

## BLOOD TRANSFUSION: INDICATIONS, PROCEDURE, AND CLINICAL CONSIDERATIONS

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*Blood transfusion is a critical intervention in modern medicine, used to treat patients suffering from blood loss, anemia, or coagulopathy. It involves the administration of blood or its components, such as red blood cells, plasma, and platelets. Despite being a life-saving procedure, transfusions carry inherent risks, including transfusion reactions, infections, and circulatory overload. Evidence-based practices now favor restrictive transfusion strategies, minimizing unnecessary transfusions while ensuring patient safety. This article reviews the clinical indications for blood transfusion, the procedures involved, potential risks, and recent advances in transfusion medicine.*

### Introduction

Blood transfusion has been a cornerstone of medical practice for over a century, playing a vital role in managing acute blood loss, chronic anemia, and various coagulopathies. Over time, improvements in transfusion medicine, such as blood typing, screening for infectious diseases, and the advent of component therapy, have significantly reduced the risks associated with transfusion. Despite these advances, inappropriate or unnecessary transfusion remains a concern. As a result, there has been a shift toward more conservative, evidence-based approaches to transfusion management, such as restrictive transfusion strategies. These strategies aim to minimize transfusions while ensuring patients receive adequate treatment.

### Blood Transfusion Procedures

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Blood transfusion involves several critical steps to ensure both patient safety and the effectiveness of the intervention. The first step is blood typing to determine the patient's blood group and ensure compatibility with the donor blood. Cross-matching is then performed to further reduce the risk of hemolytic reactions. Once the blood is matched, screening for infectious diseases like HIV(human immunodeficiency virus), hepatitis B and C, and syphilis is carried out to prevent transmission of these pathogens.

The transfusion itself is administered intravenously, typically using a drip set or an infusion pump, and the patient is monitored for any signs of adverse reactions. Transfusion reactions, although rare, may include allergic reactions, fever, or more serious complications like transfusion-related acute lung injury (TRALI) or transfusion-associated circulatory overload (TACO). These reactions require immediate attention and management.

One of the critical aspects of modern transfusion practices is the use of component therapy. Instead of transfusing whole blood, which is less common today, specific blood components such as red blood cells, plasma, and platelets are administered based on the patient's needs. Red blood cells are used to treat anemia, while plasma is given to correct clotting deficiencies, and platelets are used in patients with bleeding disorders. This approach reduces the risks associated with whole blood transfusion and ensures that patients receive the most appropriate therapy for their condition.

#### Risks and Complications

Despite its life-saving role, blood transfusion is not without risks. Hemolytic reactions can occur when incompatible blood is transfused, leading to the destruction of red blood cells. Allergic reactions are another potential complication, ranging from mild symptoms like rashes to more severe responses such as anaphylaxis. Transfusion-related acute lung injury (TRALI) is a rare but serious complication, where the patient develops sudden respiratory distress after transfusion, typically within six hours.

One of the most concerning complications is transfusion-associated circulatory overload (TACO), where the rapid infusion of blood products leads to fluid overload, resulting in heart failure, especially in patients with pre-existing cardiac conditions. These risks highlight the importance of careful monitoring and adherence to transfusion guidelines.

In addition to immediate reactions, blood transfusion carries a small but significant risk of transmitting infections, even though the likelihood has decreased dramatically with improved screening techniques. Blood banks now screen for a range of infectious agents, including HIV, hepatitis B and C, and syphilis, significantly reducing the risk of transfusion-transmitted infections.

### Restrictive Transfusion Strategies

Recent evidence suggests that a more restrictive approach to transfusion can be equally or more effective than liberal transfusion practices. Restrictive transfusion strategies typically involve transfusing blood only when hemoglobin levels drop below a certain threshold (usually 7 g/dL in stable patients). These strategies aim to reduce unnecessary transfusions, which not only minimizes exposure to potential risks but also conserves valuable blood products.

Multiple studies have demonstrated that restrictive transfusion practices are associated with better clinical outcomes in certain populations, including critically ill patients and those undergoing surgery. This approach not only minimizes the risks of transfusion but also leads to fewer complications such as infections and transfusion-related acute lung injury (TRALI).

### Conclusion

Blood transfusion remains an essential and life-saving procedure in modern healthcare, especially in cases of severe blood loss or impaired oxygen transport. Advances in transfusion medicine, including the shift toward component therapy and the adoption of restrictive transfusion strategies, have significantly improved patient safety. However, the procedure carries inherent risks, including allergic reactions, hemolytic reactions, and infections, which must be carefully managed. By adhering to evidence-based guidelines and focusing on patient-specific needs, healthcare providers can ensure that blood transfusion is used safely and effectively, maximizing benefits while minimizing risks.

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