

BMS Program

Bloodless Medicine
and Surgery



About Bloodless Medicine and Surgery

In October, 1996, Hartford Hospital became the first hospital in Connecticut with a Bloodless Medicine and Surgery Program. Our uses of safe and effective transfusion free medical and surgical techniques reduce many of the risk associated with blood transfusions. Through a multidisciplinary approach to patient care, complex procedures such as cardiac surgery, aortic aneurysm repair, total joint replacements, kidney transplants, and major oncological procedures have been performed without blood transfusions.

Why Bloodless Medicine and Surgery?

The goal of the Hartford Hospital Bloodless Medicine & Surgery service is to provide surgical and/or medical treatment without the administration of blood or blood related products.

Our Goals:

- Minimize blood loss during and after surgical, medical or laboratory procedures
- Provide alternative methods to maintain or expand blood volume
- Provide alternative methods for increasing oxygen carrying capacity

Our Service Provides:

- Patient education and assistance regarding Decisions for Care.
- Preadmission drug therapy to stimulate blood cell production in preparation for surgery; minimized sampling; intraoperative techniques to minimize blood loss.
- Networking with other BMS programs to assure that the latest techniques and alternatives to transfusions are available for our patients and physicians.

Information for You

This handout is to provide you with a greater understanding of alternatives to transfusions. After reviewing this information, you will be able to make an informed decision on these alternatives. Without your consent, we will not be able to use these alternatives. You will not receive whole blood, blood cells or plasma if you chose to be on our program. Other acceptable treatment options may available.

Patient Blood Management

Hartford Hospital is proud to offer a progressive approach to transfusion free medical and surgical procedures. We offer many techniques specifically designed to minimize blood loss. By being informed of these techniques and the alternatives to transfusion you will be equipped to make decisions that are within your wishes.

Technology and Procedures Utilized in Bloodless Surgery

MEDICAL AND SURGICAL TECHNIQUES

Controlled Hypotension/Hypotensive anesthesia: intentional and controlled lowering of blood pressure reduces bleeding by decreasing pressure on injured blood vessels and causing less disruption of newly formed clots.

Arterial Embolization: therapeutic introduction of either mechanical or chemical agents into blood vessels to occlude them. In emergencies, embolization can control active bleeding from a lacerated artery. This intervention may avoid general anesthesia and major surgery (postpartum hemorrhage, uterine fibroids, gastro-intestinal bleeding).

Hemodilution: At the start of the surgical procedure some of the patient's own blood is diverted through a closed circuit while intravenous fluids are given to replace blood volume. This technique dilutes the patient's blood and reduces the amounts of blood cells and clotting factors lost during surgery.

Oximetry: This is a non-invasive monitoring of the oxygen level of blood.

Laboratory sampling: Minimal volumes of blood samples are obtained for laboratory analysis.

BLOOD CONSERVATION DEVICES AND EQUIPMENT (devices which promote clotting)

Electrosurgery: a probe heated used to cut and coagulate capillary vessels and small arteries during surgical procedures.

Harmonic Scalpel: a scalpel that uses sound waves to seal tissue as it cuts, used during surgery on vascular organs, such as the spleen or liver.

Argon Beam Coagulator: a device which uses argon gas to coagulate blood vessels to lessen bleeding.

Intraoperative blood salvage (Cell Saver): The patient's own blood is recovered, filtered, and returned during surgery.

Technology and Procedures Utilized in Bloodless Surgery (continued)

MINIMALLY INVASIVE SURGERY

(performed with specialized devices designed to use small incisions, minimizing blood loss; bleeding or other problems can be located, diagnosed, and treated without conventional open surgery).

Laparoscopy: using a tube-like device, abdominal structures can be visualized through a small “keyhole” incision.

Endoscopy: using a flexible tube-like device a visual examination of the interior of the stomach, intestines, and other body cavities is possible.

HEMATOLOGICAL AGENTS

(stimulate blood cell growth and development)

Synthetic Erythropoietin: also known as PROCRIT, EPOGEN, or “EPO”; this medication stimulates the patient’s own bone marrow to produce red blood cells.

