Blood: Can't live with it, can't live without it

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The literature on transfusion-related morbidity and mortality in cardiac surgical patients is vast. Despite traditional teaching that patients with coronary artery disease benefit from hematocrits greater than 30%, the majority of studies published demonstrate increases in short- and long-term mortalities among cardiac surgical patients receiving packed red blood cells (pRBCs).¹⁻³ A number of studies warn that exposure to any quantity of transfused blood is associated with decreased survival after coronary artery bypass grafting.^{3,4} In contrast, *The New England Journal of Medicine* published a randomized, controlled study in 2015 that revealed a decrease in survival among those cardiac surgical patients randomly allocated to a restrictive transfusion threshold (hemoglobin <7.5 g/dL) relative to a liberal transfusion threshold (<9 g/dL). Despite the increase in mortality in the restrictive group, no difference with respect to postoperative morbidity, such as sepsis, stroke, or acute kidney injury, was observed.⁵

The study in this issue of *The Journal* by Bjursten and colleagues⁶ from Lund, Sweden, presents a large (9907 patients in 11 years) retrospective analysis from a single institution detailing the relationship between blood product use and mortality in patients after coronary artery bypass grafting, aortic valve replacement, or both procedures. Bjursten and colleagues⁶ found that the use of sex-mismatched pRBCs increased postoperative mortality. They also discovered that transfusing small amounts of leukocyte-depleted (LD) pRBCs did not affect mortality, whereas transfusion of any amount of non-LD pRBCs or of large amounts of LD pRBCs increased postoperative mortality. Finally, in a contrast with previous investigations, they found that increased age of blood products administered was not associated with increased postoperative mortality.

Strengths of this study include its size, the duration of follow-up, and the use of Sweden's national tax registry for accurate tracking of patient deaths. This study is an important addition to the extensive transfusion literature, because it identifies potential confounding risk factors such as sex-mismatching and use of non-LD products. Although previous studies have demonstrated an increase

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Central Message

Transfusion of sex-mismatched red blood cells is associated with increased long-term mortality, but transfusing 1 to 2 units of leukocyte-depleted red blood cells does not decrease survival.

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in mortality for patients transfused simply 1 unit of pRBCs,² this study reveals that transfusing 1 to 2 units of LD pRBCs does not increase mortality.

The primary weakness of this study is its retrospective design and the inherent limitations associated with that process, including reliance on accurate data collecting, lack of quality data, and the difficulty of identifying associations versus causations when examining results. In addition, this study relies on advanced statistical analysis, often a criticism of retrospective database reviews. On a positive note, however, one of the article's coauthors is a professor of epidemiology, and the manuscript underwent statistical review by one of *The Journal's* statistical editors. Finally, Bjursten and colleagues⁶ did not address secondary morbidity outcomes. Cardiac surgery's mortality is multifactorial, and secondary outcomes would have strengthened the results.

Overall, this article by Bjursten and colleagues⁶ is an important adjunct to the literature on transfusion during cardiac surgery, because it expands on the knowledge of potential sex-mismatch risk and reiterates the potential benefits of limiting transfusion to LD pRBCs. This study suggests that sex-mismatched blood transfusions may create a high enough risk to necessitate a change in transfusion protocols. As for leukocyte depletion, many countries already have universal leukoreduction strategies, including Canada, Britain, and Germany. Perhaps this article by Bjursten and colleagues⁶ calls for the United States to pursue the same policy.

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