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Sex-mismatched red blood cell transfusions and mortality

When a unit of red blood cells is selected for transfusion, compatibility is determined by the blood type of the donor and the recipient, but not their sex. However, observational studies that have looked at the relationship between donor characteristics and patient outcomes suggest that identifying a compatible donor may involve knowing more than just their blood type. Research findings point to donor characteristics like sex, age and parity (the number of times a woman has carried a pregnancy to a viable stage), as factors that may affect patient outcomes after blood transfusion.

This study summarized evidence from studies that examined the impact of sex-mismatched transfusions (when a patient receives a red blood cell transfusion from a donor of the opposite sex) on patient outcomes.

IN BRIEF: More rigorous data are required to better understand the relationship between sex-mismatched red blood cell transfusions and patient outcomes.

What did the researchers do?

The researchers conducted a systematic review and meta-analysis. A systematic review of the literature searched six databases and included both randomized controlled trials (RCTs) and observational studies. Studies were considered to be eligible for inclusion in the review if they compared outcomes in patients exposed to sex-matched and sex-mismatched red blood cell transfusions.

Researchers independently extracted data and assessed study quality. A three-level meta-analytic model was applied.

What did the researchers find?

The researchers included five eligible studies in their analysis that, considered together, reported on 86,737 patients. All were retrospective observational studies of patients transfused during a hospital admission. No RCTs were found. The outcome reported in all studies was mortality, but the follow-up times varied from in-hospital mortality to mortality assessed at 12 years. Of the five eligible studies, three focused on patients undergoing cardiovascular surgery, and two focused on all transfused patients who were admitted to hospital.

The overall analysis showed that sex-mismatched red blood cell transfusions were associated with a higher risk of death compared with sex-matched transfusions. There was no significant increase in mortality with sex-mismatched transfusions for the subgroup of patients who had cardiovascular surgery. The data were prone to confounding, selection bias and reporting bias. Certainty of the evidence was very low.

How can you use this research?

This study found that sex-mismatched red blood cell transfusions were associated with a higher risk of death compared to sex-matched transfusions. The study authors note that the implications of this study are limited. The certainty of the evidence was very low because only observational studies—which are at a higher risk of bias—were included in the analysis. Scientifically rigorous RCTs are required to better understand the relationship between sex-mismatched red blood cell transfusions and recipient outcomes.

If sex-matching for RBC transfusion is shown to benefit patients through RCTs, this could change how we define and select a compatible unit of RBC.

These findings suggest that the impact of sex-mismatching in blood transfusion is an area worthy of further exploration.

About the research team: This This research was led by **Dr. Michelle Zeller,** medical officer at Canadian Blood Services and hematologist and transfusion specialist at McMaster University. The research group included **Nancy Heddle**, professor emeritus at McMaster University and research director of the McMaster Centre for Transfusion Research (MCTR); **Dr. Donald Arnold**, director of MCTR and associate professor at McMaster University; **Dr. Jason Acker**, Canadian Blood Services senior scientist and professor in the department of laboratory medicine and pathology at the University of Alberta; **Dr. Bram Rochwerg**, assistant professor in the department of medicine at McMaster University; and **Dr. Christopher Hillis**, hematologist at McMaster University. Erin Jamula, Na Li, and Shannon Lane are staff at MCTR; Ryan Runciman and Naveen Ahmed were students at MCTR.

This Research Unit is derived from the following publication:
[1] Zeller MP, Rochwerg B, Jamula E, Li N, Hillis C, Acker JP, Runciman RJR, Lane SJ, Ahmed N, Arnold DM, Heddle NM. Sex-mismatched red blood cell transfusions and mortality: A systematic review and meta-analysis. *Vox Sang*. 2019 Jul;114(5):505-16.

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