Synthetic Granulocyte-Colony Stimulating Factor: also known as Neupogen, Filgrastim, or G-CSF; this medication stimulates the bone marrow to produce neutrophils, a specific infection-fighting white blood.

Medical Thrombopoietic agents: drugs that stimulate the bone marrow to produce blood platelets that are needed for normal clotting.

HEMOSTATIC AGENTS

(promote clotting; can be given intravenously or applied topically)

Aminocaproic Acid and Tranexamic Acid: medications given intravenously which slow or stop the breakdown of blood clots.

Volume Expanders: Intravenous fluids enhance the circulation of the patient’s own blood by maintaining adequate volume.

Iron Therapy

What is iron?

Iron is a mineral, naturally found in some foods or replacement sources and is an essential part of hemoglobin. Hemoglobin which is contained in red blood cells carries oxygen throughout your body. Iron supplements contain no blood products but are important in your blood building process.

What foods contain iron?

Unsulfured molasses, liver, lean meats, lentils, green leafy vegetables, dried fruit, whole grain breads and fortified cereals are all good sources of iron.

Why might I need an iron supplement (ferrous sulfate, ferrous gluconate, etc.)?

1. Some anemias are caused by an iron-deficiency. Your diet may not contain adequate amounts of iron-rich foods or your body may not absorb the iron from the food you eat.
2. If you suffered a loss of blood, your body needs additional iron in order to produce more blood to replace what was lost.
3. Pregnant mothers need additional iron for themselves and their growing fetus.
4. If you are receiving medication like erythropoietin to build more red blood cells, you need additional iron for your body to make these cells.

What side effects of this medicine might occur?

1. Oral iron may cause gastric irritation if taken on an empty stomach.
2. It may also cause diarrhea or constipation.
3. Oral iron may cause your stools to change color to dark green or black.

Should I take my iron with food or other medications?

1. Iron should be taken on an empty stomach. However, if it causes irritation it may be taken with meals.
2. Some foods will reduce iron absorption: milk, tea, many cereals, and eggs.
3. Some medications will reduce iron absorption: antacids and tetracycline.
4. Some foods will increase iron absorption: citrus fruits and citrus juices.
5. Some medications will increase iron absorption: Vitamin C.

What is intravenous iron (iron sucrose, iron dextran) and when is it used?

Iron may be given intravenously in the presence of severe anemia from iron deficiency or after a significant blood loss. It may be given in combination with erythropoietin in preparation for surgery to increase red blood cells. This must be administered in the hospital or hospital infusion center such as at Harry Gray Cancer Center. Its appearance is a dark fluid, resembling color of maple syrup; however, it contains no blood products.

Erythropoietin

(also called Epoetin Alfa, Epogen, Procrit)

What is erythropoietin?

It is a hormone which is normally produced in your kidneys. When your body senses that your oxygen level is low, more of this hormone is produced. This hormone will in turn stimulate your bone marrow to produce more red blood cells. Your red blood cells are the cells that carry oxygen throughout your body. This hormone enables you to replace blood loss.

Why might I need erythropoietin?

1. If you are scheduled for surgery, during which time we expect that you will have a measurable blood loss, your doctor may prescribe this medication prior to surgery. This gives a greater margin of safety with major surgery.
2. If your kidneys do not produce erythropoietin or insufficient amounts, your doctor may order this medication. This sometimes happens when patients are on hemodialysis (kidney machine) or chemotherapy and premature infants.

Is this a blood product?

The medication Erythropoietin is developed by a process called genetic engineering, which is not from blood. However, because it is unstable by itself, a small amount of albumin (0.01%) is added. Albumin is a protein taken from human blood and is processed so as not to carry blood borne diseases.

What are the side effects of this medication?

1. If you have problems with these or other side effects, check with your doctor.
 - a. Headache; nausea and vomiting; flu-like symptoms (e.g., chills, sweating, muscle pain); joint pain; weakness; diarrhea; dizziness; rash
 - b. Some patients may have other side effects that are not listed below.
2. The following side effects may be more serious. **CALL YOUR DOCTOR IMMEDIATELY IF ANY OF THE FOLLOWING OCCURS:** Seizures; chest pain, difficulty breathing; irregular heartbeat; swelling of the face, hands or feet; severe rash and itching.
3. **WARNING:** You should not be given this medicine if you have had an allergic reaction to erythropoietin or albumin (human). Erythropoietin should not be taken by patients with uncontrolled high blood pressure.
4. **Precaution:** Check with your doctor before taking this medicine if you are pregnant or breast feeding.

