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## UNDERSTANDING BLOOD CANCERS

Visit [www.LLS.org/CaregiverWorkbook](http://www.LLS.org/CaregiverWorkbook) to access all chapters and worksheets.

**Blood, Marrow and the Lymphatic System.** Blood is the main transport system in the body. It is the liquid that flows through a person's arteries and veins. It carries oxygen and nutrients to the lungs and tissue. It carries away waste products by taking them to the kidneys and liver, which clean the blood.

**Blood Cells.** Blood contains the following components:

- **Red blood cells.** Red blood cells contain a protein called "hemoglobin" which carries oxygen to all the cells in the body and helps remove carbon dioxide from the body.
- **Platelets.** Platelets help stop bleeding at the site of an injury.
- **White blood cells.** White blood cells help fight infection and disease. There are several types of white blood cells including neutrophils, monocytes, eosinophils, basophils and lymphocytes.
- **Plasma.** The liquid part of blood, called "plasma," is largely water but also includes chemicals such as proteins, hormones, vitamins, minerals, electrolytes and antibodies.

The healthcare team will closely monitor your loved one's blood cell counts during and after treatment. See **Blood Cell Counts** on page 3 to learn more.

**Bone Marrow.** Bone marrow is the spongy tissue inside bones. Stem cells in the bone marrow develop into blood cells. The process of blood cell formation is called "hematopoiesis." Healthy individuals have enough stem cells to keep producing new blood cells continuously. Blood passes through the marrow and picks up fully developed and functional red blood cells, white blood cells and platelets to circulate through the body.



Visit [www.LLS.org/3D](http://www.LLS.org/3D) to view an interactive 3D image of blood cell development.

**The Lymphatic System.** The lymphatic system is part of the immune system, which helps protect against disease and infection. It includes:

- Lymph nodes (small, oval-shaped organs located throughout the body that help trap and kill disease and infection)
- Lymphatic vessels
- The spleen (the organ that filters blood)
- Bone marrow
- The thymus gland (the organ that produces lymphocytes until young adulthood)

Lymph (clear fluid) and lymphocytes (type of white blood cells) travel through the lymph vessels into the lymph nodes where the lymphocytes destroy infection and disease that invade the body. There are three main types of lymphocytes. They are:

- B lymphocytes (B cells)
- T lymphocytes (T cells)
- Natural killer (NK) cells

Lymphocytes are also found in other parts of the body including the skin, spleen, tonsils and adenoids, intestinal lining and the thymus.

**Types of Blood Cancer.** Leukemia, lymphoma, myeloma, myelodysplastic syndromes (MDSs) and myeloproliferative neoplasms (MPNs) are types of cancer that can affect the bone marrow, blood cells, lymph nodes and other parts of the lymphatic system. Each of these blood cancers also contains different subtypes. Blood cancers affect people of all ages, races and sexes. Blood cancers can be acute (severe and sudden onset) or chronic (disease progresses slowly).

**Leukemia.** Leukemia begins in a cell in the bone marrow. The cell undergoes a change and becomes a type of leukemia cell. Once the marrow cell undergoes a leukemic change, the leukemia cells may grow and survive better than normal cells. Over time, the leukemia cells crowd out and/or suppress the development of normal cells. The rate at which leukemia progresses and the ways in which the cells replace the normal blood and marrow cells are different with each type of leukemia.

Subtypes of leukemia include:

- Acute lymphoblastic leukemia (ALL)
- Acute myeloid leukemia (AML)
- Chronic lymphocytic leukemia (CLL)
- Chronic myeloid leukemia (CML)

**Lymphoma.** “Lymphoma” is the name of a group of blood cancers that develop in the lymphatic system. The two main types are Hodgkin lymphoma (HL) and non-Hodgkin lymphoma (NHL).

Hodgkin lymphoma is distinguished from other types of lymphoma by the presence of Reed-Sternberg cells. These are large, cancerous cells, named for the scientists who first identified them. With proper treatment, HL can be cured in most patients.

Non-Hodgkin lymphoma (NHL) comprises a diverse group of diseases distinguished by the characteristics of the cancer cells associated with each disease type. NHL subtypes can be either indolent (slow growing) or aggressive (fast growing). Most people with NHL (about 85 to 90 percent) have a B-cell subtype of lymphoma. The others (about 10 to 15 percent) have a T-cell subtype or natural killer (NK)-cell subtype of lymphoma. Some patients with fast-growing NHL can be cured. For patients with slow-growing NHL, treatment may keep the disease in check for many years. It is important to know the patient’s exact NHL subtype because different subtypes of NHL require different treatment.

Some of the subtypes of NHL include:

- Diffuse large B-cell lymphoma (DLBCL)
- Follicular lymphoma
- Burkitt lymphoma
- Cutaneous T-cell lymphoma (CTCL)
- Mantle cell lymphoma (MCL)

**Myeloma.** Myeloma is a cancer of plasma cells. B lymphocytes (or B cells) are a type of white blood cell found in the blood, lymph nodes and bone marrow that develop into plasma cells. In myeloma, a plasma cell undergoes change and becomes a myeloma cell. The cell multiplies, and the myeloma cells begin to crowd out normal cells.

