Introduction
Bone marrow is the spongy tissue inside all of your bones, including your hip and thigh bones. The bone marrow is like a factory that makes different types of blood cells. There are many diseases that can affect the bone marrow. If there is a problem with your bone marrow, a transplant can give you healthy, new marrow. If your health care provider recommends a bone marrow transplant, the decision whether to have the procedure is also yours.

This reference summary explains bone marrow transplantation. It covers why the procedure is needed, alternative treatments and how a bone marrow transplant is done. It also talks about what to expect after the procedure.

Blood and Bone Marrow
Blood consists of blood cells floating in plasma. Plasma is mostly made of water. It also has chemicals in it. These chemicals include proteins, hormones, minerals and vitamins.

There are 3 basic types of blood cells:
- Platelets.
- Red blood cells.
- White blood cells.

Platelets are small pieces of cells that help blood to clot when a person is injured. Clotting controls bleeding and prevents the loss of too much blood. Red blood cells are also called RBCs. They make up almost half of blood and give blood its red color. Red blood cells are filled with hemoglobin, which carries oxygen from the lungs to the body’s tissues.
White blood cells are also called WBCs. These cells help the body fight infection and disease. There are several kinds of white blood cells. Each fights different kinds of germs. Blood cells are formed in the soft, spongy center of bones called the bone marrow. New, undeveloped blood cells are called stem cells. Some stay in the marrow to develop. Others travel to different parts of the body.

Stem cells can grow into all 3 types of blood cells. They also make copies of themselves over and over again. These cloned stem cells eventually become mature blood cells.

**Reasons for Bone Marrow Transplant**

Bone marrow diseases may:

- Destroy bone marrow.
- Prevent bone marrow from making enough blood cells.

A bone marrow transplant may be used to treat bone marrow diseases.

Certain cancers can affect the bone marrow. Some examples of these cancers are:

- Leukemia.
- Lymphoma.
- Multiple myeloma.
- Myelodysplastic syndromes.

Leukemia is cancer of the white blood cells. White blood cells normally form in the bone marrow. But with leukemia, the bone marrow makes abnormal white blood cells. Lymphoma is a cancer of a part of the immune system called the lymphatic system. It can spread into the bone marrow and affect the production of blood cells.

Multiple myeloma is a cancer that begins in plasma cells, a type of white blood cell. In time, myeloma cells collect in the bone marrow and in the solid parts of bones. Myelodysplastic syndromes or MDS, is a group of disorders where your bone marrow does not work well, and the blood-forming stem cells in your bone marrow fail to make enough healthy blood cells. People with MDS can lack the right amount of red blood cells, white blood cells, and platelets, the small cells that help blood to clot.
Some cancer treatments can also destroy stem cells in the bone marrow. Patients that receive high doses of radiation therapy or chemotherapy may receive a bone marrow transplant after treatment.

A bone marrow transplant may also be needed to treat severe blood diseases. Some of these diseases include:

- Aplastic anemia.
- Sickle cell anemia.
- Paroxysmal nocturnal hemoglobinuria.
- Thalassemias.

These diseases cause the body to not make enough blood cells or to make blood cells that do not work well. Aplastic anemia is a rare but serious blood disorder. The bone marrow does not make enough new blood cells. Sickle cell anemia is a disease in which the body makes abnormally shaped red blood cells. The cells are shaped like a crescent or sickle.

Paroxysmal nocturnal hemoglobinuria or PNH is a rare and serious blood disease that causes red blood cells to break apart. Doctors call this breaking apart "hemolysis". It happens because your blood cells are missing a protein that protects them from your body's immune system. Thalassemias are genetic diseases. With these diseases, the body has problems making hemoglobin. Hemoglobin is the protein in red blood cells that carries oxygen throughout the body.

Certain diseases prevent the body from making some types of white blood cells. Bone marrow transplant can provide blood stem cells that can replace the missing cells.

**Alternative Treatments**

Depending on your bone marrow disease, other treatments may be available.

Cancers that affect the bone marrow may be treated with:

- Surgery.
- Chemotherapy.
- Radiation therapy.
- Immunotherapy.
- Vaccine therapy.
Chemotherapy is the use of drugs to kill cancer cells. Radiation therapy uses high-energy rays to kill cancer cells or stop them from growing and spreading. Immunotherapy is treatment to boost or restore the ability of the immune system to fight cancer.

Vaccine therapy uses a substance or a group of substances to stimulate the immune system to destroy the cancer. Alternative treatments for severe blood diseases may include blood transfusions. A blood transfusion is a procedure in which blood is given to you through an intravenous, or IV, line in one of your blood vessels.

