Efficacy of red blood cell transfusion in the critically ill: a systematic review of the literature

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CRD summary
The review evaluated the association between red blood cell (RBC) transfusion and clinical outcome among hospitalised adult patients. The authors concluded that RBC transfusion was associated with an increased risk of death, acquired infection and acute respiratory distress syndrome. The authors' conclusions reflected the evidence presented, but their reliability was unclear due to the observational design of included studies and lack of formal validity assessment.

Authors' objectives
To evaluate the association between red blood cell (RBC) transfusions and clinical outcome among hospitalised adult patients.

Searching
The MEDLINE (1966 to June 2007), EMBASE and Cochrane Database of Systematic Reviews databases were searched to identify relevant studies in any language. Search terms were reported. Bibliographies of all selected articles and of pertinent review articles were also searched to identify additional studies.

Study selection
Observational studies of hospitalised adult patients that assessed the independent effect (by multivariate analysis) of red blood cell transfusion on mortality and/or the risk of infections, multi-organ dysfunction syndrome or acute respiratory distress syndromes (ARDS) were eligible for inclusion in the review. The primary outcome of interest was mortality. Secondary outcomes of interest were acquired infections, multi-organ dysfunction syndrome and ARDS and, in the case of cardiological and neurological studies, myocardial infarction rate and neurological outcomes scores. The reason for hospitalisation of the patients varied between the studies.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
Data was extracted in order to calculate odds ratios (OR) and 95% confidence intervals (CI) for each outcome. Two independent reviewers performed the data extraction and disagreements were resolved through discussion.

Methods of synthesis
ORs were combined in a meta-analysis using a random-effects model. Heterogeneity was assessed using the Cochran Q statistic. Sensitivity analysis was performed by grouping patients according to the major diagnostic groups of trauma, general surgery, cardiological, neurological studies, myocardial infarction rate and neurological outcomes scores. The reason for hospitalisation of the patients varied between the studies.

Results of the review
Forty five observational studies were included in the review (n=272,596 patients): 21 studies were retrospective cohort studies; and 24 were prospective cohort studies. Cohort size varied from 63 to 78,974 patients (median of 687 patients). RBC transfusion was associated with a statistically significant increase in the risk of mortality (12 studies, OR 1.7, 95% CI: 1.4, 1.9) and a statistically significant increase in the risk of an infectious complication (nine studies, OR 1.8, 95% CI: 1.5, 2.2). Moderate heterogeneity was reported (Q statistics not reported). RBC transfusion was also associated with a statistically significant increase in the risk in developing ARDS (six studies, OR 2.5, 95% CI: 1.6, 3.3) for which there was no evidence of statistically significant heterogeneity. Lack of data precluded the calculation of a pooled OR for multi-organ dysfunction syndrome.

Authors' conclusions
RBC transfusions were associated with increased morbidity and mortality. Transfusion practices may require re-evaluation.
CRD commentary
This review addressed a clear research question and was supported by adequate inclusion criteria. The search was adequate and had no language restriction, which reduces the possibility of language bias. There was no attempt to search for unpublished material, which may mean that relevant studies may have been missed. It was not reported how study selection was performed, which may mean that this process was subject to reviewer error or bias. There was no attempt to assess validity, which means that the reliability of the data derived from the included studies could not be fully assessed. Synthesis methods were appropriate, including the use of a random-effects model given anticipated heterogeneity. The authors' conclusions were an accurate reflection of the results of the review. But, the reliance upon observational studies, of which almost half were retrospective, and the lack of validity assessment meant that the reliability of the authors' conclusions was unclear.

Implications of the review for practice and research
Practice: The authors stated that the risks and benefits of RBC transfusion should be assessed in every patient before transfusion.

Research: The authors stated that additional prospective randomised studies were required to determine the risks and benefits of RBC transfusion in various disease states to investigate their optimal transfusion triggers and the effects of blood storage time and leukodepletion on clinical outcomes.

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