Blood Transfusion

A Patient's Perspective: Information for patients and their families.

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Content for this pamphlet was taken from the online e-Learning tool previously developed.

Visit our website at www.transfusionontario.org to view the on-line program.

Note

This information is provided to help you and your family prepare for a potential transfusion. It is not intended to replace speaking to a trained health care professional, preferably a physician, about your questions and concerns. Please see the back of this pamphlet (pages 22-23) for space to record your questions as you read through the material.

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Contents

CHAPTER 1

Blood Basics

In this chapter you will learn:

- Facts about blood
- Blood cells and what they do

Facts About Blood

- Blood plays an important role in maintaining our health.
- Blood carries oxygen and nutrients throughout our bodies. It also carries carbon dioxide and other waste products back to the lungs, kidneys, and liver for removal. Blood works to fight against infection and to heal our wounds.
- The average person has between 5 and 7 litres of blood in their bodies. Blood accounts for approximately 7% of our total body weight (for example, a 200 lb person holds 14 lbs of blood).
- Blood cells are created in the bone marrow, especially the vertebrae, ribs, hips, skull, and sternum. Blood is a mixture of cells and watery liquid called plasma, in which the cells float. It also contains other things like nutrients (such as sugar), hormones, clotting agents, and waste products to be flushed out of the body.

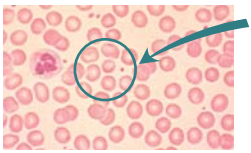
What is Blood Made of?

Blood consists of three types of cells:

- Red blood cells
- White blood cells
- Platelets

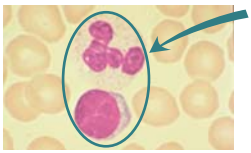
Each drop of blood contains 250 million red blood cells, 400,000 white blood cells and 15 million platelets suspended in a liquid called **plasma**.

What are Red Blood Cells?



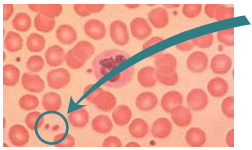
Red blood cells (also called erythrocytes) make up 40 to 45% of your blood. Their main role is to carry oxygen and to deliver it to the various parts of the body and return carbon dioxide to the lungs for removal.

What are White Blood Cells?



White blood cells (also called leukocytes) make up approximately 1% of your blood. Their main role is to fight infection. When they detect a foreign substance, such as bacteria, viruses, and foreign proteins, they react to destroy and remove the "invader."

What are Platelets?



Platelets (also called thrombocytes) form a small fraction of the total blood volume. Platelets help to plug holes in blood vessels to stop bleeding.

What is Plasma?

Plasma is a clear, yellowish liquid part of the blood system. Plasma accounts for approximately 55% of your total blood volume and includes water (at least 70%), as well as carbohydrates, fats, antibodies, hormones, clotting factors and other components. Its key objectives are to transport water and nutrients to your body's tissues. The proteins in plasma also help to fight disease.

Blood Disorders

In this chapter you will learn:

- Blood disorders that affect your red blood cells
- Blood disorders that affect your platelets

Types of Blood Disorders That Affect Your Red Blood Cells

A common type of blood disorder that affects your red blood cells is anemia.

Anemia occurs when a person has less than the normal number of red blood cells, or hemoglobin, in their blood.

Anemia can be caused by:

- Iron, folic acid or B12 deficiency
- Leukemia
- Lymphoma
- Bone marrow failure, or
- Blood loss

Types of Blood Disorders That Affect Your Platelets

These disorders include:

Thrombocytopenia

This is caused when you have an abnormally low number of platelets in your blood due to failure of production or increased destruction by the bone marrow.

Idiopathic Thrombocytopenic Purpura (also know as ITP)

This is an autoimmune disease in which your body produces antibodies against your own platelets, which are then destroyed.

The Use of Blood Components

What Components are Transfused & Why

Red blood cells, platelets and plasma are transfused for the following reasons:

Red Blood Cells

Red blood cells are transfused when anemia is severe enough to compromise the ability of the patient's blood to deliver oxygen to tissues and organs and threatens to cause damage. Within the red cells, oxygen is attached to a protein called hemoglobin.

