Blood Transfusion and Donation

Transfusions of blood and blood products temporarily replace parts of the blood when a person's body can't make its own or has lost them from bleeding. Here, we describe blood and its components and why they are important. We also explain how blood is donated and transfused and how this relates to people with cancer.

Blood Transfusions for People with Cancer

A transfusion is putting blood or some part of it into a person’s vein through an intravenous (IV) line.

Transfusions of blood and blood products may be given to a person who is bleeding or who can’t make enough blood cells. Blood transfusions save millions of lives in the United States every year.

People usually donate whole blood – blood taken right out of a vein through a needle. This whole blood may be called a **unit** or pint of blood, and equals about 450 milliliters

or 16.7 ounces. But whole blood is rarely given as a transfusion. **Blood has many parts (called components)**, and each one does a different job. Whole blood is usually separated into red blood cells, platelets, and plasma. Plasma can be further separated into clotting factors and certain proteins. This lets doctors give patients only what they need. It also helps to get the most out of the donated blood.

Why people with cancer might need blood transfusions

People with cancer might need blood transfusions because of the cancer itself. For instance:

- Some cancers (especially digestive system cancers) cause internal bleeding, which can lead to anemia[1] from too few red blood cells; see “Red blood cell transfusions” in the next section.
- Blood cells are made in the bone marrow, the spongy center of certain bones. Cancers that start in the bone marrow (like leukemias) or cancers that spread there from other places may crowd out normal blood-making cells, leading to low blood counts.
- People who have had cancer for some time may develop something called anemia of chronic disease. This anemia is caused by certain long-term medical conditions that affect the production and lifespan of red blood cells.
- Cancer can also lower blood counts by affecting organs such as the kidneys and spleen, which help keep enough cells in the blood.

Cancer treatments may also lead to the need for blood transfusions:

- Surgery to treat cancer may lead to blood loss and a need for red blood cell or platelet transfusions. (See “Red blood cell transfusions” and “Platelet transfusions” in the next section.)
- Most chemotherapy[2] drugs affect cells in the bone marrow. This commonly leads to low blood cell counts, and can sometimes put a person at risk for life-threatening infections[3] or bleeding.
- When radiation[4] is used to treat a large area of the bones, it can affect the bone marrow and lead to low blood cell counts.
- Bone marrow transplant (BMT) or peripheral blood stem cell transplant[5] (PBSCT) patients get large doses of chemotherapy and/or radiation therapy. This destroys the blood-making cells in the bone marrow. These patients often have very low blood cell counts after the procedure and need transfusions.

Types of transfusions

Red blood cell transfusions

Red blood cell basics

Red blood cells (RBCs) give blood its color. Their job is to carry oxygen from the lungs through the bloodstream to every part of the body. A substance in red blood cells called **hemoglobin** does this. Then, the red cells bring carbon dioxide (CO_2) back to the lungs, where it's removed from the body when we exhale.

Red blood cells (and all other blood cells) are normally made in the bone marrow, the soft inner part of certain bones. The production of RBCs is controlled by the kidneys. When the kidneys sense that there aren't enough RBCs in the blood, they release a hormone called erythropoietin that causes the bone marrow to make more.

When red blood cell transfusions are used

Anemia: People who have low numbers of red blood cells (RBCs) are said to have anemia or be anemic. People who have anemia may need RBC transfusions because they don't have enough RBCs to carry oxygen to all of the cells in the body. (Low iron or vitamin B_{12} levels are less common causes of anemia in cancer patients.)

A **normal hemoglobin level is about 12 to 18 g/dL**. A red blood cell transfusion may be suggested if it drops below 8 g/dL. Whether you need a transfusion for anemia depends on many factors, such as how long it took for the anemia to develop and how well your body is able to cope with it. Anemia due to a sudden loss of blood will probably need to be corrected right away. Anemia that develops slowly is less likely to cause problems, because the body has time to adjust to it to some extent. If your hemoglobin level is lower than normal but you're not dizzy, pale, or short of breath, you may not need a transfusion.

Patients who have certain heart or lung diseases may be more affected by anemia and may need transfusions even if their hemoglobin level is not very low. Other conditions that increase the need for oxygen may also require transfusions.

There are drugs that can treat anemia instead of a transfusion in some patients, but they carry different risks, work slowly, and cost a lot. For more information about anemia and how it's treated, see Anemia in People With Cancer[6].

Surgery: Transfusions may be given during or after surgery to make up for blood loss. In some cases, blood lost during surgery can be collected and given back to the patient. See “Intra-operative or post-operative blood salvage” in Alternatives to Blood Transfusion[7] for more on this.

