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The transfusion dilemma – Weighing the known and newly proposed risks of blood transfusions against the uncertain benefits

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Due to its significant role in saving lives, blood transfusion became one of the most commonly used therapies in medicine. In the USA red blood cell transfusions, for instance, are given to an estimated 3–4 million patients per year. However, the accepted benefits of transfusion do not come without harm. Acute transfusion reactions have been estimated to occur in almost one-fifth of total transfusions, with serious reactions in approximately 0.5%. Although methods of blood collection, preparation and storage have improved significantly, potential complications and controversial efficacy, especially of red blood cell transfusions, are still a major concern. One long-standing primary concern has been bacterial and viral contamination but recently other risks have been identified, mostly related to recipient immunomodulation and storage lesion-related changes.

In this article, we emphasise the most common transfusion reactions, pathophysiology, clinical and laboratory findings along with the management and preventive measures wherever available.

During the last half of the 20th century blood transfusion became one of the most commonly used therapies in medicine. The most important roles of transfusion are the life-saving applications in severely bleeding patients as well as in life-threatening anaemia. Despite advanced and improved resuscitation techniques, transfusion remains virtually the only effective therapy in such patients. However, the accepted benefits of transfusion entail significant risks.[1] During the late 1980s, acute

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transfusion reactions were estimated to occur in 20% of total transfusions, with serious reactions in approximately 0.5%.[2]

Throughout the last two decades, methods of blood and blood product collection, preparation and storage have improved significantly, and some substantial transfusion risks drastically reduced. This is particularly true for risks related to infectious organisms contaminating the transfusion. Nevertheless, potential complications and controversial efficacy, especially of red blood cell (RBC) transfusions, are still a major concern and recently have become a primary focus of research and clinical interest. Although RBC transfusion remains a key therapy prescribed by physicians of all specialities with an estimated of 3–4 million patient recipients per year in the USA, there is little or no evidence base for current practices, nor clear indications for transfusion in most clinical settings.[3]

Transfusion therapy

The benefit of blood transfusions long was thought to outweigh any related risks; however, associated hazards have been closely examined during the last few decades. One long-standing primary concern was bacterial and viral contamination but recently other risks have been investigated, primarily related to recipient immunomodulation and storage lesions related changes in blood cells (red cells and platelets).

In transfusion medicine, several blood products can be prepared and used as replacement therapy; however, four of these products are more commonly used in general practice: RBCs, fresh frozen plasma (FFP), platelets and cryoprecipitate. RBC transfusions are mainly administered to improve tissue oxygenation in cases of anaemia or acute blood loss due to trauma or surgery. As there are no specific signs or laboratory parameters that can consistently and reliably indicate the need for RBC transfusion in any patient, physicians most often depend on their clinical experience and the haemoglobin concentration. Platelet transfusions, on the other hand, are often prescribed for bleeding patients after major trauma and/or during major surgery, for patients who are undergoing chemotherapy, stem cell transplant or organ transplant. In addition to the underlying condition, other factors should also be considered before platelet transfusion. Thus, developing a standard transfusion guideline has become the focus of most transfusion centres recently. For instance, a platelet count of $<10 \times 10^3\ \mu l^{-1}$ requires a prophylactic platelet transfusion in most settings.[4,5] With a platelet count between 20 and $50 \times 10^3\ \mu l^{-1}$, platelet transfusion is usually recommended with active bleeding or if the patient is undergoing major surgery or an invasive medical procedure.

FFP is mostly transfused for coagulation factor replacement in acute serious bleeding, major trauma that requires massive transfusion, liver failure with bleeding, in liver transplant or for vitamin K antagonist anticoagulant reversal. Another major use of FFP is in aphaeresis for thrombotic thrombocytopenic purpura (TTP). Plasma may also be administered in some cases of disseminated intravascular coagulopathy (DIC). Cryoprecipitate is mostly transfused for fibrinogen replacement as in liver failure or in massive bleeding.

Several strategies such as leucoreduction (proven in randomised trials for both red cell[6] and platelet transfusions)[7] and shorter storage times (still under investigation) have been employed to reduce transfusion complications. Another approach to reduce transfusion-related reactions is to reduce the number of transfusions administered. Up until few years ago, a haemoglobin concentration of $10\ g\ dl^{-1}$ was used as a trigger for RBC transfusion regardless of the patient's underlying condition. However, most of recent clinical trials have demonstrated that a restrictive strategy is as safe or safer and results in fewer transfusions.[8–14]

Transfusion reactions

Transfusion is often considered as a safe therapy with minimal to no side effects. In reality, blood transfusion therapy is and should be considered as a temporary organ transplant. Most recent publications suggest that the need for transfusion should be carefully evaluated, avoided when possible and considered only as a last-resort life-saving measure.

A precise estimation of transfusion reactions is not feasible due to several issues. First, many reactions are wrongly attributed to the patient's underlying condition(s) and never reported. Second,