So, if your hemoglobin is low, it means the red cells are carrying less oxygen to your tissues. The anemia may be due to blood loss or failure to produce enough red cells. The amount of blood transfused should be the least amount required to solve the problem. Wherever possible, non-transfusion approaches are preferred (e.g. treating iron deficiency anemia with iron).

Platelets

Platelets are transfused to patients who are:

- Unable to produce enough platelets for themselves
- At risk for bleeding in the course of treatment, or
- Taking medication that affects platelet function

Plasma

For replacement of clotting factors either because the patient's own production of these is impaired or not treatable by clotting factor concentrates.

Reasons to use plasma include:

- Preparation for surgery, or
- Other invasive procedure in patients with defective clotting (e.g. due to liver disease)

In this chapter you will learn:

- Common reasons you may need a blood transfusion
- What components are transfused and why

Why You Might Need a Blood Transfusion

Approximately every minute of every day in Canada, someone will need blood. **Some of the reasons you may require a blood transfusion are listed below:**

- Blood loss as a result of a surgical procedure or medical condition
- If you are born with, or develop, a blood disorder
- To support the body through cancer treatments
- Treatment of a major injury
- If you are born prematurely

Donor Information

In this chapter you will learn:

- Types of donations
- The 5 steps to donating blood
- The blood screening process

All regular blood donors in Canada are unpaid volunteers. Finding and keeping volunteer donors is a major activity of Canadian Blood Services and, in Quebec, Hema-Quebec.

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Types of Donations

There are four basic types of blood donations:

Whole Blood

Whole blood can be processed into red cells, platelets and plasma products.

Apheresis

One specific component of blood is donated at a time. The apheresis machine spins the blood, separating it into components of blood while giving the rest of the blood back to the donor. This entire process takes about 2 hours. Plasma and platelets can be collected by apheresis.

Autologous

This can be done by a patient having surgery who meets specific donor criteria so they can donate their own blood for use during their surgery.

Directed

This type of donation is made for a specific patient under special circumstances. It is usually made by parents for minor children, or for relatives of patients with rare blood types.

5 Steps

The 5 Steps to Donating Blood

The actual process of donating blood is quite simple. The process can be broken down into five basic steps:

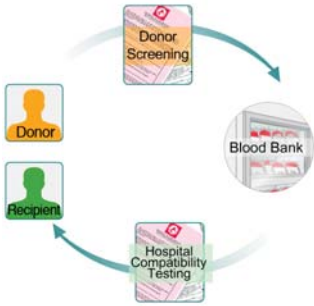
1. Before the donation, it is important to drink 3-4 glasses of water and have something to eat.
2. Upon arriving at the donor clinic, a small amount of blood is taken from the donor's finger to measure the amount of hemoglobin in the donor's blood. If the individual is found to have normal hemoglobin, he/she qualifies to donate blood and is directed to the donation area.
3. The donor will be asked to fill in a questionnaire that will then be reviewed by a nurse. The questions include medical history, recent travel destinations, and other information important to the suitability to donate blood. The donor will also have his or her temperature, pulse and blood pressure recorded.
4. At the time of donation, a trained professional will swab the donor's arm inside the elbow with an antiseptic solution to clean the area where the needle will be inserted. It usually takes less than 20 minutes to collect the unit of blood.
5. The donor is asked to rest for several minutes following the donation. Cookies and refreshments are served in the refreshment area. Before leaving, donors are told to drink plenty of fluids for the next 24 hours, to be cautious about lifting heavy objects and to avoid physical exercise.

The Blood Screening Process

Screening makes sure the donor's blood is safe for transfusion:

At the Blood Centre:

Before donation, during the donor screening, the patient's health and medical background are reviewed to determine their suitability to donate blood. If the donor is found to be unsuitable, the donation will not take place. Following donation at the blood centre, the blood is tested for infections that can be spread through blood (HIV, hepatitis B virus, hepatitis C virus, etc.).



At the Hospital:

Before each transfusion, the donor's blood is tested with the patient's blood to ensure blood group compatibility.

Blood Groups and Compatibility

In this chapter you will learn:

- Major blood groups
- Blood group compatibility

Major Blood Groups

There are many different blood types or groups. The ones that matter most are the ABO system and the Rh (Rhesus) system.