How do I know the medication is working?

Your doctor will order a blood test to evaluate how well the medication is working. This may be done once every three days. Your doctor will also have your blood pressure checked while on this medication.

Albumin and Globulins

What are albumin and globulins?

These are proteins which are found in many body tissues and are also carried in blood. Albumin has an important function in balancing the fluid balances within your tissues and circulating blood volume. Globulins are proteins which carry antibodies which enable you to fight certain diseases. These proteins can be taken from blood and given to another person to function in that same way.

Why might I need albumin?

Albumin is sometimes used to replace blood volume when someone has lost a significant amount of their blood. Initially that volume is replaced by clear intravenous solutions (Saline, Ringer's Lactate, Dextran, Hespan). These intravenous solutions are not blood derivatives. When those solutions are insufficient to maintain your blood volume, the doctor may consider albumin if it is acceptable to you. Albumin is also used when a patient is on hemodialysis (kidney machine) or recovering from burns. A typical amount of albumin used to replace volume is slightly over 1-2 ounces in non-blood solution.

Why might I need globulins, such as RhoGam?

One type of globulin, immunoglobulins or gammaglobulin, contains antibodies which enable you to fight infections by certain bacteria, fungi, and viruses. This would be given if you were exposed to a disease and would help you fight off that disease.

A different globulin is contained in a product called Rh immune globulin (RhoGam, Rhophyllac) which is given to pregnant patients who have an Rh-negative blood type. This may be given during pregnancy or soon after delivery of an Rh-positive baby. This prevents the mother from developing antibodies to Rh-positive blood. If a mother were to develop antibodies to Rh-positive blood it could seriously affect the health of a later pregnancy when the baby has an Rh-positive blood type.

Are these blood products?

These are fractional blood products. Although albumin and globulins are found in many tissues, they are carried in blood. The products are taken from another person's donated blood. Some do not equate these products with blood transfusions and will accept them. Because these products are carried in blood and taken from blood, some patients choose to refuse these products.

Are there risks of blood borne disease with albumin/globulins?

These products are processed and are considered to have no risk of blood borne disease.

Fractional Products to Stop Bleeding

What are these products to stop bleeding?

Fractional blood products include clotting factors VIII, IX, and fibrinogen. These may be administered into the vein to stop bleeding. Tissue adhesives are similar products which are applied topically. Tissue adhesives are applied directly to tissue which is bleeding.

Are these blood products?

These are fractional blood products - a small part of donated blood which helps your blood to clot normally.

Why are they used?

Sometimes, with major injuries (trauma), major surgery or illness, your blood may lose the ability to clot. This clotting process is necessary to stop bleeding. Some people have an inherited condition called hemophilia which results in inadequate levels of a clotting factor and a tendency to bleed. These fractional blood products are given to restore normal clotting and thereby stop the bleeding.

Are there risks to these products?

These are all tested negative for Hepatitis B virus and HIV (AIDS). However there is no guarantee:

Current risks for:	Hepatitis B	1:355,000 ¹
	Hepatitis C	1:2,000,000 ²
	HIV/AIDS	1:2,300,000 ²

In most cases, the risk of bleeding severely is a greater than the risk of disease transmission.

Are there products to stop bleeding that are not derived from blood?

There are some artificial clotting factors, called recombinant clotting factors. These do not contain any blood fractions. Some medications also help stop bleeding. There are tissue adhesives that are synthetic or derived from plants that can help control bleeding. However, there is not an artificial form for every clotting factor that our body makes.

¹ Zou S, Stamer SL, Notari ET, et al. Current incidence and residual risk of hepatitis B infection among blood donors in the United States. Transfusion 49: 1609-20 (2009)

² Zou S, Dorsey KA, Notari EP, et al. Prevalence, incidence, and residual risk of human immunodeficiency virus and hepatitis C virus infections among United States blood donors since the introduction of nucleic acid testing. Transfusion 50: 1495-1504 (2010)

Blood Salvage: Cell Saver

Intraoperative and Postoperative

What is intraoperative/postoperative blood salvage?

