Preoperative autologous donation decreases allogeneic transfusion but increases exposure to all red blood cell transfusion: results of a meta-analysis

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Authors' objectives

To determine:

1. The degree to which pre-operative autologous donation of blood reduced the patient’s exposure to allogeneic red blood cells.

2. If exposure to all transfusions of red blood cells (allogeneic or autologous) was affected by pre-operative autologous blood donation.

3. If the use of a transfusion protocol affected the efficacy of pre-operative autologous blood donations.

4. If the efficacy of pre-operative autologous blood donation varied with the type of surgery.

Searching

MEDLINE was searched from 1966 to April 1996 using the search terms 'blood transfusion' and 'autologous'. The search was limited to studies of humans, and abstracts and letters were included. In addition, EMBASE was searched (the search dates were unclear) using the search terms 'blood transfusions' and 'autologous' combined with 'autotransfusion'. The bibliographies of retrieved studies were also searched. Organisations, such as the Red Cross of Canada, were contacted for relevant literature such as newsletters and annual reports, whilst investigators in the International Study of Perioperative Transfusion group were asked to identify relevant articles.

Study selection

Study designs of evaluations included in the review

Randomised controlled trials (RCTs) were included in the primary analysis, while cohort (prospective or retrospective) studies were included in a secondary analysis.

The inclusion criteria for the RCTs were:

1. Patients allocated to donate autologous blood pre-operatively were compared with patients who did not donate blood pre-operatively.

2. The patients underwent elective surgery.

3. The proportion of patients who underwent transfusion with allogeneic blood was reported.

The criteria for the cohort studies were:

1. To meet criteria 1 through 3 above.

2. The clinical characteristics of the control group were similar to the intervention group.

3. The control and intervention groups had to undergo surgery over similar time periods.

Specific interventions included in the review

Pre-operative autologous donation of blood.

Participants included in the review
Human patients undergoing elective surgery. Studies included patients undergoing the following: hip arthroplasty; colon, liver or aortic aneurysm resection; cardiac surgery; radical hysterectomy or prostatectomy; and mammoplasty. One study included all types of elective surgery. The mean age of the patients in the included studies ranged from 34 to 71 years. Iron supplementation was featured in 12 of the 15 studies.

Outcomes assessed in the review
The outcomes assessed were: exposure to allogeneic blood in autologous donors; total units of blood transfused; haematocrit level, both pre-operatively and 7 days post-operatively; and the proportion (%) of donated blood that was transfused.

How were decisions on the relevance of primary studies made?
Two authors independently reviewed the titles and abstracts of 2,275 articles identified by the search.

Assessment of study quality
The RCTs were assessed using the scoring system of Jadad et al. (see Other Publications of Related Interest). Observational studies were not quality assessed. Two authors independently reviewed all of the retrieved articles (768), and any disagreements were resolved by consensus. Inter-observer agreement on the quality scores was determined.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the authors performed the data extraction.

Methods of synthesis
How were the studies combined?
The studies were combined by pooling the estimate of the odds ratio (OR) using a random-effects model. The RCTs and cohort studies were analysed separately. Subgroup analyses were performed, based on whether a transfusion protocol existed and on the type of surgery.

How were differences between studies investigated?
Heterogeneity was evaluated using the Cochran Q test, where statistically-significant heterogeneity was indicated by a P-value of less than 0.05.

Results of the review
Six RCTs (n=1,099), 7 prospective cohort studies (n=1,816) and 2 retrospective cohort studies (n=539) were included.

The test for heterogeneity was significant (P<0.008) for all studies, but non significant for the subgroups based on type of surgery (P>0.26 for colon resections) and whether a transfusion protocol existed (P>0.20 and P>0.10 for those with and without, respectively).

Exposure to allogeneic blood.
RCTs: OR was 0.17 (95% confidence interval, CI: 0.08, 0.32) for the autologous donors compared with non-donors. The OR was 0.26 (95% CI: 0.19, 0.37) for colorectal surgery, and 0.20 (95% CI: 0.00, 0.28) for hip arthroplasty. In studies with a transfusion protocol, the OR was 0.25 (95% CI: 0.17, 0.37), compared with 0.02 (95% CI: 0.00, 0.24) for those without.

Cohort studies: the OR was 0.19 (95% CI: 0.14, 0.26).

Number of units of blood transfused (either allogeneic or autologous).
RCTs: the OR was 3.03 (95% CI: 1.70, 5.39) for autologous donors, and 3.29 (95% CI: 1.59, 6.82) for autologous donors in studies with a transfusion protocol.
Cohort studies: the overall OR was 12.32 (95% CI: 5.90, 25.40) for autologous donors.

Haematocrit values: the haematocrit was an average of 3.5 points lower in the autologous donors pre-operatively, but the same on discharge. This finding was not affected by the presence or absence of a transfusion protocol.

Percent of autologous blood donation not used: 25 to 46% of the donated blood was not used.

**Authors' conclusions**
Pre-operative autologous donation of blood decreased the exposure to allogeneic blood, but increased the exposure to any transfusion (allogeneic and/or autologous). There was a direct relationship between the transfusion rate in the control group and the benefit derived from pre-operative autologous donation. This suggested that other methods of decreasing blood transfusion, such as surgical technique and transfusion protocols, may be as important as pre-operative, autologous blood donation.

**CRD commentary**
This review was carried out with high methodological rigour. The literature search was extensive, although it was unclear what languages were searched, and what the effect of any restriction may have had on the results. The inclusion and validity criteria were well-defined and well-executed. It was unclear whether the quality scores were used for any purpose, i.e. the exclusion or weighting of results. The primary study data were presented in a table, but more information would have been helpful for generalisability purposes. The synthesis of the data was performed by accepted methods. The relationship between the baseline or control transfusion rates and the risk difference found in the studies could have been explored further.

This review has significance for the field of surgery, and the authors' conclusions are justified.

**Implications of the review for practice and research**
Methods of reducing the control or baseline transfusion rate need to be further investigated and implemented.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.