ABO Blood Types

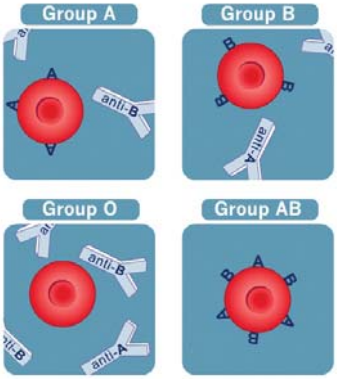
Each of us inherit our ABO group from our parents.

Rhesus (Rh) Blood Types

In Canada, the red cells of 85% of people test Rh Positive and 15% test Rh Negative.

Blood Group Compatibility

ABO Blood Types



Group A persons inherit the A antigen and make "antibodies" which destroy cells carrying B antigens.

Group B persons inherit the B antigen and make "antibodies" which destroy the A antigens.

Group AB persons inherit the A and B antigens and do not make either type of "antibody".

Group O persons do not inherit the A or B antigens and therefore make both "antibodies" that will destroy cells carrying the A or B antigens.

Rhesus (Rh) Blood Types

Antibodies to the Rh antigens are sometimes made after a transfusion of Rh Positive blood or pregnancy when the baby is Rh Positive and the mother is Rh Negative.

That is why, except in some emergency situations, Rh Positive blood should not be given to an Rh Negative female who may later have children.

Know your ABO and Rhesus blood type (e.g. O Positive) and, if possible when blood is to be transfused to you, check that your name and blood type are on the bag label before the transfusion is started.

The Risks of Transfusion

In this chapter you will learn:

- Risk of complication from transfusion and how they compare to other risks

Blood transfusion, like other medical processes, can never be without risk.

As a patient, knowledge of your options and the risks associated with them is in everyone's best interest.

Risk of event	Event
1 in 5,000,000	Annual risk of death from being struck by lightening in Canada
1 in 1,000,000	Annual risk of death from accidental electrocution in Canada
1 in 300,000	Death from oral contraceptives age < 20 yrs
1 in 200,000	Risk of death from transfusion of 1 unit of blood*
1 in 200,000	Death from anesthesia in fit patients
1 in 60,000	Annual risk of being murdered in Canada
1 in 10,000	Annual risk of death in a motor vehicle crash
1 in 100	Death associated with hip replacement surgery
1 in 60	Stroke within 30 days of cardiac surgery
1 in 10	Dying from lung cancer after smoking 1 pack a day for 30 years

**Patient risk for a blood transfusion should be determined as a multiplication of the risk by the number of units transfused. The risk of death per 1 unit transfused is approximately 1 in 200,000.*

As you can see, the risk of death from a blood transfusion is very low.

The following are the risks of complication following transfusion:

Hemolytic Reactions

"Hemolytic" means red blood cell destruction. This may occur soon after starting transfusion ("acute") or two or more days after transfusion ("delayed"). Both types of hemolytic reactions are typically the result of the incompatibility of blood between donor and recipient. Acute hemolytic reactions can often be prevented by accurate identification of donor and recipient blood type information.

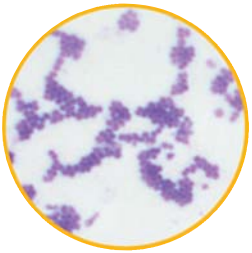
Acute Hemolytic Reactions

When Acute Hemolytic Reactions occur, the transfused red blood cells are immediately destroyed. The patient may experience symptoms such as fever and chills, back pain, and passing dark urine. This occurs in roughly 1 in every 40,000 units of red blood cells transfusions.

Delayed Hemolytic Reactions

When Delayed Hemolytic Reactions occur, the red blood cells are destroyed 2 to 10 days after the transfusion. The patient may experience symptoms such as jaundice and passing dark urine. This occurs in roughly 1 in every 7,000 units of red blood cells transfused. However, most of these reactions do not cause serious adverse effects. They are not always preventable.

The Risks of Transfusion (cont'd)



Bacterial Contamination

Bacteria in donor blood may come from three main sources:

- Bacteria on the donor's skin, or
- Bacteria from the donor's bloodstream, or
- Bacteria inadvertently introduced during processing

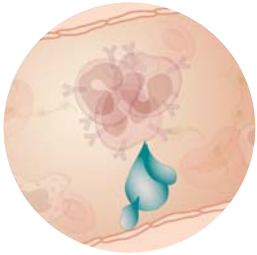
The risk of bacterial infection from a red blood cell transfusion is less than 100,000 while the risk of bacterial infection from a platelet transfusion is less than 10,000.

