



Stem Cell Transplant Overview

A stem cell transplant is a treatment option for people who have multiple myeloma. This resource offers answers to some common questions about stem cells and stem cell transplants, and provides you with links to resources for more in-depth information.

KEY POINTS

1. Stem cells (sometimes called hematopoietic stem cells) are immature cells within your bone marrow that can divide themselves to make more stem cells and mature into different types of cells
2. A stem cell transplant is a treatment option for people who have multiple myeloma
3. Your doctor will work with you to decide whether a stem cell transplant may be right for you

WHAT ARE STEM CELLS?

You have many different types of cells within your body that perform different jobs to help your body function. Stem cells (sometimes called hematopoietic stem cells) are cells that are immature (or not fully formed) and do not yet have a specific job.

Stem cells are self-renewing, meaning that they can divide themselves to make more stem cells. In fact, they're always dividing and replacing old cells. Stem cells can also mature into any one of several different types of cells—like white blood cells that fight infection, red blood cells that carry oxygen, or platelets that help stop bleeding.

WHERE ARE STEM CELLS FOUND?

Stem cells are found in 2 places within your body:

- **Bone marrow.** Bone marrow is the soft, spongy tissue found within large bones, such as your pelvis and breastbone
- **Peripheral bloodstream.** This is the blood that flows through your body

Stem cells are also found in umbilical cord blood (the blood within a newborn baby's umbilical cord).

WHAT IS A STEM CELL TRANSPLANT, AND HOW CAN IT HELP SOMEONE WITH MULTIPLE MYELOMA?

A stem cell transplant is a medical procedure in which healthy stem cells are infused (or put into) the blood of patients whose stem cells have been damaged by diseases like multiple myeloma or by certain medications or by certain treatments such as radiation. Stem cell transplants can help to restore the bone marrow's ability to produce healthy blood cells in people with multiple myeloma.

Stem cell transplants are sometimes referred to as hematopoietic stem cell transplants or bone marrow transplants. The name changes depending on where the cells are sourced. For this article, we will use the term "stem cell transplant."



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ARE STEM CELL TRANSPLANTS COMMON?

In the United States, patients were estimated to have received more than 18,000 stem cell transplants in 2012. More than 6,000 of these were to treat multiple myeloma. The rest were to treat other diseases such as non-Hodgkin lymphoma, different types of leukemia and other cancers, autoimmune disorders, and other conditions.

HOW DOES A STEM CELL TRANSPLANT WORK?

There are 3 types of stem cell transplants based on the source of the stem cells:



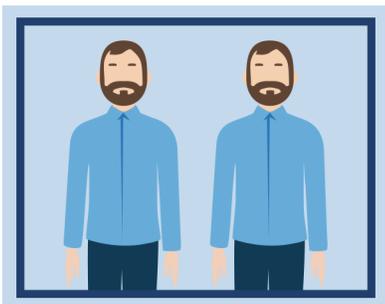
Autologous (stem cells are harvested from the patient [self-donor])

- This transplant procedure utilizes a patient's own stem cells
- This is the most common type of stem cell transplant for people with multiple myeloma. Learn more about autologous transplants below



Allogeneic (stem cells are harvested from a matched donor or an umbilical cord [related or unrelated])

- This transplant procedure utilizes stem cells donated by a person who is not an identical twin to the patient
- Most times, the donor's genes must at least partly match the patient's genes. Specific blood testing is performed to confirm/ensure that a donor is a good match for the patient
- Allogeneic stem cell transplants are less common today than autologous stem cell transplants because of their increased risk of complication, though they do offer benefits to certain patients



Syngeneic (stem cells are harvested from an identical sibling)

- This transplant process utilizes stem cells that are donated to the patient by his or her identical twin
- Syngeneic stem cell transplants are rare compared with autologous or allogeneic stem cell transplants. This is because they can only be performed if the person with multiple myeloma has an identical twin, with an identical genetic makeup and tissue type

Today, most stem cell transplants performed for multiple myeloma are autologous, with the patient's own cells used for the transplant. Multiple factors are taken into consideration by your medical team when deciding which type of transplant is right for you.