Plasma transfusions

Plasma basics

Plasma is the clear, pale-yellow liquid part of blood. It contains proteins (called **clotting factors**) that help make blood clot. This is important when the body is injured because clots are needed to help seal blood vessels and stop bleeding. Plasma also contains other proteins, such as antibodies, which help fight infection.

Once plasma is separated from the red blood cells, it can be frozen and kept for up to a year. Once thawed, it’s called **fresh frozen plasma**.

Plasma can be donated in a process called apheresis, or sometimes called plasmapheresis. The donor is hooked up to a machine that removes blood, separates the plasma, and puts it into a special container. The machine returns the red cells and other parts of the blood to the donor’s bloodstream.

When plasma transfusions are used

Plasma is commonly given to patients who are bleeding because their blood is not clotting the way it should. Cancer patients might also be given fresh frozen plasma if they have a problem called DIC (disseminatedintravasculararcoagulation). In this rare condition, all of the clotting factors in the body are used up or broken down. Signs and symptoms (such as excessive bleeding and bruising) and blood tests help the doctor identify DIC.

Platelet transfusions

Platelet basics

Platelets are fragments of cells in blood and are another important part of the clotting process. They work with the clotting factors in plasma to help stop bleeding.

Platelets are usually found in the plasma, and like red blood cells, they can be separated from it. A unit of whole blood has only a small volume of platelets. It takes platelets from several units of whole blood to help keep a person from bleeding. A unit

of platelets is defined as the amount that can be separated from one unit of whole blood.

Unlike red blood cells, platelets do not have a blood type (see “Blood types” in Getting a Blood Transfusion[8]), so patients can usually get platelets from any qualified donor. For platelet transfusions, 6 to 10 units from different donors (called **random donor platelets**) are combined and given to adult patients at one time (they are called **pooled platelets**).

Platelets can also be collected by apheresis. This is sometimes calledplateletpheresis. In this procedure, the donor is hooked up to a machine that removes blood, and keeps just the platelets. The rest of the blood cells and plasma are returned to the donor. Apheresis can collect enough platelets so that they don’t have to be combined with platelets from other donors. Platelets collected in this way are called **single donor platelets**. (You can find more information about this in Donating Blood[9].)

When platelet transfusions are used

Cancer patients may need platelet transfusions if their bone marrow is not making enough. This happens when platelet-producing bone marrow cells are damaged by chemo or radiation therapy or when they are crowded out of the bone marrow by cancer cells.

A normal platelet count is about 150,000 to 400,000 platelets per microliter (mcL) of blood, depending on the lab. When platelet counts drop below a certain level (often 20,000/mcL), a patient is at risk for dangerous bleeding. Doctors consider giving a platelet transfusion when the platelet count drops to this level or even at higher levels if a patient needs surgery or is bleeding. If there are no signs of bleeding, a platelet transfusion may not be needed even if the platelet count is low.

Different medicines can be used to help with low platelets depending on the cause of the low platelets.

Cryoprecipitate transfusions

Cryoprecipitate basics

Cryoprecipitate, or "cryo,"is the name given to the small fraction of plasma that separates out (precipitates) when plasma is frozen and then thawed in the refrigerator. It has several of the clotting factors found in plasma, but they are concentrated in a smaller amount of liquid. A unit of whole blood has only a small amount of cryoprecipitate, so about 8 to 10 units (from different donors) are pooled together for

one transfusion.

When cryoprecipitate transfusions are used

Cryoprecipitate may be given to replace several blood clotting factors such as:

- Factor VIII (missing in patients with hemophilia A)
- Von Willebrand factor (needed to help platelets work)
- Fibrinogen (a protein needed to form a clot)

Unless they're bleeding, people with cancer rarely need cryoprecipitate.

White blood cell (granulocyte) transfusions

White blood cell basics

Chemotherapy can damage cells in the bone marrow, and patients getting chemo often have low white blood cell (WBC) counts. (The **normal range for WBCs is 4,000 to 10,000 per mcL** of blood.)

White blood cells, especially the type called neutrophils (NEW-trow-fills), are very important in fighting infections. When patients have low WBC counts, doctors carefully watch the number of neutrophils or the absolute neutrophil count(ANC). Neutropenia is when a person's ANC goes below 1,000/mcL. People with neutropenia are at risk for serious infections[10], even more so if the count stays low for more than a week.

When white blood cell transfusions are used

White blood cell transfusions are given rarely. Research does not show that giving white blood cell transfusions lowers the risk of death or infection in people with low white blood cell counts or white blood cells that are impaired.

