

Red Blood Cell Transfusion Strategies in Adult and Pediatric Patients with Malignancy



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KEYWORDS

• Randomized clinical trials • RBC transfusion • Malignancy • Bleeding

KEY POINTS

- Randomized clinical trials of red blood cell transfusion practice have provided high-quality evidence in the management of common complications of cancer.
- The preponderance of clinical trial data supports using restrictive transfusion strategies (hemoglobin levels between 7 and 8 g/dL) in most hospitalized medical and surgical patients.
- Additional studies are needed to understand best practice in the management of anemia in cancer patients with a focus on quality of life in addition to clinical outcomes.

INTRODUCTION

Anemia is common in patients with malignancy and has been associated with increased morbidity and mortality.¹ Its incidence has been correlated with advancing cancer stage and declining functional status at the time of diagnosis.² The severity of anemia has been found to be proportional to aberrations in inflammatory cytokines as well as hepcidin, ferritin, and erythropoietin levels.³

The cause of anemia in the setting of malignancy is often multifactorial and as with anemia in general includes 3 broad categories: decreased production, increased destruction, and acute blood loss. In addition to anemia related to suppression of erythropoietin, infection, and decreased red blood cell (RBC) survival owing to auto-antibodies, causes specific to malignancy include direct effects of a neoplasm such

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as leukemic infiltration of the bone marrow as well as the effects of chemotherapy and radiation.⁴

Patients with malignancy often undergo intensive medical and surgical therapies to treat their disease. The prevalence of anemia in patients varies by the type of malignancy and the time course of diagnosis and treatment with published rates ranging from 30% to 90%.^{1,5-7} Surgical treatment of malignancy often accepts significant blood loss and results in intraoperative or postoperative anemia. In parallel, medical treatment with chemotherapy often results in a hypoproliferative state and subsequent anemia. This is particularly true for patients requiring myeloablative chemotherapy or hematopoietic stem cell transplantation, who almost universally develop severe anemia that necessitates RBC transfusion.^{6,8} During and after therapy, it is also not uncommon for cancer outpatients to require RBC transfusions intermittently for weeks or months.

With the performance of many randomized clinical trials there has been significant progress in understanding when to transfuse RBCs in hospitalized medical and surgical patients. Although these clinical trials were not focused on patients with malignancy, many of them included such patients and provide high-quality evidence in the management of common complications of cancer such as acute bleeding and infection.

Clinical trials to date have focused on acute conditions requiring hospitalization, and little evidence exists in the management of chronic anemia such as that of patients with hematologic malignancy. The current controversy for the use of RBCs includes the optimal hemoglobin (Hgb) trigger for transfusion and the impact of different transfusion strategies on quality of life for both inpatients and outpatients. Most outcomes collected in clinical trials relate to mortality and morbidity outcomes, such as cardiac events and hospital duration of stay. Functional status and quality of life have not been outcomes in almost all of these studies, despite oncologic society guidelines advising RBC transfusions be administered to maintain quality of life.^{9,10}

In this paper, we review the randomized clinical trials evaluating RBC transfusion in the management of anemia related to common complications of malignancy. We begin by describing the goals of therapy in acute and chronic settings. We then review the risks of anemia and summarize current clinical trial data and their role in the development of society guidelines for RBC transfusion practice.

GOALS AND RISKS OF RED BLOOD CELL TRANSFUSION

The often-stated goal of RBC transfusion is to improve oxygen delivery to the tissues. However, the measurement of oxygen delivery is challenging and thresholds for transfusion are generally well above the level needed for tissue oxygenation.¹¹ In clinical trials, the impact of RBC transfusion has been measured in relation to symptoms and clinical events. In hospitalized patients, the goal of transfusion is to maximize survival and minimize morbid events such as infection and myocardial infarction. In contrast, the goals of RBC transfusion for chronically anemic patients with hematologic conditions or malignancies are to enhance quality of life and function while minimizing the side effects of chronic exposure to transfusion.¹² Thus, in acute settings, studies generally focus on mortality and morbidity whereas in chronic settings they focus on symptoms and function.

RBC transfusions include biologically active products that may induce immune responses and expand vascular volume. With advances in transfusion medicine, complications related to transfusion-transmitted infections, transfusion-related acute lung injury, and severe hemolytic reactions have become uncommon.¹³ However, immune modulation, iron overload, or prothrombotic effects related to transfusion may have short- and long-term clinical sequelae.

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