However, recent improvements in collection methods have reduced these risks considerably.

Febrile Non-Hemolytic Reactions

Febrile non-hemolytic transfusion reaction (FNHTR) is a reaction with fever and or chills which usually presents during or up to several hours after transfusion.

Reactions occur with 1 per 300 units of red blood cells transfused and 1 in 10 pools of platelets (1 pool consists of 4 donations).



Allergic Reactions

A minor allergic reaction is common (1 in 100), usually due to allergens in donor plasma or, less often, to antibodies from an allergic donor. These reactions may cause diarrhea, hives, headache and occasional dizziness. Less frequently, shortness of breath, wheezing, and incontinence.

Fluid Overload

Fluid overload arises when the rate of blood transfusion is greater than what the heart can manage. Fluid backs up in the lungs and causes difficulty breathing.

This may arise either because of:

- Impaired cardiac function, AND/OR
- Excessively rapid transfusion

Incidents of these complications are estimated to occur in about 1 in 700, with the rate rising to 1 in 100 for elderly patients.

Episodes of fluid overload are usually preventable by using a slow rate of transfusion and by pre-medication with drugs to increase fluid loss by the kidneys (diuretics).

Transfusion Related Acute Lung Injury (TRALI)

The cause of TRALI is not well understood but probably results from antibodies in donor blood that damage the patient's white blood cells in the lungs, causing fluid build up in the lungs. TRALI occurs in roughly 1 in 5,000 transfusions.

The Risks of Transfusion (cont'd)

Graft versus Host Disease

Graft-vs.-host disease (GVHD), in the context of blood transfusion, is usually seen in a patient with low immunity from disease or chemotherapy. This complication is rare. It is preventable by irradiating blood products intended for transfusion to such patients.

GVHD can occur occasionally in patients with normal immunity if they receive blood from a donor with similar but slightly different tissue type, usually a close relative. Preventative irradiation is therefore required if donor blood is obtained from a family member.

Infectious Disease Transmission

Some infectious diseases can be transmitted through blood transfusion. Some examples are:

Hepatitis

At least two forms of hepatitis can be transmitted through blood transfusion:

- Hepatitis B
- Hepatitis C

All blood and components are specifically tested for transmissibility of both the Hepatitis B and C viruses. Currently, the risk of being exposed to Hepatitis B from a transfusion is 1 in 153,000. With current testing for Hepatitis C, the estimated risk of acquiring Hepatitis C from a blood transfusion is approximately 1 in 2,300,000 per unit.

Human Immunodeficiency Virus (HIV)

Currently the risk of transmission of HIV as the result of a transfusion of a unit of blood is estimated to be approximately 1 in 7,800,000.

Cytomegalovirus

Cytomegalovirus (CMV) can be transmitted through red blood cell and platelet transfusion, and other components containing leukocytes. People with competent immune systems generally do not have problems with the virus. However, patients with poor immunity are at risk for serious complications from CMV reactivation or primary infection. CMV infection may cause severe multi-organ inflammation.

Others

Other infectious agents that are routinely checked for in all donations include Syphilis, West Nile Virus and Human T-cell Lymphotropic Virus.

What to Look For Following a Blood Transfusion

In this chapter you will learn:

- Signs and symptoms of a transfusion reaction

Following a blood transfusion, your healthcare professional will carefully monitor you for any unexpected signs of a transfusion reaction. For more information on transfusion reactions, please refer to chapter 6 in this pamphlet.

If you received a blood transfusion within an outpatient setting and were discharged home, it is very important that you understand the signs and symptoms to be aware of and what action you should take if the situation arises.

The following is a list of symptoms that can be a result of a reaction to your transfusion:

- Fever (temperature greater than 38° C/101.5° F, or a change in temperature of more than 1° C or 2° F)
- Chills (shaking)
- Headache and or backache
- Rash, hives and or itching
- Nausea and or vomiting
- Difficulty breathing and or shortness of breath
- Blood in urine/dark urine

You should notify your healthcare professional if you experience any of the symptoms listed above.