Instead of transfusing WBCs, doctors now commonly use drugs called **colony-stimulating factors** or **growth factors** to help the body make its own. These drugs stimulate the body to make neutrophils and other types of granulocytes.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/low-blood-counts/anemia.html

2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html
3. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/infections.html
4. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html
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7. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/blood-transfusion-and-donation/blood-transfusion-alternatives.html
8. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/blood-transfusion-and-donation/how-blood-transfusions-are-done.html
9. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/blood-transfusion-and-donation/donating-blood.html
10. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/infections.html

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Getting a Blood Transfusion

A blood transfusion is given through tubing connected to a needle or fine tube (catheter) that's in a vein. The amount and part of the blood transfused depends on what the patient needs.

First, blood tests such as a **complete blood count** (CBC) are done to find out if the patient's symptoms are likely to be helped by a transfusion. A CBC measures the levels of components within the blood such as red blood cells, white blood cells, and platelets. Tests of clotting (coagulation) may also be done if abnormal bleeding is a problem.

If a transfusion is needed, it must be prescribed by a health care provider. At that point, more blood tests must be done to find a donated blood component that closely matches the patient.

Blood types

Blood types are important when it comes to transfusions. If you get a transfusion that does not work with your blood type, your body's immune system could fight the donated blood. This can cause a serious or even life-threatening transfusion reaction. (See "Possible risks of blood transfusion.")

To be sure no mistakes are made, donated blood is carefully tested to find out what type it is. This is done when it's taken from the donor and again once it's received by the hospital lab. The blood bag is labeled with the type of blood it contains. When a person needs a blood transfusion, a blood sample is drawn from them and tested the same way.

All blood has the same components, but not all blood is the same. People have different blood types, which are based on substances called antigens on a person's blood cells. The 2 most important antigens in blood typing are called A, B, O, and Rh.

- Each person has **an ABO blood type – either A, B, AB, or O** – which means antigen A, antigen B, both antigens (type AB), or neither antigen (type O) is found on their blood cells.
- Each person also is **either Rh-positive or Rh-negative** (you either have Rh or you don't).

These 2 factors can be combined into 8 possible blood types:

A positive	B positive	AB positive	O positive
A negative	B negative	AB negative	O negative

ABO blood types

Two antigens on blood cells (A and B) determine a person's ABO blood type (either A, B, AB, or O). In the United States, the most common blood type is O, followed closely by type A.

- If you have type O blood, you can only get type O red blood cell transfusions. But you can give yourred bloodcells to people with type A, B, AB, or O blood, which is why you are sometimes called a **universal donor**. (Universal donor blood cells are typically only used in emergencies. For example, if a person is bleeding severely and nearing death, there may no time for testing. In everyday practice, people in the US are almost always given the exact same type of red blood cells that they have.)
- If you have type A blood, you cannot get either type B or AB red blood cells.
- If you have type B blood, you cannot get type A or AB red blood cells.
- If you have type AB blood, you can get transfusions of O, A, B, or AB red blood cells.

Rh factor

Blood is either Rh-positive or Rh-negative, depending on whether the red blood cells have Rh antigens on their surface. A person who has type B, Rh-positive blood is called **B positive**, whereas a person with type B, Rh-negative blood is **B negative**.

If you have Rh-positive blood, you can get Rh-positive or Rh-negative red blood cell transfusions. But people with Rh-negative blood should only get Rh-negative red blood cells except in extreme emergencies. This is because an Rh-positive blood transfusion can cause a person with Rh negative blood to make antibodies against the Rh factor, causing a transfusion reaction (discussed below). If an Rh-negative woman makes antibodies like this, it can seriously harm any Rh-positive babies she may have in the future. Her anti-Rh antibodies can attack Rh-positive blood cells in the fetus.

Other antigens

There are other antigens on red blood cells that can lead to transfusion reactions. These are rare because people don't make antibodies against them unless they have had transfusions before. Still, these antigens may become a factor in matching blood for a person who has had many transfusions in the past, as is the case for some people with cancer.

Plasma, platelets, cryo, and blood type

Blood types are also important for plasma transfusions, but the rules are different than the rules for red blood cells transfusions. For example, people with type AB blood are universal plasma donors, and they can only receive type AB plasma.

For platelet and cryoprecipitate transfusions, matching the blood type of the donor to the recipient is usually not critical, but labs still try to match them. This may become important for patients who have already had many transfusions or who have reacted to transfusions in the past.

Antibodies and cross-matching

After blood is typed, a test called an **antibody screen** is done to see if a patient's plasma contains other antibodies besides those against A, B, and Rh. If there are extra antibodies, the cross-matching may take longer. This is because some units of donor blood may not fully match the recipient's, even though they have the same ABO and Rh types.

