# Preoperative Anemic Patients Have Poor Outcomes; How Can We Optimize These Patients Prior to Surgery?

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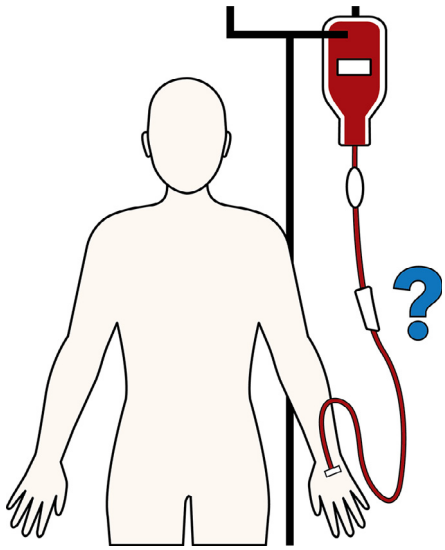
The management of anemia in cardiac surgery remains a great source of debate. Our understanding of the effects of perioperative anemia and blood transfusion has changed considerably over the last few decades; but even in the current era, practice patterns remain widely divergent with transfusion rates between 13% and 60%.[1] Multiple studies have demonstrated that lower intraoperative nadir hematocrits correlate with poorer outcomes.[2–5] However, red-cell transfusion has been correlated with poor long-term survival.[6–8]

In this issue, Jabagi et al tackle 2 important questions: (1) What effect does preoperative anemia (in the absence of intraoperative transfusion) have on postoperative outcomes? (2) Does it benefit these anemic patients to transfuse during bypass (to a post-cardiopulmonary bypass (CPB) hemoglobin [Hb] >9.5 g/dL)? The authors should be commended for their attempts to address not 1, but 2 important questions in the perioperative management of anemia.

In a retrospective review of nearly 4000 patients from their single-center institution over a 2-year period, the authors confirm previous observations that untreated anemia is associated with significantly increased risks of death, stroke, and renal failure. To account for selection bias in this cohort study, a propensity score matching algorithm was used. Ultimately, 392 anemic patients who did not have intraoperative transfusion matched to 392 controls for the intraoperative anemia analysis and 261 low post-CPB Hb subjects were matched to 261 high post-CPB Hb patients. The subgroups had significant heterogeneity before propensity matching, suggesting unrecognized covariates may be contributing to differences in outcome.

The authors demonstrated that preoperative anemia, in the absence of red blood cell transfusions, is associated with significantly increased risks of perioperative death, stroke, renal failure, and other composite outcomes. It is unclear whether preoperative anemia is a marker for unrecognized, confounding patient comorbidity, or whether the anemia itself is causative. In the intraoperative transfusion analysis, the authors found no difference between propensity-matched anemic patients based on a transfusion threshold of 9.5 g/dL at the end of CPB, an observation consistent with the findings of the TRICS investigators who found no difference in outcomes in cardiac surgery patients randomized to a transfusion threshold of 9.5 vs 7.5 g/dL at 6 months postop.[9]

Although the results of the current analysis are not new,[10] and a host of methodological modifications can be suggested to strengthen the conclusions of the study, it exposes the significant knowledge gaps in our understanding of optimal blood management strategies despite decades of scholastic inquiry. This begs the question, does correcting preoperative



Patients with preoperative anemia are at increased risk, yet the optimal management strategy remains unclear.

**Central Message**

Intraoperative transfusion cannot reduce the increased risk associated with preoperative anemia.

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anemia improve outcomes, or is anemia just a marker of other illnesses and risk factors that are unlikely to be reversible? How can we optimize these patients preoperatively to reduce their risk? Are these differences in outcomes dependent on the specific type of anemia? Should anemic patients be transfused well ahead of the index operation rather than concurrently? If so, what is the ideal interval between transfusion and surgery? Is the anemia/transfusion interaction especially prominent in coronary artery bypass graft patients given the association of RBC transfusions and graft failure presumptively based on an inflammatory mechanism?[9] Should transfusion thresholds be modified based on patient's age, comorbidities, and/or the development of perioperative complications?[11] On cardiopulmonary bypass, should we be looking at total oxygen delivery and not just Hb with a fixed bypass flow rate? Like so many retrospective analyses, this body of work has generated even more unanswered questions that warrant further analysis.

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