

## **Whole Blood Transfusions**

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### **Abstract**

Whole blood transfusions are becoming more prevalent and preferred in certain patient scenarios. Component therapy is the current practice in delivering blood transfusions due to the ability to treat multiple patients with a donation from one person. However, whole blood is beginning to reappear as a method for transfusing patients that experience massive hemorrhage due to the increased coagulation factors and decreased donor exposure and opportunity for clerical errors in the high intensity situations. There are some disadvantages in using this due to strict guidelines in place to prevent any transfusion reactions. However, it is possible it could be a better alternative in situations where massive hemorrhage is an issue.

### **Introduction**

The idea of using whole blood for transfusions is not a new theory, but actually an older method that is resurfacing. When blood transfusions were first being used, there was not proper equipment to separate whole blood into the components seen today, and only whole blood was used. In the 1960s, polyvinyl chloride containers and closed systems of tubing helped lead to the desire of separating whole blood into components such as pRBC, FFP (Fresh Frozen Plasma), and platelets. Since this, component therapy has been seen as a better alternative because of the ability to use specific components for certain diagnoses. This allows more than one patient to benefit from one unit of blood and enables better storage conditions for each different component. Today, some are theorizing that whole blood transfusions are still a better option for certain scenarios and the method of using this over component therapy in these situations is becoming more prevalent.

### **Discussion**

Component therapy is currently the widely used method of delivering blood in transfusions due to the ability to treat several patients from one donated whole blood unit. In situations with massive hemorrhage such as traumas, obstetric patients, or surgical bleeding, it is required that all blood components must be transfused until the hemorrhage is controlled. Currently, the standard of care is to deliver a 1:1:1 ratio which includes 1 unit of pRBC, FFP, and platelets in many trauma centers (Myers et al., 2023, p. 113). However, in military zones, the use of whole blood transfusions is present again due to them not having the best capability of separating and properly storing blood components in the combat areas. According to McCoy et al. (2021), "Recent military conflicts in Iraq and Afghanistan renewed interest in the use of

whole blood transfusion” (p. 10). After seeing the beneficial use of it in military scenarios, the interest of it being used again in civilian areas started.

In April 2018, the AABB changed their standards to allow whole blood to be used in transfusions in specific situations as long as proper monitoring and volume restrictions are applied in them (Zhu et al., 2019, p. 1430). With many of these instances, it is to control massive hemorrhages in initial steps of patient care including prehospital care. Zhu et al. (2019) states, “Hemorrhage is the leading cause of potentially survivable prehospital death. The ability to provide enhanced resuscitation capabilities at the point of injury using the tenets of remote damage control resuscitation has shown great promise in decreasing prehospital mortality among the severely injured” (p. 1430).

Due to its use in trauma and emergency situations where timing is critical, the use of whole blood transfusions has many guidelines. For one, the type of blood used is extremely specific. Low titer O whole blood (LTOWB) is used which contains low levels of anti-A and anti-B IgM, defined as a titer of less than 1:256 (Hanna et al., 2022, p. 235). This titer does vary, with some centers declaring a higher or lower threshold. There has not yet been a definite defined titer value to determine what the threshold should be. However, the majority of institutions do follow a standard of using group O Rh positive male donors, due to the risk of TRALI, for all males and females over the age of 50, and Rh negative units for females of child-bearing age (Hanna et al., 2022, p. 235). This whole blood is typically collected in citrate-phosphate dextrose storage solution and kept refrigerated between 1 °C and 6 °C, lasting up to 21 days (Hanna et al., 2022, p. 235).

Even with the strict guidelines present, there are many advantages to using whole blood transfusions as opposed to component therapy in some situations. According to Troughton &

Young (2021), some of these include the speed of transfusing one product over three, expediting treatment, eliminating multiple storage requirements, reducing the risk of septic reactions from bacterial contamination, and minimizing the number of donors (p. 1966). It is well known that most transfusion reactions are due to clerical errors that occur. The use of transfusing one product instead of three in intense situations also helps lessen the chance of this happening as there is less to check thoroughly. As well, it is thought that whole blood might be better in these massive hemorrhage scenarios that require many coagulation factors due to concentrated blood products. Hanna et al. (2022) states that, “One unit of WB typically contains 500 mL and is composed of a hematocrit of 38–50%, platelet count of 150–400 K, 100% plasma coagulation factors and 1000 mg of fibrinogen. CT has a larger volume and does not attain the same level of concentrated blood products and coagulation activity as WB” (p. 235)

There are many advantages, but there are also disadvantages to using whole blood transfusions. The main obstacle is the insufficient availability of LTOWB donors, resulting in a demand that cannot be sustained. The donor eligibility includes being blood group O negative or positive, typically male for TRALI mitigations, titer restrictions, and excluding any that use aspirin (Troughton & Young, 2021, p. 1970). Even without all of these restrictions, blood donations and supply are low, and these stipulations only decrease an already small group. As well, starting a whole blood program in a blood bank can be very expensive since the cost would have to be added to an already established component therapy blood bank (Hanna et al., 2022, p. 237). Even with the added costs, many US programs only validate LTOWB for 14-21 days of storage, which could lead to a significant risk of blood wastage if there is an inability to match supply/demand and waste of the initial costs (Hanna et al., 2022, p. 237).

Some trauma centers and hospitals have been able to overcome the obstacles, and there are situations where the whole blood transfusions are benefiting patients. This is especially happening in prehospital patient care, trauma situations, and obstetrics. A study by Zhu et al. (2019) states, “Initial placement of cold-stored LTOWB on helicopters was a substantial improvement in our trauma system. However, as our data show, the proportion of patients that would benefit from whole blood largely lies in favor of those transported by ground units within Bexar County” (p. 1438). While this focused on trauma situations, a study by Myers et al. (2023) concerning obstetrics came to the conclusion that “a protocol that incorporates WB may mitigate the risk of death from hemorrhage and the incidence of coagulopathy in these high-risk OB patients” (p. 113). While it is not simple to achieve, the use of whole blood could be more beneficial in certain patient care areas.

### **Conclusion**

The use of whole blood transfusions is resurfacing from before component therapy became available and widely used. This is likely due to it reappearing in military combat zones where it has been used to treat injuries including massive hemorrhages. It is very beneficial in these high intensity situations where little time and coagulation factors tend to cause a problem in treating patients. It does have obstacles such as the low number of donors eligible and willing to donate, the cost associated, and the risk of wasting blood due to the specific situations it can actually be used in. This topic is very controversial due to component therapy already being the present and widely accepted method of choice. However, medicine is always evolving, and the best protocols should be in place to lead to the best patient care. In certain situations, it does seem as though whole blood transfusions might be the best patient care.

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