

Title:

Red Blood Cell Transfusion in the ICU: A Systematic Review

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Session Title:

Evidence-Based Practice in the ICU

Slot:

H 12: Monday, 30 October 2017: 2:45 PM-3:30 PM

Scheduled Time:

3:05 PM

Keywords:

Complications of Red Blood Cell Transfusion, Critical care settings and Systematic review of evidence

References:

Dos Santos A, Sousa A G, Piotto R, Pedrosa J. (2015). Mortality risk is dose-dependent on the number of packed red blood cell transfused after coronary artery bypass graft. *Braz J Cardiovasc Surg*, 28(4): 509-517.

Kumar R, Gupta M, Gupta V, Kaur A, Gupta S. (2014). Acute transfusion reactions (ATRs) in Intensive Care Unit (ICU): A retrospective study. *J Clin Diagn Res*, 8(2): 127-129.

Rubinstein C, Davenport D, Dunnagan R, Saha S, Ferraris V, Xenos E. (2013). Intraoperative blood transfusion of one or two units of packed red blood cells is associated with a fivefold risk of stroke in patients undergoing elective carotid endarterectomy. *Journal of Vascular Surgery*, 57(2): 53S-57S.

Szpila B E, Ozrazgat-Baslanti T, Zhang J, Lanz J, Davis R, Rebel A, Vanzant E, Efron P A. (2015). Successful implementation of a packed red blood cell and fresh frozen plasma transfusion protocol in the surgical intensive care unit. *PLoS One*, 10(5): e0126895.

Toy P, Bacchetti P, Grimes B, Gajic O, Murphy E, Winters J, Gropper M, Looney M. (2015). Recipient clinical risk factors predominate in possible transfusion-related acute lung injury. *Transfusion*, 55(5): 947-952.

Abstract Summary:

In the critically ill patient, who is not actively bleeding, is the transfusion of a single unit of red blood cells helpful or harmful? This presentation will share a systematic review of the evidence to answer the question. Implications for practice and education of care providers will be outlined.

Learning Activity:

LEARNING OBJECTIVES	EXPANDED CONTENT OUTLINE
Summarize the current evidence of the risks and benefits associated with PRBC transfusion in the critically ill patient.	Incorporate outcomes from the conduct of the systematic review of the literature. Emphasis will be placed upon the process and findings through description of the literature search

	(keyword and database selection); the retrieval and sorting of findings from 372 studies to the inclusion of 10; and the quality of the studies included, as well as the need for future rigorous research related to PRBC transfusion in the critically ill patient.
Describe the risks and benefits of PRBC transfusion as found in the current scientific literature related to the critically ill population.	A common practice in critically ill patients is to transfuse PRBCs secondary to low hemoglobin and hematocrit (H&H) values. Given that the evidence finds that a decreased H&H value may in fact be secondary to a common physiologic response in the critically ill, outcomes from the review will be discussed regarding the identified risks and benefits of PRBC transfusion as a common practice.

Abstract Text:

Anemia is one of the most common abnormal laboratory findings in the population of critically ill patients. Approximately 95% of patients in the ICU for three days or more become anemic, and approximately 50% of these patients receive an average of five units of PRBCs while in the ICU. ^{1,2} Many of these transfusions are given to treat a low hemoglobin finding and not active bleeding. In the past, anemia was thought to lead to increased morbidity and mortality in the critically ill patient and transfusion with packed red blood cells (PRBCs) was often implemented to maintain a pre-illness blood value to decrease morbidity and mortality. However, whether the increased morbidity and mortality seen in the ICU population is related to the anemic state or a 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 capacity and to oxygenate hypoxic tissue. However, an emerging body of evidence is demonstrating that this clinical benefit is often not achieved. This presentation will share findings from a systematic review of the evidence to answer the question; "In the critically ill patient, who is not actively bleeding, is the transfusion of a single unit of PRBCs of clinical benefit or clinically harmful?"

Using the methodological standards recommended by the PRISMA Statement, an electronic search followed by a manual search and screen was completed. The electronic databases used for this review included PubMed, CINAHL, 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. A total of 372 studies were retrieved. The screening process eliminated duplicate articles (N=6) and articles with irrelevant outcomes (N=353). Criteria for irrelevant outcomes included transfusion in a situation with active bleeding, non-critically ill population, or use of volume replacement other than red blood cell transfusion. Thirteen studies remained for further review. One article (N=1) was excluded because the outcome was not considered eligible for inclusion, two articles (N=2) were found to be duplicated. The remaining ten studies were selected for inclusion in this review.

The studies examined the effects of transfusing one unit of PRBCs in the critically ill patient. The majority of study designs included in this systematic review of the literature were either retrospective or prospective, and only one was a randomized-controlled trial. A common finding among all studies was that transfusion of a single unit of PRBCs in the critically ill patient increases risk and may lead to higher morbidity and mortality. The studies relied upon biophysical data to ascertain risk associated with PRBC transfusion. Based on these findings, it appears that all included studies identified some risk associated with the transfusion of a single unit of PRBCs in the critically ill patient. Following careful analysis of the

patient outcomes from each of the included studies, the following four primary clinical findings categories were formulated.

- No increased risk in single versus double transfused PRBCs
- Risk increases as the number of transfused PRBCs increases
- Immune changes occur due to transfusion of PRBCs
- Patient survival following a transfusion of PRBCs is not increased

The evidence demonstrates the occurrence of health risks associated with receiving a PRBC transfusion in the critically ill population. The findings reveal that in some at-risk patients, even a single unit of PRBCs may result in acute respiratory distress syndrome, acute renal injury, cardiogenic shock, infection, and higher mortality and morbidity rates when compared to other ICU patient populations. The implications of this evidence for patient care guidelines and the education of healthcare providers will be outlined. Additionally, this review demonstrates the need to conduct further more rigorous research studies of this common therapeutic intervention in the critically ill population to ascertain relative risk and benefit.

References

1. Marik PE, Corwin HL. Efficacy of red blood cell transfusion in the critically ill: A systematic review of the literature. *Crit Care Med* 2008 Vol. 36, No 9. 2667-2674. doi:10.1097/CCM.0b013e3181844677.
2. Kamran MA, Puri N, and Gerber DR, "Anemia and Blood Transfusions in Critically Ill Patients," *Journal of Blood Transfusion*, vol. 2012, Article ID 629204, 7 pages, 2012. doi:10.1155/2012/629204.
3. Patel MS, Carson JL. Anemia in the Preoperative Patient. *The Medical Clinics of North America*. 2009;93(5). 1095-1104. doi: 10.1016/mcna2009.05.007.