Before a person can get a transfusion of red blood cells, another lab test called a **cross-match** must be done to make sure that the donor blood is compatible with the recipient's.

A unit of the right ABO and Rh type blood is selected, and a drop of donor red cells from the unit is mixed with a drop of plasma from the patient. The mixture is watched to see if the patient's plasma causes the donor blood cells to clump. This may happen if the patient has extra antibodies to a protein in the donor unit. If there are no problems (no clumping), a cross-match takes about 30 minutes.

A cross-match is usually not needed for a platelet or plasma transfusion unless the platelets look like they could contain some red blood cells.

The transfusion process

Most blood transfusions are given in the hospital or in outpatient clinics.

Red blood cell transfusions are usually started slowly while the patient is watched closely for the signs and symptoms of a transfusion reaction. The patient's vital signs (such as temperature, heart rate, and blood pressure) are checked often. If there are no problems, the infusion rate will slowly be increased (so the blood goes in faster). Each unit of red blood cells is usually given over a couple of hours, and should be completed within 4 hours. Other blood products, like plasma and platelets, go in much faster.

A visiting nurse can give transfusions and monitor patients in their homes. Home transfusions follow the same safety standards as hospital transfusions. A health care provider must be sure that a patient's health is stable for transfusion at home. Emergency medical care must be available close by in case it is needed. And the blood must be kept within a certain temperature range while being taken to the home.

Possible risks of blood transfusions

Although blood transfusions can be life-saving, they are not without risks. Infections were once the main risk, but they have become extremely rare with testing and donor screening. Transfusion reactions and other non-infectious problems are now more common than infections.

When you are getting a transfusion of any kind, it's very important that you let your nurse know right away if you notice any changes in how you feel, such as itching, shivering, headache, chest or back pain, throat tightness, nausea, dizziness, trouble breathing, or other problems. You should report any changes that happen in the next few days, too.

Transfusion reactions

Blood transfusions sometimes cause **transfusion reactions**. There are several types of reactions and some are worse than others. Some reactions happen as soon as the transfusion starts, while others take several days or even longer to develop.

Many precautions are taken before a transfusion is started to keep reactions from happening. The blood type of the unit is checked many times, and the unit is carefully matched to be sure that it matches the blood type and Rh factor of the person who will get it. After that, both a nurse and blood bank lab technician look at the information about the patient and the information on the unit of blood (or blood component) before it's released. The information is double-checked once more in the patient's presence before the transfusion is started.

Allergic reaction

This is the most common reaction. It happens during the transfusion when the body reacts to plasma proteins or other substances in the donated blood. Usually the only symptoms are hives and itching, which can be treated with antihistamines like diphenhydramine (Benadryl). In rare cases these reactions can be more serious.

Febrile reaction

The person gets a sudden fever during or within 24 hours of the transfusion. Headache, nausea, chills, or a general feeling of discomfort may come with the fever. Acetaminophen (Tylenol) may help these symptoms.

These reactions are often the body's response to white blood cells in the donated blood. They are more common in people who have had transfusions before and in women who have been pregnant several times. Other types of reaction can also cause fever, and further testing may be needed to be sure that the reaction is only febrile and not something more serious.

Patients who have had febrile reactions or who are at risk for them are usually given blood products that are leukoreduced.This means that the white blood cells have been removed by filters or other means. People with cancer often get leukoreduced blood products.

Transfusion-related acute lung injury

Transfusion-related acute lung injury (TRALI) is a rare but very serious transfusion reaction. It can happen with any type of transfusion, but is much more likely in people who are already seriously ill. Transfusions that contain more plasma, such as fresh frozen plasma or platelets, seem more likely to result in TRALI. It often starts within 1 to 2 hours of starting the transfusion, but can happen anytime up to 6 hours after a transfusion. There's also a delayed TRALI syndrome, which can begin up to 72 hours after the transfusion is given.

The main symptom of TRALI is trouble breathing, which can become life-threatening. If TRALI is suspected during a transfusion, the transfusion should be stopped right away.

Doctors now believe that several factors are involved in this illness. Many of the patients who get TRALI have had recent surgery, trauma, cancer treatment, transfusions, or have an active infection. Most of the time, TRALI goes away within 2 or 3 days if the person is helped with oxygen, fluids, and sometimes a breathing machine. Even with this kind of treatment, it's deadly in 5% to 10% of cases. TRALI is more likely to be fatal if the patient was already very ill before the transfusion.

