

Restrictive Versus Liberal Red Blood Cell Transfusion Strategies in Critically Ill Patients With AML and Myelodysplastic Syndromes

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INTRODUCTION

- Restrictive red blood cell (RBC) transfusion thresholds (<7.0 g/dL) are the standard of care in general critical illness, but patients with acute myeloid leukemia (AML) and myelodysplastic syndromes (MDS) are routinely excluded due to profound bone marrow failure and perceived tissue hypoxia risk.
- Clinicians frequently adopt empirical "liberal" transfusion strategies (transfusing at 7.0–7.9 g/dL), despite lacking dedicated safety and efficacy evidence in hematologic ICU populations.
- Emulating a target trial across two independent electronic ICU databases clarifies whether early transfusion in this gray zone improves survival.

AIM

Primary Aim: Evaluate whether an early liberal RBC transfusion strategy within the hemoglobin 7.0–7.9 g/dL "gray zone" reduces in-hospital mortality compared with a restrictive strategy in critically ill AML/MDS patients.

Secondary Aim: Replicate findings across independent academic (MIMIC-IV) and multi-center community (eICU-CRD) cohorts and evaluate ICU mortality.

METHOD

Study Population & Design: Target trial emulation in adult ICU patients with AML or MDS developing hemoglobin 7.0–7.9 g/dL within 72 hours of ICU admission.

Strategy Definitions:

Liberal Strategy: Receipt of packed RBCs (PRBC) within 6 hours of entering the gray zone.

Restrictive Strategy: No PRBC transfusion within the 6-hour window.

Statistical Analysis: Multivariable logistic regression adjusting for age, sex, and baseline index hemoglobin level performed independently in MIMIC-IV (discovery) and eICU-CRD (validation).

CONCLUSIONS

Across two independent multi-center ICU cohorts, early RBC transfusion in the hemoglobin 7.0–7.9 g/dL gray zone was **NOT associated with improved hospital or ICU survival** in critically ill AML/MDS patients.

Restrictive transfusion strategies appear safe in acute marrow failure critical illness, supporting blood conservation protocols and motivating prospective randomized trials in hematologic malignancies.

RESULTS

MIMIC-IV Discovery Cohort (N = 503):

65 patients managed with an early liberal strategy and 438 restrictively.

Crude hospital mortality was comparable: **27.7% (liberal) vs. 26.9% (restrictive)**.

Liberal transfusion did not improve hospital mortality (aOR **0.93**, 95% CI 0.52–1.69) or ICU mortality (aOR **1.17**, 95% CI 0.55–2.46).

eICU-CRD Validation Cohort (N = 167):

17 patients managed liberally and 150 restrictively.

Crude hospital mortality was similar: **35.3% (liberal) vs. 34.0% (restrictive)**.

No significant survival benefit with liberal transfusion for hospital mortality (aOR **0.92**, 95% CI 0.31–2.70) or ICU mortality (aOR **0.87**, 95% CI 0.25–3.03).

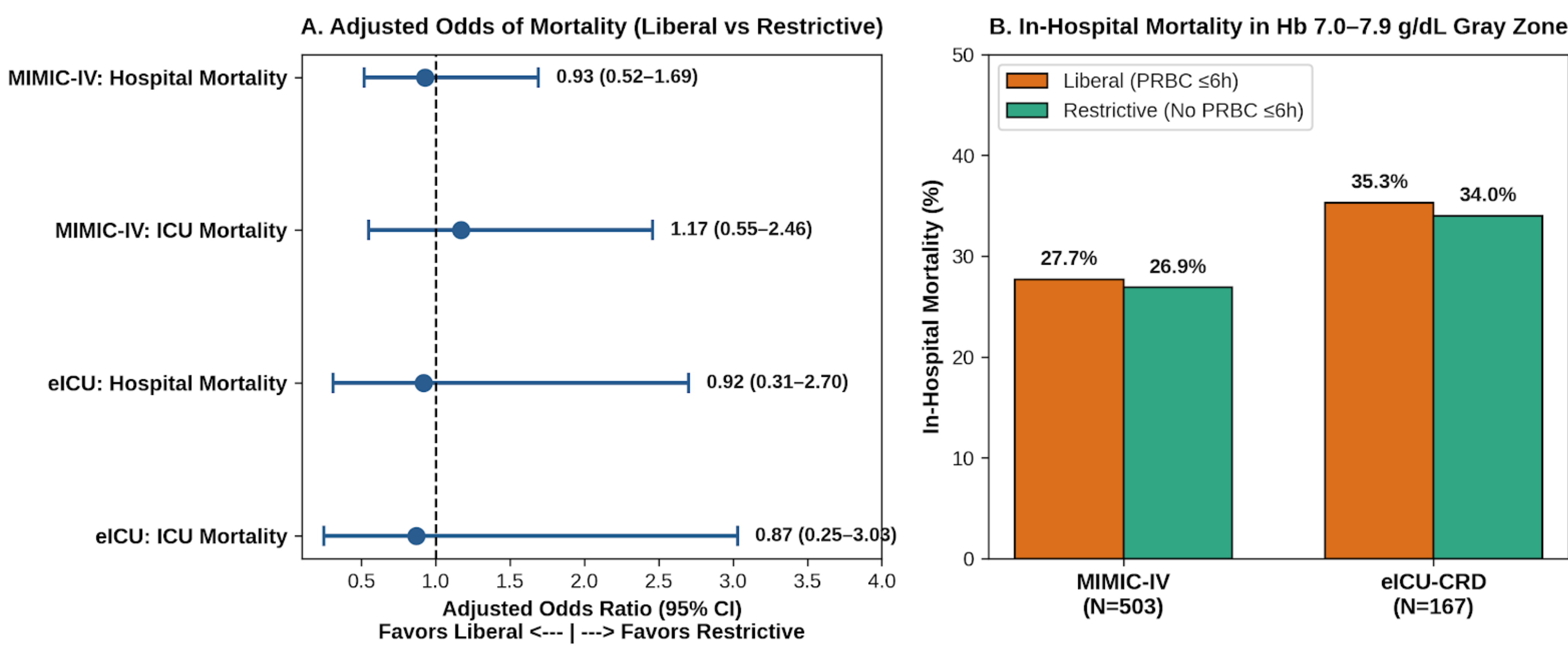


Figure 1. Emulated Target Trial of Early Liberal Versus Restrictive RBC Transfusion in Critically Ill AML/MDS Patients.

(A) Multivariable adjusted odds ratios for hospital and ICU mortality comparing liberal (≤6h PRBC) versus restrictive strategies across MIMIC-IV and eICU-CRD cohorts. (B) In-hospital mortality proportions within the hemoglobin 7.0–7.9 g/dL gray zone, demonstrating no survival advantage with early liberal transfusion.

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