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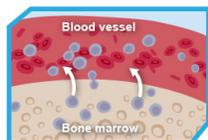
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The main steps for an autologous stem cell transplant include:

Induction therapy

1. **Induction therapy:** The patient undergoes treatment for multiple myeloma to help reduce the number of myeloma cells in the blood or bone marrow. This is referred to as induction therapy.

Stem cell mobilization



2. **Stem cell mobilization:** The patient undergoes mobilization. During mobilization, the patient may receive stem cell-stimulating agents with or without chemotherapy. These agents are given through injections. They help to increase the amount of stem cells in the patient's bloodstream, so there are more available at the time of collection.

Stem cell collection



3. **Stem cell collection:** Stem cells are collected from the patient's blood or bone marrow. The most common way these cells are collected is from the peripheral blood through a process called apheresis. During apheresis, blood is removed from the patient and the stem cells are then extracted from the blood. The remaining blood is then returned to the patient.

This process is completed over several hours in an outpatient setting. The patient is seated in a reclining chair for the entire procedure and is monitored by specially trained nurses and physicians throughout the process. Apheresis may take place over several days, depending on the amount of stem cells harvested (collected) and the number needed for transplant. This amount will vary from patient to patient.

Your doctor and the staff of the apheresis unit will be able to provide you with more detailed information on your specific requirements.

Preparation for storage



4. **Preparation for storage:** The collected stem cells are stored in special bags (called infusion bags) and prepared for storage.



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Cryopreservation



- 5. Cryopreservation:** The prepared stem cells are then frozen. If the stem cell transplant is not performed right away, the stem cells are kept frozen until they are needed.

Conditional Therapy (chemotherapy and/or radiation)



- 6. Conditioning therapy (chemotherapy and/or radiation):** The patient receives a high dose of chemotherapy, and possibly also radiation. This treatment is referred to as the conditioning/preparative regimen. The conditioning regimen is given to kill any remaining myeloma cells and to make space within the bone marrow for the newly transplanted cells to grow.

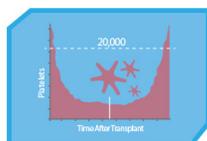
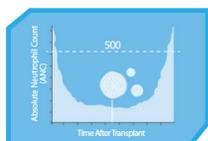
Depending on the transplant center where you are receiving care, this conditioning period can be performed in an outpatient center or in the hospital over 1 or more days. Your medical team will provide you with detailed information on how and where you will undergo your conditioning regimen.

Stem cell transplant



- 7. Stem cell transplant:** The stored frozen stem cells are thawed and reinfused—or returned—back into the patient's blood through a catheter (a thin tube), much like a blood transfusion.

Stem cell engraftment and recovery



- 8. Stem cell engraftment and recovery:** Once in your bloodstream, the stem cells can find their way to your bone marrow and replace the stem cells killed off by chemotherapy and then produce new, healthy immune cells. This process is called engraftment. It can take approximately 7–14 days for the new cells to begin to grow and produce functioning cells to support the patient's body.

During this time, you will be closely monitored by your healthcare team for signs of infection, bleeding, and side effects from the transplant. It is important that you follow all instructions and take medications as prescribed during this recovery time. If you are unclear about the instructions you are given, ask questions so that you and your loved ones are clear about follow-up appointments and about signs and symptoms you should report to your doctor. Once your blood counts begin to recover, your doctor may adjust some of your restrictions and medications.



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Once your blood counts have fully recovered, which can take several weeks, your doctor will assess your response to the transplant and discuss the next steps in your treatment plan.

HOW DO I KNOW IF A STEM CELL TRANSPLANT IS RIGHT FOR ME?

Your doctor will work with you to decide whether a stem cell transplant may be right for you. The decision will be based on a combination of factors—including your age, how well you've responded to multiple myeloma treatment, any other medical conditions you may have, and your own desires and available support. The decision of whether or not to have a stem cell transplant will affect your overall treatment plan.

FOR MORE INFORMATION ON STEM CELL TRANSPLANTS, YOU MAY VISIT:

[Multiple Myeloma Research Foundation \(MMRF\) website's section on stem cell transplants](#)

[Leukemia & Lymphoma Society \(LLS\) Blood and Marrow Stem Cell Transplantation guide](#)

Information about these independent organizations is provided as an additional resource for obtaining information related to multiple myeloma. It does not indicate endorsement by Celgene Corporation of an organization or its communications.

Your healthcare team is your best source of information.

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