

Blood Transfusions

A blood transfusion is a medical procedure in which blood or parts of blood products are given to a patient through a narrow tube placed in the patient's vein (blood vessel). Blood products can come from another person or be taken from the patient ahead of time for future use.



What is blood made of?

Blood products are treatment materials derived from human blood. Human blood (whole blood) is made up of different parts: **plasma, red blood cells, white blood cells and platelets**.

Plasma is the liquid part of blood, composed of water, sugar, protein, fats, and salt. Its primary function is to transport blood cells throughout the body along with nutrients, waste products, antibodies, clotting proteins, hormones, and proteins that help keep the body's fluid in balance.

Red blood cells (RBCs), which are also called erythrocytes, are the most abundant cell type in the blood, accounting for 40 to 45% of blood volume, and their shape is that of a biconcave disc with a flattened centre.

The production of RBCs is controlled by a hormone called erythropoietin, which is primarily produced in the kidneys. RBCs are made in the bone marrow and have a life span of about 120 days (3 months) after reaching maturity and being released into the bloodstream.

RBCs contain haemoglobin (Hb), which helps to carry oxygen from the lungs to the rest of the body and then returns carbon dioxide from the lungs to the body.

White blood cells (WBCs), also known as leucocytes, are much fewer than RBCs and make up only 1% of blood. They help protect the body from infections. The most common WBC type is called the neutrophil, which is the first to respond during an infection and is therefore known as the "immediate response" cell.

Neutrophils typically only live less than a day, so they cannot be used for transfusions. Lymphocytes are another important type of WBCs. There are two main types of lymphocytes:

- T-lymphocytes - help regulate the function of other immune cells and directly attack infected cells and tumours.
- B-lymphocytes - make antibodies which specifically target bacteria, viruses, and other unknown materials.

Platelets are small pieces of cells that help the blood clot. They gather at the site of an injury, stick to the lining of the injured blood vessel and form a base for the clotting process to begin.

A higher-than-normal number of platelets can cause unwanted clotting, which can lead to conditions such as strokes and heart attacks.

What is a blood type and why is it important?

Blood is grouped into four main types: A, B, AB, and O. These types are based on molecules called antigens found on the surface of blood cells. Antigens can cause immune system reactions if the wrong blood type is given.

Some people also have another antigen on the surface of their blood cells called the Rhesus (Rh) factor. If someone has the Rhesus factor, their blood is rhesus positive (Rh-positive), and their blood type will have a "+" (positive) sign. If the Rhesus factor is missing from the blood cells, the person is rhesus negative (Rh-negative), and their blood type will have a "-" (negative) sign.

This means there are eight blood types in total: A+, A-, B+, B-, AB+, AB-, O+, and O-.

When receiving a blood transfusion, it is important to receive the correct type of blood.

People with type O- blood are known as the universal donors because their blood can be given to anyone. But they can only receive O- blood. People with type AB+ blood are the universal recipients, meaning they can safely receive blood from anyone. But they can only donate to other people with AB+ blood.

Other blood types can donate and receive from specific matching types.

If someone is given the wrong type of blood, their immune system may attack it, causing serious symptoms like fever, muscle aches, and difficulty breathing. In rare cases, this can be life-threatening.

Blood products in South Africa

The South African National Blood Service (SANBS) provides blood products in South Africa and serves both the public and private healthcare systems. Common blood products that are available in South Africa include:

1. **Red cell products** – red cell products contain only the RBCs and are usually given when someone has low haemoglobin levels, either due to blood loss or a chronic condition.
2. **Whole blood products** - whole blood products are kept for special cases as most patients can be helped with red cell products. Whole blood is used in exchange transfusion (blood transfusion in which the patient's blood is exchanged with donor blood) in neonates and in cases where there is massive bleeding (loss of 50% of the blood volume within three hours or a rate of loss of blood that is more than 150ml per minute). Limiting the use of whole blood helps make the most of each donation because red blood cells, platelets,

and plasma can be separated from a single donor's blood and given to different patients as needed.

