Intraoperative autologous transfusion (IOAT) during elective infrarenal aortic reconstruction: a decision analysis model

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
Intraoperative autologous transfusion during elective infrarenal aortic reconstruction for both abdominal aortic aneurysm (AAA) and aortoiliac occlusive disease (AIOD).

Type of intervention
Treatment.

Economic study type
Cost-utility analysis.

Study population
Patients undergoing elective aortic reconstruction for both AAA and AIOD.

Setting
Hospital. The economic study was conducted in Gainesville, Florida, USA.

Dates to which data relate
Transfusion requirements were determined from a retrospective review of all elective aortic reconstructions from January 1991 to June 1995 in which CS was used. Also, the operative mortality rates were determined by a previous retrospective review of all 722 elective infrarenal aortic reconstructions performed in the authors’ institution over a 12 year period. Effectiveness data were extracted from studies published in the period 1980-1995. 1996 prices were used.

Source of effectiveness data
Two retrospective studies designed by the authors and a review of previously completed studies.

Study sample
The hospital records of all patients who underwent elective infrarenal aortic reconstruction using the CS were retrospectively reviewed. The CS was used in 138 of the 168 reconstructions (82.1%) during the study period (1991-1995). Also, the operative mortality rates were determined by a previous retrospective review of all 722 elective infrarenal aortic reconstructions performed in the authors’ institution over a 12-year period.

Study design
Retrospective case series.
Analysis of effectiveness
The main health outcome extracted from the 2 studies undertaken by the authors was the operative mortality rate for AAA and for AIOD.

Effectiveness results
The operative mortality rate was 6.3% for AAA and 5.7% for AIOD, based on the 722 patients in the study.

Clinical conclusions
The use of intraoperative autologous transfusion devices during aortic reconstruction procedures has significantly expanded, as a result of increased awareness of transfusion-associated complications.

Modelling
A decision analysis tree was constructed (Decision Analysis, Tree Age; Boston, Mass.) to model all the possible outcomes associated with red blood cell replacement during elective infrarenal aortic reconstruction.

Outcomes assessed in the review
The main health outcomes considered were: operative death, transfusion reaction (fatal, non-fatal), transfusion infections (hepatitis C, B, HIV, Human T cell lymphotrophic virus (HTLV) types I/II), transfusion infection outcome (fulminant hepatitis, hospitalisation acute hepatitis, symptom acute hepatitis, hepatitis C resolve, symptomatic chronic hepatitis C, hepatitis B resolve, symptomatic chronic hepatitis B, chronic active hepatitis B or C, interferon for chronic active hepatitis B or C, liver biopsy if interferon, HTLV I/II myelopathy), quality of life adjustments, and life expectancy.

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
Not stated.

Number of primary studies included
Ten studies were included in the review.

Methods of combining primary studies
Narrative.

Investigation of differences between primary studies
Not performed.
Results of the review
The values assigned to decision analysis variables were as follows:

Operative death, AAA reconstruction = 0.063 and AIOD reconstruction = 0.057;

Transfusion reaction (per unit of PRBC), fatal = 0.0001, nonfatal = 0.000002;

Transfusion infections (per unit of PRBC), hepatitis C = 0.0003, hepatitis B = 0.000002, HIV = 0.0000022, HTVL I/II = 0.000017;

Transfusion infection outcome, fulminant hepatitis = 0.005, hospitalisation acute hepatitis = 0.025, symptom acute hepatitis = 0.25, hepatitis C resolve = 0.5, symptomatic chronic hepatitis C = 0.075, hepatitis B resolve = 0.9, symptomatic chronic hepatitis B = 0.015, chronic active hepatitis B or C = 0.4, interferon for chronic active hepatitis B or C = 0.5, liver biopsy if interferon = 1.0, HTLV I/II myelopathy = 0.01.

Quality of life adjustments were assigned the following values: 0.0385 for symptoms of acute hepatitis, 0.0192 for hospitalization for acute hepatitis, 0.0055 for liver biopsy, 0.0385 for interferon therapy, 0.90 for symptomatic chronic hepatitis B or C (per year), 0.99 for asymptomatic chronic hepatitis B or C (per year), 0.5 for HIV infection (pre-AIDS, per year), 0.25 for AIDS (per year), 0.9 for HTLV I/II myelopathy (per year).

Life expectancy values were as follows: 12.3 for AAA reconstruction, 17.63 for AIOD reconstruction; excess mortality, none for AAA and 0.059 for AIOD reconstruction, 0.0035 for chronic hepatitis; 9 for HIV/AIDS.

Measure of benefits used in the economic analysis
QALYs and life expectancy were used as the measures of benefits in the economic analysis.

Direct costs
Direct health service costs were considered: the costs of the CS, allogenic packed red blood cells (PRBC), and transfusion related complications. The cost of CS included the cost of equipment, all disposable items, maintenance and dedicated personnel. 1996 prices were used. Costs were reported separately. All costs that were accrued in the future were discounted at 5%. Quantities were not reported separately.

Statistical analysis of costs
Not performed.

Indirect Costs
Not considered.

Currency
US dollars ($).

Sensitivity analysis
Extensive sensitivity analyses were performed on the model variables.

Estimated benefits used in the economic analysis
Routine use of CS during infrarenal aortic reconstructions added only 0.00218 QALYs for AAA reconstructions and 0.00062 QALYs for AIOD reconstructions.
Cost results
Routine use of CS during reconstructions cost $263.75 for AAA repairs, and $356.68 for AIOD.

Synthesis of costs and benefits
The use of CS during reconstructions for AAA repairs yielded a rate of $120,794 per QALY, the corresponding rate for AIOD being $578,275 per QALY. The threshold value for cost-effectiveness was defined as $50,000/QALY.

Authors' conclusions
The routine use of the CS during elective infrarenal aortic reconstructions is not cost-effective. The use of the device should be reserved for a selected group of aortic reconstructions, including those in which cost-effective salvage volumes are anticipated. Alternatively, the CS should be used as a reservoir and activated as a salvage device if significant bleeding is encountered.

CRD COMMENTARY - Selection of comparators
The reason for the choice of the comparator is clear. You, as a database user should consider if this applies to your own setting.

Validity of estimate of measure of benefit
Data do not appear to have been used selectively to prove a particular point and the choice of health outcomes is justified. As there is no evidence of a systematic search of the literature, it is not clear whether all relevant studies were included.

Validity of estimate of costs
Extensive details of methods of quantity/cost estimation were given and no important cost items were omitted.

Other issues
Cost data may not be generalisable to other settings or countries. Appropriate comparisons were made with other studies.

Implications of the study
A well designed RCT is needed in order to determine the cost-effectiveness of IOAT.

Source of funding
None stated.

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