This is a process which reduces total blood loss during major operations by collecting your blood with suction as it accumulates within the surgical site (i.e. chest cavity, abdominal cavity, or joint). Your blood then goes through tubing in a machine, a Cell Saver, which washes, filters and returns your red blood cells through a tubing to your vein. Sometimes this process continues immediately after surgery in the recovery room. This can be set up in a closed continuous circuit.

Does this involve any blood products from another person?

No, this is returning only red blood cells from your own blood.

Is this always used?

No, your surgeon and anesthesiologist will determine if this is necessary and appropriate for you depending on the type of surgery you need. This is not used for surgical procedures when little blood loss expected.

What is the OrthoPAT?

This is a small blood salvage machine used specifically during orthopedic/bone surgery. This can be used in the operating room, recovery and several hours after surgery.

How is the OrthoPAT different from the Cell Saver?

Your blood is processed in the same way as Cell Saver; however, your red blood cells fill into a small plastic bag attached to the machine. Your intravenous line is then attached to the bag of your washed blood cells. The bag is then disconnected from the machine, inverted for reinfusion to you.

A second small plastic bag is attached to the machine, and process repeated. Normally, your blood is connected to you going to the machine or returning, but not in a continuous circuit. However, the OrthoPAT may be setup in a continuous circuit when specifically requested.

Hemodilution

What is hemodilution?

The word hemodilution means dilution of blood. This is a process used to reduce the amount of actual blood cells lost during surgery. Any bleeding that you have during surgery is less concentrated and therefore, blood cell loss is reduced. This is a valuable technique when the expected blood loss is significant.

How is this done?

In the operating room, the anesthesiologist will quickly divert some of your blood into a collection bag which contains a substance that prevents the blood from clotting. With all bloodless surgery patients, this will be set up with IV tubing slowly and continuously returning your blood to you. The doctors will not disconnect the circuit while in process. The amount of blood diverted through that system is replaced with a clear non-blood solution (such as normal saline or Ringers Lactate). This clear solution has the effect of diluting your blood during the surgery. As the surgery progresses your blood is slowly returned to your vein.

Does this involve any blood products?

No, this is only involving the flow of some of your own blood.

Is this always used?

No, your surgeon and anesthesiologist will determine if this is necessary and appropriate for you depending on the type of surgery you need.

Heart-Lung Machine

(Also called Cardiopulmonary Bypass)

What is the heart-lung machine?

The heart-lung machine or cardiopulmonary bypass machine temporarily takes over the function of the heart as a pump and the lungs in adding oxygen to the blood. This is only used during heart surgery while the heart is repaired. Blood is diverted from its normal return to the heart through tubing to the heart-lung machine where oxygen is added to your blood. Your blood then continues to be pumped back to your body. This is necessary to provide a continuous flow of oxygenated blood to all your vital organs while your heart is being repaired.

Does this involve any blood products?

The heart lung machine provides a way for your own blood to get oxygen during the surgery. When patients request bloodless surgery, no whole blood, cells or plasma are used. If your Directions for Care permit fractional blood products, such as albumin, it may be used if needed. The machine and all tubing are primed with a non-blood solution.