3. **Platelet products** – platelet products are used to prevent bleeding (prophylactic transfusions) as well as to stop active bleeding (therapeutic transfusion) when someone has a low platelet count or their platelets are not working properly.
4. **Plasma products** - plasma products are made up of plasma components and plasma derivatives.
 - *Plasma components* are made by separating plasma from blood using physical methods. These include:
 - Fresh Frozen Plasma (FFP), which is plasma that is frozen shortly after being collected to preserve its clotting proteins.
 - Cryoprecipitate, which is a portion of plasma rich in clotting proteins (called factors) that help stop bleeding.
 - *Plasma derivatives* are made by combining plasma from many donors (more than 12) and processing it using special techniques to make it safe to give to others. Examples include:
 - Clotting factors - concentrated proteins used to treat people with bleeding disorders, such as haemophilia.
 - Plasma expanders - fluids used to maintain or increase the volume of blood in the body, often used in emergencies or surgery.
 - Immunoglobulins - proteins that strengthen the immune system and help fight infections.
 - Solvent detergent treated FFP - a safer alternative to fresh frozen plasma. It has been treated to remove viruses and lower the risk of side effects associated with FFP.

Reasons someone might need a blood transfusion

Blood transfusions are given as part of medical treatment when someone has lost a lot of blood due to surgery, a serious injury, childbirth, etc. They are also given when a person has a medical condition that prevents the body from making blood or some blood products correctly.

During a blood transfusion, a patient receives only the specific part or parts of the blood that they need. For example, red blood cells may be given after surgery, platelets used for a person undergoing cancer treatment, or plasma used for a person with a severe infection. In some cases, patients may need more than one blood transfusion.

Risks of blood transfusions

Blood transfusions are generally considered safe when performed by properly trained medical staff in facilities that follow the correct processes and procedures before giving blood prod-

ucts. However, there are still some risks of mild and rarely severe complications during the transfusion or some days after.

- Allergic reactions can be mild or severe. Mild symptoms can include hives, itching and fever. Severe symptoms can include troubled breathing, chest pain, or nausea. These symptoms may occur during and/or after a transfusion.
- Donated blood is tested, and donors are screened to minimise the risk of transfusion-related infections such as HIV, hepatitis B or C. While extremely low, the risk cannot be eliminated completely.
- Transfusion overload happens when someone gets more blood than they need. This can lead to problems like shortness of breath and other symptoms, which usually appear within a few hours to a day after the transfusion. People with heart conditions are at higher risk. To help prevent this, doctors might give a diuretic (a medicine that helps remove extra fluid) after the transfusion.
- Iron overload (too much iron in the body) happens when the body gets too much iron from repeated blood transfusions over time. It is more common in people who need many transfusions for ongoing medical conditions.
- Acute immune haemolytic reaction occurs when the patient's immune system attacks the transfused red blood cells because the donor blood type is not a good match. The attacked cells release a substance into the patient's blood that damages their kidneys
- Delayed haemolytic reaction is like the acute immune haemolytic reaction; however, it occurs more slowly, and it may take one to four weeks to notice a decrease in red blood cell levels.
- Graft-versus-host disease happens when transfused white blood cells attack the patient's bone marrow. It is usually fatal and is more likely to happen in patients who have a very weak immune system, such as cancer patients with leukaemia and lymphoma.

Donated blood is carefully tested and matched to the patient to reduce these. However, as the risks cannot be eliminated entirely even with testing, blood transfusions should be given by trained health professionals who can monitor the patient during and after the transfusion.

What is covered as PMB level of care?

Blood products and transfusions should be covered under Prescribed Minimum Benefit (PMBs) when clinically indicated. This includes transfusions for PMB conditions listed in the 271 Diagnostic and Treatment Pairs, medical emergencies, or the 26 Chronic Disease List.

The Medical Schemes Act 131 of 1998 defines an emergency medical condition as *“the sudden and, at the time, unexpected onset of a health condition that requires immediate medical or surgical treatment, where failure to provide medical or surgical treatment would result in serious impairment to bodily functions or serious dysfunction of a bodily organ or part or would place the person's life in serious jeopardy”*.

This includes major trauma from vehicle accidents, fires, and acts of violence such as gunshot wounds. In all these instances, a transfusion of a blood product may be required.

The 271 medical conditions listed in the “Diagnostic and Treatment Pairs” under the Medical Schemes Act include a range of conditions, such as different types of anaemia, thalassemia (a blood disorder that prevents the body from producing enough haemoglobin, a protein that carries oxygen in red blood cells) and other disorders affecting haemoglobin, problems with blood clotting, acute and chronic leukaemia, lymphomas, major blood vessel injuries, life-threatening shock or dangerously low blood pressure, perforated or bleeding stomach ulcers, and severe gastroenteritis with life-threatening bleeding or dehydration.

Haemophilia A and B are treated with specialised clotting factors, known as coagulation factor concentrates, to help the blood clot properly and they are included in the 26 Chronic Diseases Therapeutic Algorithms listed under Annexure A.

The use of blood products in a PMB condition where it is clinically appropriate to use them is not limited to the above-mentioned examples.

References

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