Alternatives to Transfusion

For patients who are undergoing surgery, some preventative steps include:

- A thorough medical assessment (to identify any treatable conditions and treat them, and to determine which, if any, measures are suitable for the individual patient)
- In advance of surgery, ensure adequate supply of iron and vitamins required to maintain "healthy" blood levels
- Perform a blood count to determine the capacity to withstand blood loss without transfusion (hemoglobin level)
- Plan to stop, if possible, using drugs (e.g. aspirin) which tend to increase bleeding during surgery (with your physician's approval)
- Collection of the patient's own ("autologous") blood before surgery. Autologous blood involves taking 1-3 bags of blood from the patient, and storing until time of their surgery. This has to take place at least 2 weeks prior to surgery to allow the patient to make up the loss
- Erythropoietin (EPO) is a hormone produced by the kidney. This hormone is responsible for regulating red cell production and can be given to boost hemoglobin prior to surgery
- Other drugs to decrease blood loss

Non-Surgical Transfusion Needs

Measures are also available to reduce transfusion in patients with non-surgical transfusion needs such as kidney failure or cancer patients.

Some of these measures include:

- Ensuring any otherwise treatable condition is treated
- Reviewing use of anti-platelet drugs (e.g. aspirin) or blood thinners, which may cause or increase, blood loss
- Using Erythropoietin (EPO) to boost hemoglobin production
- Ensuring adequate supply of iron and vitamins

In this chapter you will learn:

- Alternatives to transfusion

There are various alternatives that can be used alone, or in combination, to eliminate or reduce the need for blood transfusion. Since some of these measures take time to be effective, they require advanced planning.

We will discuss the methods for patients undergoing surgery, as well as those with diseases not requiring surgery.

Informed Consent

In this chapter you will learn:

- Informed Consent – It is your right to know

Within the context of Transfusion Medicine, the process of consent involves:

1) a potential donor making a choice to donate blood or to refuse to donate blood, or

2) a potential recipient (patient) making a choice to receive blood transfusions as therapy for a particular condition or to choose another therapeutic option, including the option of no therapy whatsoever

National standards require that there be documentation of the need for transfusion. As a possible recipient you also have the opportunity to ask questions and raise any concerns you may have and you should receive satisfactory answers to those questions and concerns.

Each hospital should have a policy established to ensure that patients are appropriately informed before receiving blood and blood products. This information should be presented in a language that the recipient can understand.

The following information should be explained to you:

- Information about the blood product, the process of administering the product and the expected outcome
- The reasons for the transfusion
- The transfusion associated risks, including the infectious and non-infectious associated risks
- Clinically appropriate alternatives to transfusion, including the benefits and risks provided in a sufficient timeframe to ensure the alternatives can be implemented
- The probability of success of the transfusion
- The consequences of declining the transfusion

How do I use this information to participate in deciding about transfusion?

Patients should be informed and specifically consent to blood transfusions (except in emergency cases when the patient is unable to consent). By understanding blood transfusions, and the associated issues that come with transfusions, you are better able to make an informed decision about consent.

Consent has several elements:

- Must be voluntary
- The patient must be competent to give consent
- Consent must be specific to the treatment proposed
- Consent must be "informed" – the patient must understand the risks, benefits and alternatives

Understanding the content of this pamphlet will enable you to:

- Decide in advance the questions you wish to ask to be "informed" (don't be afraid to ask!)
- Identify any alternatives to be considered
- Better understand why the transfusion is being recommended
- Take a critical interest in your own treatment

Informed Consent (cont'd)

Questions to Ask My Physician

If you are going for elective surgery, ask your physician for more information about blood conservation programs in your area. If you are interested in donating your own blood, talk to your physician at least 6 weeks prior to surgery.

To find more useful resources, please visit www.transfusionontario.org

Question 1:

Answer:

Question 2:

Answer:

Question 3:

Answer:

Question 4:

Answer:

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Blood Transfusion: A Patient's Perspective e-Learning tool is available as an electronic learning tool. It is accessible at www.transfusionontario.org along with more useful resources for patients and their families.

Ordering Information: Please contact the Regional Coordinator of the Ontario Regional Blood Coordinating Network in your area.

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