Delayed TRALI has been observed in people who are already critically ill or seriously injured. These patients have a higher risk of death. If a patient who has had TRALI in the past needs red blood cells, doctors may try to prevent it by removing most of the plasma from the red blood cells or by taking other measures. Researchers are working on other ways to reduce the risk of TRALI.

Acute immune hemolytic reaction

An acute hemolyticreaction is the most serious type of transfusion reaction, but careful blood handling has helped make it very rare. It happens when donor and patient blood types do not match. The patient's antibodies attack the transfused red blood cells, causing them to break open (hemolyze) and release harmful substances into the bloodstream.

Patients may have chills, fever, chest and lower back pain, and nausea. The kidneys may be badly damaged, and dialysis may be needed. A hemolytic reaction can be deadly if the transfusion is not stopped as soon as the reaction starts.

Delayed hemolytic reaction

This type of reaction happens when the body slowly attacks antigens (other than ABO antigens) on the transfused blood cells. The blood cells are broken down days or weeks after the transfusion. There are usually no symptoms, but the transfused red blood cells are destroyed and the patient's red blood cell count falls. In rare cases, the kidneys may be affected, and treatment may be needed.

People don't usually have this type of reaction unless they have had many transfusions in the past. Those who do have this reaction need special blood tests before any more blood can be transfused. Units of blood that do not have the antigen that the body is attacking must be used.

Graft-versus-host disease

Graft-versus-host disease (GVHD) can occur when a person with a very weak immune system gets a transfused blood product that contains white blood cells. The white cells in the transfusion attack the tissues of the patient who got the blood.

Within a month of the transfusion, the patient may have fever, liver problems, rash, and diarrhea.

To prevent white blood cells from causing GVHD, donated blood can be treated with radiation before transfusion. (Radiation stops white blood cells from working but does not affect red blood cells.) These are called **irradiated blood products.** They are often used for people with cancer.

Infections

Blood transfusions can transmit infections caused by bacteria, viruses, and parasites. The chance of getting an infection from blood in the United States is extremely low, but the exact risk for each infection varies. Testing units of blood for infection and asking

questions to learn about donor risks has made the blood supply very safe. Still, no test or set of questions is 100% accurate.

Bacterial contamination

Rarely, blood gets contaminated with tiny amounts of skin bacteria during donation. Platelets are the most likely blood component to have this problem because platelets must be stored at room temperature. Other components are refrigerated or frozen which curbs the growth of bacteria.

Blood banks now routinely test platelets and destroy units that are likely to cause harm. The tests are still being refined, but today fewer cases of illness are caused by platelets. Also, more hospitals use single donor platelets, which have a lower risk of bacterial contamination than pooled platelets.

Hepatitis B and C viruses

Several steps are routinely taken to reduce the risk of viral hepatitis from blood transfusion. People who are getting ready to donate blood are asked questions about hepatitis risk factors and symptoms of hepatitis. Donated blood is also tested for infection from hepatitis B virus, hepatitis C virus, and other liver problems that could be signs of other types of hepatitis.

Viral hepatitis infection transmitted by blood transfusions is rare. The risk of getting hepatitis B from a blood transfusion in the US is about 1 in 800,00 to 1 in 1 million. The risk of getting hepatitis C is about 1 in 1 million.

Work continues to be done to reduce the risk of these infections even further.

Human immunodeficiency virus (HIV)

Human immunodeficiency virus (HIV) causes acquired immune deficiency syndrome (AIDS). Testing each unit of donated blood for HIV began in 1985, and all donated blood is now tested for HIV with 2 screening tests.

With improved testing for HIV, the number of transfusion-related AIDS cases continues to drop. The risk of HIV transmission from a transfusion is estimated to be about 1 in 1 million to 1 in 1.5 million. Along with testing, the risk is reduced by asking donors questions about HIV risk factors and symptoms.

Cytomegalovirus (CMV)

Cytomegalovirus (CMV) is a very common infection in the United States. Up to 3 in 4 people have this infection by the age of 40. Most people with CMV don't know they have it because it rarely causes serious symptoms. Still, because it doesn't cause problems for most people, donated blood is not always tested for CMV.

If you haven't had CMV and your immune system is weakened, being exposed to CMV can make you very ill. CMV spreads from person to person through body fluids like blood, saliva, urine, semen, and breast milk. If you haven't had CMV and you need a transfusion, your cancer team might choose to give you **CMV-negative blood products**, which come from CMV-negative donors. Or they might use blood products prepared with fewer white blood cells in which the virus lives. Either of these measures greatly reduces the risk of getting CMV if your immune system is weak.