Kidney Machine

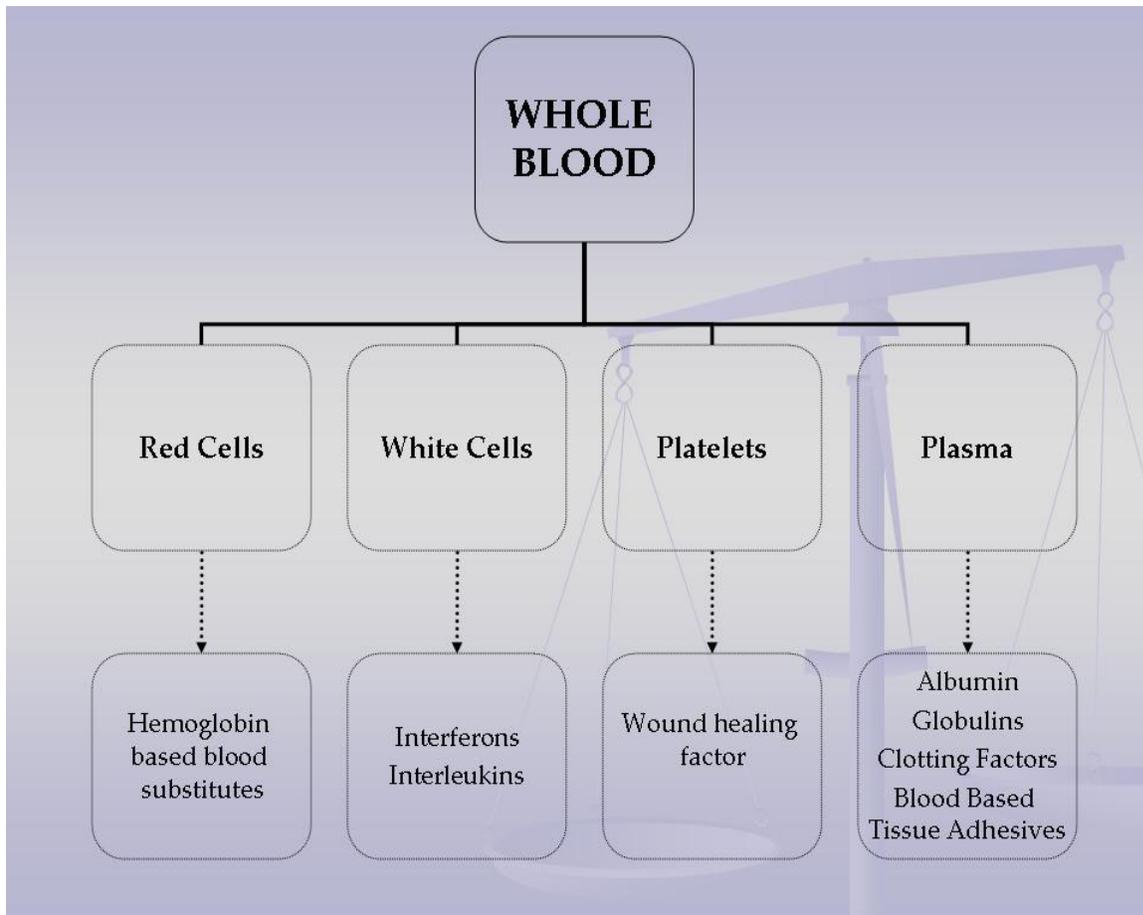
(Also called Hemodialysis)

What is the kidney machine?

The kidney machine or hemodialysis is used when a person's kidneys no longer function to clean impurities/waste products out of the blood. If your kidneys fail to function, it is vital to substitute a process to clean harmful waste products from your blood. Your blood will circulate through this machine while impurities are removed. When kidney function fails, you will need this dialysis regularly, usually three times a week.

Does this involve any blood products?

The kidney machine provides a continuous, closed circuit for your own blood to be cleansed. When patients request bloodless surgery, no whole blood, blood cells or plasma are added in this process. If your Directions for Care permit fractional blood products, such as erythropoietin or albumin, they may be used if needed. The machine and all tubing are primed with a non-blood solution.



Red Blood Cells (RBCs) carry oxygen from the lungs to the tissues around your body. As a secondary function, they are also a key player in getting waste carbon dioxide from your tissues to your lungs, where it can be breathed out.

White blood cells (WBCs), or leukocytes, are the body's defense system. Your white cell count rises with infection as your body creates more WBCs to fight disease.

Platelets have the important job of traveling to areas in your body that are bleeding and form a clot or scab to stop the bleeding. Platelets also prevent you from bleeding even when you are not cut. They prevent blood from leaking out of the very tiny vessels in your body called capillaries.

Plasma (FFPs) is a yellowish fluid that carries all blood cells. Plasma makes the blood sticky so that you don't bleed to death. It also works with platelets to form a clot or scab