Many different medicines can be used to treat severe blood disorders. These medicines may:

- Prevent and treat infections.
- Relieve pain.
- Stimulate the bone marrow to make more blood cells.
- Suppress the immune system.

Most bone marrow diseases require a successful bone marrow transplant to be cured.

**Before the Procedure**

To minimize side effects after a bone marrow transplant, health care providers will use stem cells from a donor that matches the patient as closely as possible. A close stem cell match can reduce the risk that your remaining immune system will attack and reject the donor cells. It also reduces the risk that cells from the donor’s stem cell graft will attack your body. When this happens it is called graft vs. host disease.

You may find a suitable match in your family. But if you do not, there may be volunteer donors that are a close match. You will need other medical tests and exams before a bone marrow transplant. Your health care providers will want to make sure you are healthy enough to go through the procedure, and understand the potential risks.
You will check into the medical facility a few days before the transplant. A surgeon will place a tube, or catheter, in a large vein in your chest. This tube is called a central line. The central line will be used to give you fluids, medicines and blood products and to collect blood samples. It allows easy access to your bloodstream. The tube will stay in place for at least 6 months after the transplant procedure.

To prepare your body for the transplant, you will be given chemotherapy and possibly radiation. This treatment destroys the stem cells in your bone marrow that are not working correctly.

**Bone Marrow Transplantation**

You will be awake during the transplant. You may get medicine to help you stay calm and relaxed. The transplant will take at least an hour or more. It depends on your size and age. This is usually not painful. A bone marrow transplant is like a blood transfusion. During the procedure, donated stem cells will be delivered through the central line.

Once the stem cells are in your body, they travel to your bone marrow. There they begin making new red blood cells, white blood cells and platelets. You may see signs of new blood cell production between 2 and 4 weeks after the transplant.

**Risks and Complications**

The immune system is weak after a bone marrow transplant. This means you can easily get infections. This risk decreases as you recover.

You can take steps to prevent infections, such as:

- Avoiding public or crowded places and anyone who is sick.
- Avoiding foods that may have harmful bacteria, such as raw fruits and vegetables.
- Bathing or showering daily.
You can also prevent infections by:
- Carefully brushing your teeth and caring for your gums.
- Cleaning the area where the central line enters your body.
- Washing your hands often.

Graft-versus-host disease, or GVHD, can happen if some of the cells in the new donor stem cell graft attack your, the host’s, body. Your chances of experiencing GVHD are reduced if the donor stem cells are a close match to your own.

Signs and symptoms of GVHD are:
- A rash that can affect the palms of the hands, soles of the feet and other parts of your body.
- Jaundice, the yellowing of the skin and whites of the eyes.
- Nausea, vomiting and diarrhea.

Graft failure is more common in people who receive stem cells that are not a close match. It may happen if your body rejects the donor stem cells. It can also happen if:
- Not enough stem cells are used.
- Your bone marrow is damaged after the transplant.

Some people may get a bone marrow transplant to treat cancer. In these people, there is a risk that the cancer may return.

**After the Procedure**

You may stay in a hospital for weeks or even months after your bone marrow transplant. Your stay will last until your health care providers are sure you are safe to be discharged. Your health care providers will test your blood at various times after the transplant to see if the new donor blood cells have begun to grow. They will check your blood counts every day to track your progress. You may need to receive infusions of RBCs and platelets when these blood counts are low.

Health care providers also will watch you for:
- Side effects from chemotherapy and radiation.
- Symptoms of infection.
- Signs that the transplant was not successful.
After you leave the medical facility, you will need to see your health care provider regularly. He or she will continue to monitor your progress. Recovery from a bone marrow transplant takes 6 to 12 months. For some patients who experience complications, recovery may take longer.

**Summary**

Bone marrow is the spongy tissue inside of your bones, such as your hip and thigh bones. Bone marrow makes different types of blood cells. There are many diseases that can affect the bone marrow. Most bone marrow diseases require a successful bone marrow transplant to be cured.

A bone marrow transplant is like a blood transfusion. During the procedure, you will get donated stem cells through the central line. Once the stem cells are in your body, they travel to your bone marrow. There they begin making new red blood cells, white blood cells and platelets. You will stay in a hospital facility for weeks or even months after your bone marrow transplant. Recovery is different for each person. It depends on if and how much graft vs. host disease you experience. Other unexpected complications may also happen.

Your stay will last until your health care providers are sure that your transplant was successful. Recovery for some patients happens within 6 to 12 months. But, it may be a longer and even be a lifelong process.