Other infections

Along with the tests noted above, all blood for transfusion is tested for syphilis, as well as HTLV-I and HTLV-II (viruses linked to human T-cell leukemia/lymphoma). Since 2003, donated blood has been tested for the West Nile virus, too. In 2007, blood banks also began testing for Chagas disease (common in South and Central America).

Diseases caused by certain bacteria, viruses, and parasites, such as babesiosis, malaria, Lyme disease, and others can also be spread by blood product transfusions. But because potential donors are screened with questions about their health status and travel, such cases are very rare.

Other risks

Some look-back studies have suggested patients with certain cancers, like colorectal, prostate, lung (small cell or non-small cell), and breast cancer, had worse outcomes if transfusions were given before or during surgery and/or while getting chemotherapy. The reasons for this were not clear, though it's possible that transfused blood might affect the immune system in ways that may cause problems later. But it's also important to know that many of the studies were comparing groups that may have started with major differences between them. For instance, patients who need transfusions are often sicker to start with, and might have had worse outcomes based on that alone. Also, the transfused patients might have been treated in different ways during surgery and afterward.

Alternatives to Blood Transfusions

In some cases, options other than blood product transfusions may be used.

Volume expanders

When a patient has lost a lot of fluids, the body can go into a type of shock. This may be treated or prevented by giving solutions to expand fluid volume in order to keep blood circulating through vital organs. The solutions are put right into the bloodstream through a vein. They boost fluid volume and help with circulation, but don't carry oxygen or raise the number of blood cells.

Growth factors

The body naturally makes hormone-like substances called hematopoietic**growth factors** that cause the bone marrow to make more blood cells. Man-made versions of some of these growth factors are available to help people with low blood cell counts. Growth factors can be used to boost red blood cell, white blood cell, or platelet counts.

Growth factors may help patients who would otherwise need transfusions. But they have some drawbacks that may limit their use in some cases:

- Unlike transfusions, growth factors often take many days or weeks to raise blood counts, so they may not be useful in people who need their blood cell levels raised quickly, such as those who are actively bleeding.
- People who have severe bone marrow disease may not respond to the growth factors because they don't have enough blood-producing cells in their bone marrow.
- Some growth factors might cause certain types of cancer cells (such as lymphocytic leukemia, multiple myeloma, head and neck cancer, breast cancer, cervical cancer, and some kinds of lung cancer cells) to grow more quickly.
- Growth factors generally cost a lot more than transfusions.

Because of these drawbacks, certain growth factors are not used in people whose treatment is expected to cure their cancer. And when they are used, they are given for as short a time as possible.

Intra-operative or post-operative blood salvage

Patients getting surgery sometimes need transfusions to replace blood lost during or after the operation. Sometimes this lost blood can be “salvaged” or saved by collecting it with a special machine and giving it back into the patient.

Giving a person back his or her own blood is called an autologoustransfusion. It cuts down on the need for transfusions from other donors. But some studies have found tumor cells in blood salvaged during cancer operations, and this isn’t something that can be done for all patients. (Another type of autologous transfusion is described in Donating Blood[1].)

Blood substitutes

So far, there is no real substitute for human blood. But researchers are working to develop a liquid that can carry oxygen and replace blood, at least for a short time, in certain situations.

Some products being tested can do some of the work of red blood cells, such as carrying oxygen to tissues, but cannot replace the many other functions of human blood.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/blood-transfusion-and-donation/donating-blood.html

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Donating Blood

Blood is usually donated at special collection centers. Some centers use vans (often called **bloodmobiles**) that travel to different areas to collect blood. Some larger hospitals have their own centers to collect and process donated blood. After blood is tested for safety and processed into components, it's stored in blood banks until needed.

Keeping the blood supply safe

The US Food and Drug Administration (FDA) closely regulates blood to keep the blood supply safe. The AABB (formerly the American Association of Blood Banks) also publishes guidelines for safe transfusions, which its members must follow.

In the United States, all blood centers follow careful procedures to keep the blood supply safe. Everyone who comes in to donate is asked many questions and has a chance to say whether their blood may be unsafe for any reason. Also, previous donation records and lists of ineligible donors are checked. Lab tests are done to look for blood that might transmit diseases (described in Getting a Blood Transfusion[1]). People are not allowed to donate blood if their lab tests or questionnaires show that they may be at high risk for certain diseases.

Only sterile equipment is used to collect blood. The needle used to draw blood from

your vein has never been used before, and it's thrown away right after it's used. Donors cannot get hepatitis, HIV, or any other infections or diseases from giving blood.

