# Healthcare-Associated Infection after Red Blood Cell Transfusion: A Systematic Review and Meta-Analysis of Randomized Trials

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## Introduction

RBC transfusion is a common inpatient procedure. Approximately 14 million units of RBCs were used in the US in 2011, 84.8% of which were leukocyte reduced. Transfusion-related immunomodulation may increase a patient's risk for hospital acquired infection. Approximately 1 in 20 inpatients develop an infection related to their hospital care leading to estimated annual direct medical costs of $28 to $45 billion in the United States.

**Objective:** To evaluate whether RBC transfusion thresholds are associated with the risk of infection and whether risk is independent of leukocyte reduction.

## Materials and Methods

### Search Strategy

MEDLINE, EMBASE, Web of Science Core Collection, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, ClinicalTrials.gov, International Clinical Trials Registry, and the ISRCTN Register were searched using boolean search terms, through 22 January 2014.

### Inclusion Criteria

(1) Randomized trial; (2) Use of two comparator groups in which one group received a restrictive RBC transfusion strategy and the other group received a liberal RBC transfusion strategy; (3) Infectious outcomes were reported.

### Data Synthesis

Risk Ratios (RR) were calculated comparing the risk of infection in the restrictive RBC transfusion group (numerator) to the risk of infection in the liberal RBC transfusion group (denominator).

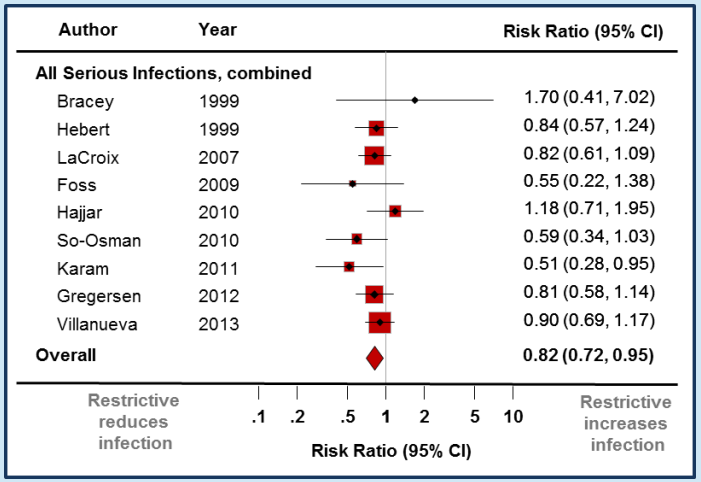
Number needed to treat (NNT) was calculated using the pooled effects and the median risk of infection in the liberal transfusion group.

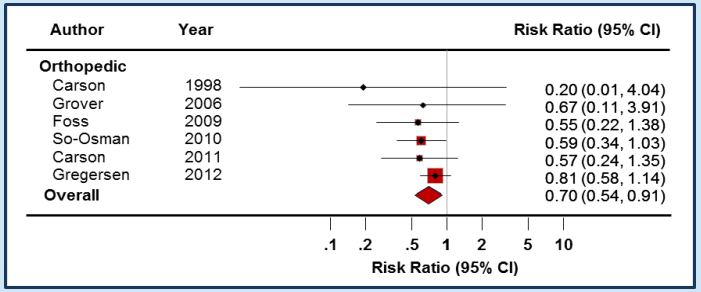
Random effects models were used (DerSimonian and Laird; Profile Likelihood).

## Results

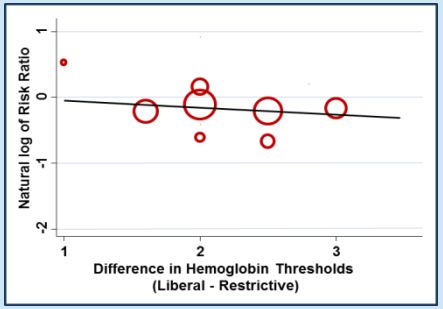
21 randomized trials with 8735 patients met eligibility criteria. The pooled risk of infection was 11.8% (95% CI: 7.0%-16.7%) in the restrictive group and 16.9% (95% CI: 8.9%-25.4%) in the liberal group for the trials that included raw counts of all serious infections combined.

Restrictive transfusion strategies reduced the risk of infection by 18% (95% CI: 5%-28%). The Number Needed to Treat with restrictive strategies to prevent 1 serious infection was 38 (95% CI: 24-122). In the trials that used leukocyte reduced RBC units only, restrictive strategies decreased infection risk by 20%. The pooled RR was 0.82 (95% CI: 0.70-0.97) for the trials using a restrictive hemoglobin threshold of <7.0 g/dL (NNT=20). Patients undergoing hip and knee surgery had a 30% reduction in infection risk with restrictive thresholds.




Patients presenting with sepsis had a 49% reduction in the risk of additional nosocomial infections with a restrictive strategy. The results suggested that wider differences in hemoglobin thresholds between the study groups yielded greater differences in the risk of infection.




## Conclusion

A restrictive RBC transfusion strategy reduced the risk of serious infection when compared to a liberal transfusion strategy.