The Risks Associated with Red Blood Cell Transfusion

Implications for Critical Care Practice

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KEYWORDS

- Blood transfusion • Complications of transfusions
- Critical care blood replacement intervention

KEY POINTS

- Blood replacement is a common intervention in critical care settings.
- Blood replacement is not without risk and may increase morbidity and mortality in critically ill patients.
- Symptomatic replacement may warrant further consideration, versus relying solely on physiologic data.
- Blood replacement may have greater risk than benefit in certain clinical conditions and in different age groups.

INTRODUCTION

Anemia is among most common abnormal laboratory finding in the population of critically ill patients. Approximately 95% of patients in the intensive care unit (ICU) for 3 days or more are anemic, and approximately 50% of these patients receive an average of 5 units of packed red blood cells (PRBCs) while in the ICU.[1,2] Many of these transfusions are given to treat a low hemoglobin, not active bleeding. In the past, anemia was thought to lead to increased morbidity and mortality in the critically ill patient and transfusion with PRBCs was often implemented to maintain a preillness blood value to prevent morbidity and mortality. However, whether the increased morbidity and mortality seen in the ICU population is related to the anemic state or more severe disease process is not clearly explicated.[3] Traditionally, the goal of administering PRBCs to the critically ill patient was to increase hemoglobin levels, to improve the blood's oxygen carrying

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capacity, and to oxygenate hypoxic tissue. However, an emerging body of evidence is demonstrating that this clinical benefit is often not achieved.

In patients with active bleeding or hemorrhage, PRBC transfusion can be a life-saving intervention. With acute blood loss, transfusion of PRBCs can increase arterial oxygen content and cardiac output. However, understanding the mechanism of anemia in the critically ill population, in the absence of active blood loss, is more complex and multifactorial. These factors include multiple phlebotomies, nutritional deficiencies and decreased erythropoietin production. Critical illness alone mediates a decrease in red blood cell (RBC) mass, leading to anemia. This effect is mediated by a variety of inflammatory cytokines such as interleukin-1 and tumor necrosis factor-alpha, which inhibit erythropoietin production and lower the rate of RBC production. As a result of lowered rate of production and increased iatrogenic loss through frequent phlebotomy, hemoglobin levels decrease.[2] Some decrease in hematocrit may be beneficial in the critically ill patient because the decrease in viscosity may increase oxygen availability to the cell by improving the flow of blood in the microcirculation. Consequently, the transfusion of PRBCs to increase the hemoglobin concentration, which increases the oxygen-carrying capacity of the blood could very well be offset by a decrease in cardiac output because of the increase in blood viscosity associated with a decreased sympathetic response. Thus, blood transfusion in the critically ill population, in the absence of active bleeding, may increase morbidity and mortality among critically ill patients. This systematic review is designed to answer the question, in the critically ill patient who is not actively bleeding, is the transfusion of a single unit of PRBCs helpful or harmful?

METHOD

Study Design

The need for scientific evidence to determine best practices is essential to safe, quality patient care. This systematic review followed the methodological standards recommended by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Statement.[4] The purpose was to identify, evaluate, and synthesize empirical evidence to answer the question, "In the critically ill patient who is not actively bleeding, is the transfusion of a single unit of PRBC helpful or harmful?" A systematic review presents a synthesis of the evidence from which conclusions can be drawn to make informed decisions about best practices in the patient care setting.[5]

Search Criteria

A search was conducted to identify empiric evidence related to the benefit or harm of transfusion of PRBCs in the critically ill population, in the absence of active bleeding. An electronic search followed by a manual search and screen was conducted. The electronic databases used for this review included PubMed, CINHAL, Cochrane, MedLine, Scopus, BMJ Clinical Evidence, and Web of Science. The search strategy was constrained to empirical studies on critically ill patients of any age in hospital settings and receiving at least a single PRBC transfusion. Studies published between 2008 and 2016 were included. The review did not exclude studies based on language. A manual search of the reference lists of the published articles was conducted to identify additional eligible studies for review. Manual screening of published articles was conducted to verify the empiric evidence was clinically appropriate and specific to the critically ill population.

Search terms included the keywords blood, blood products, adverse blood transfusion reactions, risk factors and blood transfusion, side effects of blood products, and blood transfusions and critical OR emergency care. To get relevant articles, the

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