Reactions from donating are rare and are almost always minor if they do happen. If you're healthy, you can donate a unit (about a pint) of blood without harm because one unit is a small part of your total blood volume. Your body will replace the lost fluid within a day, and your bone marrow will replace the blood cells, usually within 4 to 6 weeks.

Rules that protect blood donors

Aside from protecting those who receive donated blood, rules are also in place to protect people who want to donate. Although guidelines can vary slightly by state and facility, for the most part donors must:

- Be healthy
- Be at least 17 years old (or 16 with parental consent)
- Weigh at least 110 pounds
- Not have donated blood within the past 8 weeks (this can be shorter for most apheresis donations, which are described below)

People who are taking "blood thinners" or certain drugs that are used to treat acne, baldness, an enlarged prostate, or some other conditions may not be able to donate unless they've stopped the drug for a certain amount of time. Other health and travel questions are reviewed with each donor in detail. (For an example of eligibility criteria, check the Red Cross website at www.redcrossblood.org/donating-blood/eligibility-requirements/eligibility-criteria-alphabetical-listing[2].)

The donation process

Before giving blood, get a good night's sleep, eat a well-balanced meal, and drink extra fluids that are non-alcoholic and non-caffeinated. Many donor centers ask that you bring in a list of all the medicines you're taking and your donor card, driver's license, or 2 forms of other identification.

FDA guidelines require that before giving blood, you must register; have your blood pressure, temperature, and heart rate checked; answer health questions; and get a blood test (usually by sticking a finger for a few drops of blood). You'll need to fill out a questionnaire, asking about certain behaviors or travel that might put you at increased risk for some diseases. You must also be told details about what donating blood will be like before you decide to actually give blood.

You'll sit in a reclining chair or lie on a table. An area on your arm will be cleaned, and a sterile needle put into a vein (usually where your elbow bends). Removing a unit of whole blood usually takes about 10 to 15 minutes. Apheresis donation (described in the next section) may take 2 hours or longer.

Once your blood is taken, you'll be asked to stay for a short time to make sure you're feeling well. You'll be given something to drink (such as fruit juice) and a light snack before leaving.

You can go back to normal activities soon after giving blood, but some centers recommend that you have someone else drive you home after you donate. You might feel tired, but this usually only lasts a few hours.

Types of donations

There are several types of blood donation.

Volunteer whole blood donation

Most blood donations come as units of whole blood from volunteers who have no connection to the person who will get the blood. Once donated, the units are usually separated into components.

Platelet or other blood product donation

Donating platelets or other individual blood products is done with a process called **apheresis**. It allows volunteers to donate just one blood component. Blood is drawn out through a vein in the arm, and a machine separates out the needed component (usually platelets, although red blood cells, white blood cells, and plasma can also be collected this way). The rest of the blood is then returned to the donor, usually through a vein in the other arm. This procedure can take up to 2 or more hours depending on which blood component is being collected.

The advantage of this type of donation is that, since most of the blood is returned, a large amount of a needed component can be collected. Patients who need many platelet transfusions, like some cancer patients, are exposed to fewer donors in this way than they would be from platelets taken from many donors. This cuts down on the risk of both transfusion reactions and infections.

As with whole blood donation, apheresis donors should:

- Get a good night's sleep.
- Eat a well-balanced meal.
- Drink extra fluids before donating.

Since aspirin makes platelets less useful to a transfusion recipient, donors are usually asked not take aspirin for at least 36 hours before donation. The same FDA guidelines as those for whole blood donation must be followed. Unlike whole blood donors, those who give platelets or plasma by apheresis usually can give again in a week or so. Different blood centers may have different rules about this.

During the apheresis procedure, donors may feel cold, or they may feel a tingling sensation around the lips and nose, but this goes away once the procedure is done. (It's caused by the drug that is used to keep the blood from clotting in the machine.) Other side effects, such as feeling tired, are much like those from whole blood donation.

Donating your own blood for later use

Donating your own blood for later use is called **autologous donation**. Autologous donation is most often done in the weeks before you have a scheduled surgery that will likely require blood transfusion. Your own blood can then be used during or after the operation to replace any blood you may have lost.

This is generally thought to be the safest form of blood transfusion because you're getting your own blood back. Still, it's not totally without risk. There's always the very small chance that bacterial contamination or clerical errors can happen.

People who aren't able to donate blood for others may still be able to donate blood for themselves.

There is a processing fee for collecting, testing, storing, and delivering each unit of autologous blood. Be aware that your health insurance may not fully pay for this. You also need to plan ahead so that you have enough time before surgery to have your blood cell counts go back to normal after your blood has been collected.

