

INTRODUCTION

Anemia is common in hematologic malignancies, and RBC transfusion is a cornerstone of supportive care. However, the optimal hemoglobin transfusion threshold remains poorly defined. Evidence comparing restrictive and liberal strategies specifically in hematologic malignancies is limited. This systematic review and meta-analysis evaluate the safety and efficacy of restrictive versus liberal RBC transfusion thresholds in this population.

AIM

To evaluate the efficacy and safety of restrictive versus liberal RBC transfusion thresholds in patients with hematological malignancies using systematic review and meta-analytic methods.

METHOD

- Systematic review and meta-analysis following PRISMA 2020 guidelines.
- MEDLINE/PubMed, Embase, Cochrane CENTRAL, Web of Science, and Scopus searched from inception through April 2026.
- Included RCTs, prospective/retrospective cohort studies, and cross-sectional studies comparing restrictive vs. liberal RBC transfusion thresholds.
- Included adult and pediatric patients with hematologic malignancies.
- Two independent reviewers conducted screening, data extraction, and risk-of-bias assessment.
- Risk of bias assessed using Cochrane RoB 2 for RCTs and ROBINS-I for observational studies.
- Pooled estimates calculated using random-effects DerSimonian–Laird models.
- Heterogeneity assessed using I² and Cochran’s Q.
- Certainty of evidence assessed using GRADE.

CONCLUSIONS

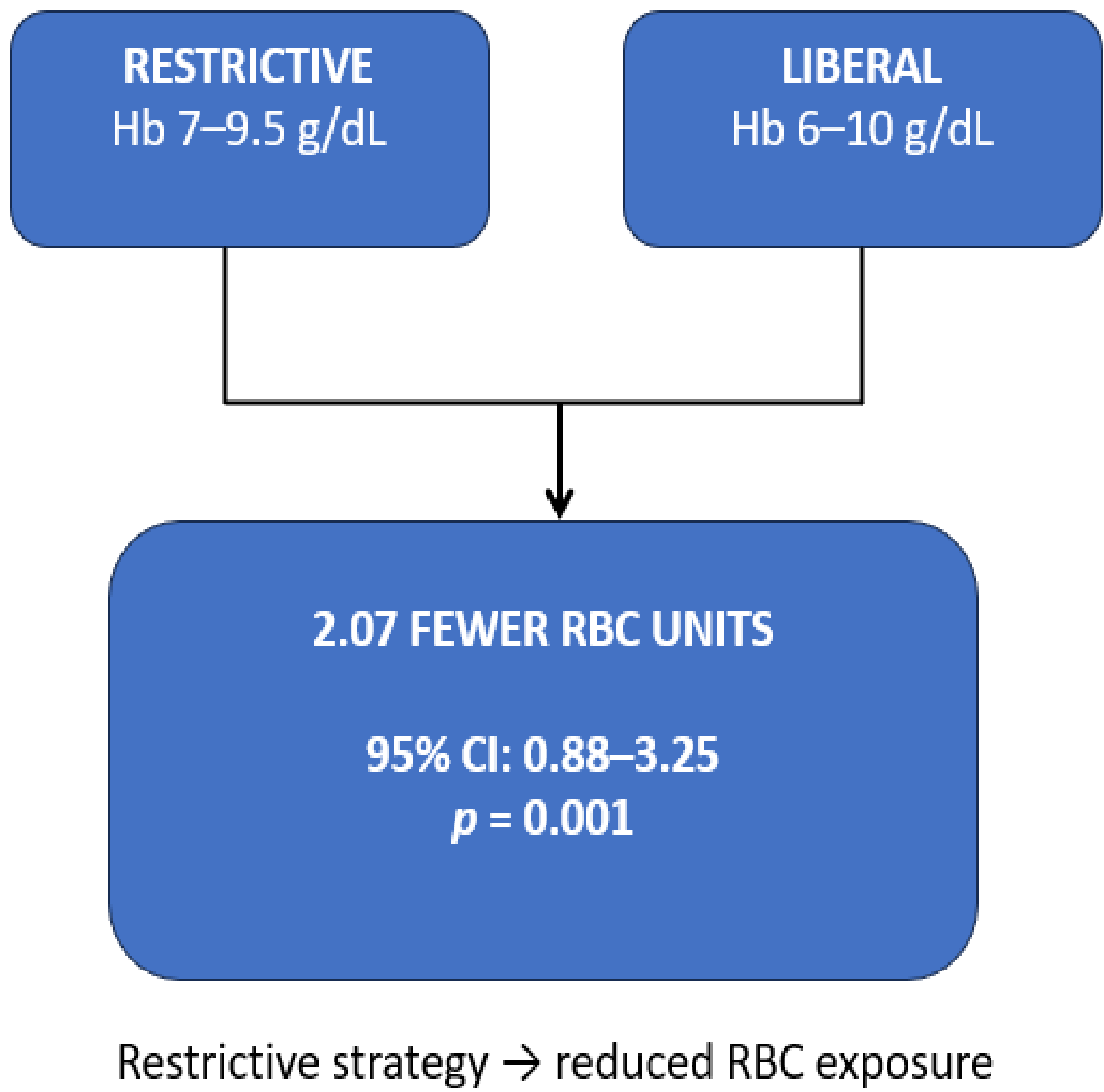
Restrictive transfusion thresholds reduce RBC exposure without clear evidence of harm, but the certainty of evidence is low due to study limitations, heterogeneity, and incomplete reporting. Larger disease-specific randomized trials are needed to define the safest transfusion strategy in this population.

