of 5% per annum.

Cost results
Total cost per allogeneic blood unit transfused (comparator)=$168.19. Incremental cost of transfused autologous unit, relative to comparator, reported by procedure: (a) total hip replacement=$68; (b) coronary artery bypass grafting=$107; (c) abdominal hysterectomy=$594; and (d) transurethral prostatectomy=$4,783. Discount rate=5% per annum.

Synthesis of costs and benefits
Incremental cost-per-QALY saved reported by procedure: (a) total hip replacement=$235,000; (b) coronary artery bypass grafting=$494,000; (c) abdominal hysterectomy=$1,358,000; and (d) transurethral prostatectomy=$23,643,000. Discount rate=5% per annum. Recalculated incremental cost-QALY ratios following sensitivity analysis are reported in detail. On the whole, these were reduced from base-line levels without changing the order of magnitude, although the schedule of optimal preoperative collectionincreased the base-line cost-QALY ratio. Autologous donation produces lowest cost per QALY ($105,000) amongst 15 year old patients undergoing procedures in which the percentage of discarded units is as low as 15%; cost-QALY ratio increases with the age of the patient and the percentage of units discarded.

Authors’ conclusions
Given the improved safety of allogeneic transfusions today, the increased protection afforded by donating autologous blood is limited and may not justify the increased cost.

CRD Commentary
The study could have been enhanced by: (a) undertaking an explicitly-documented, comprehensive and systematic review of the literature, and synthesis of the results, thus ensuring that the estimates used in the model reflect currently-available evidence; (b) reporting the resource quantities - perhaps in an appendix - upon which costs estimates based.

Source of funding
Robert Wood Johnson Clinical Scholars Program; National Heart, Lung and Blood Institute.

Bibliographic details

PubMedID
7854380
DOI
10.1056/NEJM199503163321106

Original Paper URL
http://www.nejm.org/content/1995/0332/0011/0719.asp

Indexing Status
Subject indexing assigned by NLM

MeSH
Blood Transfusion /economics; Blood Transfusion, Autologous /economics; Cost Savings; Cost-Benefit Analysis; Decision Support Techniques; Humans; Preoperative Care /economics; Sensitivity and Specificity; Transplantation, Homologous /economics

AccessionNumber
21995005033

Date bibliographic record published
10/05/1996

Date abstract record published
10/05/1996