Directed donation (for a family member or friend)

Donating blood for a family member, friend, or other specified patient is called **directed donation**. This can be done at any blood donation center, but you should call ahead to check requirements and schedule the donation. The donor must meet the same requirements as for regular blood donation, and the donor's blood must match the blood type of the recipient.

Blood from directed donors has not been shown to be safer than blood from volunteer donors and, the same types of testing are done on blood from directed donors. As with autologous donation, there's a processing fee for collecting, testing, and delivering each unit of directed donor blood. This fee might not be covered by health insurance. If the person the blood was collected for doesn't need it, some blood banks will use it for someone else. In others, it may be thrown out.

Paid donation

Blood from paid donors cannot be used in the United States for transfusion purposes. Plasma is the only component for which donors are sometimes paid, and it's taken by the apheresis method. Plasma can be treated for safety in ways that blood cells cannot.

Plasma taken from paid donors is generally treated and processed by pharmaceutical companies into drugs. It cannot be used as cryoprecipitate or fresh frozen plasma in patients.

Interested in donating blood?

Shortages in blood and platelets sometimes happen in certain areas of the country, especially during the holidays. If you're interested in donating blood, contact AABB for a list of member institutions, or visit their online blood bank locator[3]. You can also contact America's Blood Centers or the American Red Cross for donation centers near you.

Blood donation resources

American Red Cross

- Provides a locator service to find the Red Cross chapter or Blood Services region that serves you. A direct website for information on blood donation is www.redcrossblood.org[4].
- Toll-free number: 1-800-RED CROSS (1-800-733-2767)
- Website: www.redcross.org[5]

America's Blood Centers

- Has a listing of local ABC centers for donating blood; the website also offers general information about blood, blood donation, and blood use.

- Toll-free number: 1-888-US-BLOOD (1-888-872-5663)
- Website: www.americasblood.org[6]

AABB (formerly American Association of Blood Banks)

- Sets standards, inspects, and accredits blood collection and transfusion facilities. The AABB website has a blood bank locator, and general information on blood, blood product donation, and transfusions.
- Telephone: 301-907-6977
- Website: www.aabb.org[7]
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Hyperlinks

1. http://www.aabb.org/tm/donation/Pages/Blood-Bank-Locator.aspx
2. https://www.redcrossblood.org
3. http://www.redcross.org
4. http://www.americasblood.org
5. http://www.aabb.org
6. http://www.redcrossblood.org/

Blood donation resources

American Red Cross Toll-free number: 1-800-RED CROSS (1-800-733-2767)
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Can I Donate Blood if I'm a Cancer Survivor?

Some people who have had cancer are not allowed to donate blood for a certain length of time after treatment. This is done partly to protect the donor, but it may also add an extra margin of safety for the person who receives the blood. If you aren't sure if you are well enough to give blood, talk with your cancer care team before you try to donate.

While cancer has very rarely been transmitted through transplants of solid organs such as kidneys, there have been no reports of cancer transmission by blood transfusion. To check this, a group of researchers looked back in time at people who had received blood from donors who had developed cancer within 5 years of giving the blood. They found no increased cancer risk in those who got blood from those who were found to have cancer soon after donating.

This suggests that the chance of getting cancer from a blood donor with cancer is extremely small, if it exists at all. Even if cancer cells were present in donated blood, the immune system of the person getting the blood would destroy the cells. A possible exception might be in transfusion recipients with weakened immune systems, who might not be able to fight off the cancer cells. Because of this slight possibility, people whose cancer is thought to be growing or spreading are not allowed to donate blood for other people.

You cannot donate blood for other people if:

- You are being treated for cancer
- Your cancer is spreading or has come back
- You have had leukemia or lymphoma as an adult (including Hodgkin's Disease)
- You have ever had Kaposi sarcoma[1]

Different blood collection centers may have slightly different standards for allowing cancer survivors to donate. For example, the American Red Cross allows most people who have had cancer to donate if the cancer was treated at least 1 year ago and the cancer has not come back. (The time can vary at different blood centers.)

Potential donors whose cancers had not spread (in situ cancers) and required no further treatment besides surgery to remove the cancer may need to wait only until they've healed from their surgery and feel well again to donate blood.

If you have questions about whether you can donate, please contact the blood collecting center in your community.

Some cancer survivors may find these precautions frustrating. They may be eager to donate blood to help others with cancer, just as they were helped by transfusions during their treatment. Everyone should remember, though, that the most important goal in blood banking is to ensure the safety of the blood supply and to protect those who get the transfusions.

Hyperlinks

1. www.cancer.org/cancer/kaposi-sarcoma.html

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