RESULTS

- **12 studies** met eligibility criteria, including **3 RCTs, 8 retrospective cohorts, and 1 cross-sectional study**, enrolling **4,345 patients across 9 countries**.
- Hematologic diagnoses included **leukemia, lymphoma, myeloma, MDS, and mixed malignancies**. Liberal Hb thresholds ranged from **6–10 g/dL**, while restrictive thresholds ranged from **7–9.5 g/dL**.
- **No study was rated at low risk of bias**; observational studies were predominantly rated at high risk of bias.
- **All-cause mortality**: No significant difference between restrictive and liberal strategies (HR 1.18, 95% CI 0.82–1.71; p = 0.38; I² = 72.8%).
- The largest leukemia cohort (**n = 2,511**) reported higher mortality with the restrictive strategy (**HR 1.73, 95% CI 1.30–2.30**), while other studies showed no significant difference.
- **RBC transfusion exposure**: Restrictive strategies resulted in **2.07 fewer RBC units** on average (**95% CI, 0.88–3.25; p = 0.001; I² = 82.6%**).
- **Infection/febrile neutropenia**: No significant difference between strategies (**RR 1.00, 95% CI 0.76–1.31; p = 0.99; I² = 13.4%**).

- **Hospital length of stay**: No significant difference (**MD +0.22 weeks, 95% CI –0.04 to +0.47; p = 0.10; I² = 60.2%**), although the direction favored shorter hospitalization with restrictive transfusion.
- **Significant bleeding**: Only one study provided comparative data (**RR 0.51, 95% CI 0.02–11.50**); evidence was insufficient for a definitive conclusion.
- **ICU admission**: No significant difference was observed in the single available study (**RR 1.04, 95% CI 0.63–1.73**).
- **Other outcomes**: Comparative data for **thromboembolic events, readmission, and transfusion reactions were unavailable**, while quality-of-life data were limited to one study.

- **Evidence certainty**: No outcome reached moderate or high certainty; certainty ranged from **low to very low** because of risk of bias, heterogeneity, small sample sizes, and incomplete outcome reporting.



Outcome	Effect	P-value
RBC units transfused	2.07 fewer units (95% CI 0.88–3.25)	0.001
All-cause mortality	HR 1.18 (0.82–1.71)	0.38
Infection / febrile neutropenia	RR 1.00 (0.76–1.31)	0.99
Hospital length of stay	MD +0.22 weeks (–0.04–0.47)	0.10

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