Myeloma cells are usually found in the bone marrow, but they may accumulate in any part of the body. These

**“In a perfect world, I would love to not have anything to do with LLS and have anything to do with multiple myeloma. I would have been perfectly okay not ever having experienced this, but I feel like because we did and the way that we did, there has to be a reason; and if that reason is for me to help other people so that, you know, when they hear the words, ‘multiple myeloma,’ they don’t feel as completely sucker-punched as I was.”**

—Kimberly, caregiver and wife of Elijah, who passed from myeloma

Excerpt from July 2018 “No Playbook for Caregiving: Kimberly’s Story” podcast episode on *The Bloodline with LLS* ([www.LLS.org/TheBloodline](http://www.LLS.org/TheBloodline))

accumulations are known as “plasmacytomas” and most commonly occur in the bones, skin, muscle or lungs. If the myeloma cells form a single tumor, it is called a “solitary plasmacytoma.”

In most patients with myeloma, the disease already involves multiple sites at the time of diagnosis. Because of this, the term “multiple myeloma” is often used to refer to the disease in its most common form.

Myeloma is characterized by how rapidly or slowly the disease progresses.

- Asymptomatic (or smoldering) myeloma, which progresses slowly; however, the patient has no signs and/or symptoms, even though they have the disease.
- Symptomatic myeloma, which has related symptoms, such as anemia, kidney damage and bone disease

**Myelodysplastic Syndromes (MDSs).** Myelodysplastic syndromes comprise a group of diseases of the blood and bone marrow, with varying degrees of severity, treatment needs and life expectancy. An MDS may be primary (de novo) or treatment-related.

**Myeloproliferative Neoplasms (MPNs).** Myeloproliferative neoplasms are types of blood cancer that begin with an abnormal change in a stem cell in the bone marrow. The change leads to an overproduction of any combination of white blood cells, red blood cells and platelets. Types of MPNs include:

- Myelofibrosis
- Polycythemia vera
- Essential thrombocythemia



For more information about blood cancers, speak one-on-one with an LLS Information Specialist who can provide you with accurate, up-to-date disease, treatment and support information. Visit [www.LLS.org/InformationSpecialists](http://www.LLS.org/InformationSpecialists) or call **(800) 955-4572**.



You can also visit [www.LLS.org/DiseaseInformation](http://www.LLS.org/DiseaseInformation) or [www.LLS.org/webcast](http://www.LLS.org/webcast) to find more disease-specific information.

For more information about these diseases, visit [www.LLS.org/booklets](http://www.LLS.org/booklets) to view all LLS disease booklets.

For more information about lab and imaging tests, visit [www.LLS.org/booklets](http://www.LLS.org/booklets) to view, ***Understanding Lab and Imaging Tests***.

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**Blood Cell Counts.** The healthcare team will order frequent blood tests to monitor your loved one’s blood cell counts, both during and after treatment. Blood cancers and treatment for blood cancers affect blood cell counts in a number of different ways. Patients with low blood cell counts can develop:

- Anemia (a low number of red blood cells)
  - Red blood cells contain hemoglobin which carry oxygen around the body. Patients with severe anemia can be pale, weak, tired and become short of breath.
- Thrombocytopenia (low numbers of platelets)
  - Patients with thrombocytopenia are at risk for excessive bruising and bleeding. Bleeding can occur from a wound, or it can be internal. Ask the healthcare team what precautions your loved one should take.
- Neutropenia (a low number of neutrophils, a type of white blood cell)
  - Patients with neutropenia are at an increased risk of infection.
- Pancytopenia (a low number of all three blood components)

**Treating Low Blood Cell Counts.** Severely low blood cell counts can lead to serious complications that can cause delays in treatment. Common treatments include:

- Blood transfusions to replace blood cells
- Medications called “growth factors” to stimulate the bone marrow to produce more blood cells



For more information about blood cell counts, visit [www.LLS.org/booklets](http://www.LLS.org/booklets) to view ***Side-Effect Management: Managing Low Blood Cell Counts.***

**Monitoring Blood Cell Counts and Lab Values.** Be sure to talk with the healthcare team about your loved one’s blood cell counts, especially if the levels change. Ask for an explanation and if there is anything to do to help blood cell counts return to a healthy range. Find out if your loved one needs to take any special precautions to avoid complications. Ask members of the healthcare team for printed copies of all lab reports and keep them with your loved one’s medical records.

If the hospital or treatment center provides a web-based “patient portal” to access medical records, ask the healthcare team how to access and navigate the patient portal to view lab reports.

**LAB REPORT TERMINOLOGY**  
 These definitions of lab terms will help you understand the information on the lab report. Ask the patient’s healthcare team to explain how changes in these readings affect the patient’s health.

<b>Absolute Neutrophil Count (ANC)</b>	The number of neutrophils (a type of white blood cell that fights infection) in the blood.
<b>Complete Blood Count (CBC)</b>	A measure of the number of red blood cells (RBCs), white blood cells (WBCs), and platelets in the blood. The amount of hemoglobin (substance in the blood that carries oxygen) and the hematocrit (the amount of whole blood that is made up of red blood cells) are also measured. A CBC is measured using laboratory tests that require a blood sample.
<b>Differential</b>	A breakdown of the different types of white blood cells (WBCs) that make up the total WBC count. The different types of WBCs include neutrophils, band neutrophils, lymphocytes, monocytes, eosinophils, and basophils.
<b>Hematocrit (HCT)</b>	The amount (percentage) of blood that is made up of red blood cells.
<b>Hemoglobin (HGB)</b>	A protein in red blood cells (RBCs) that carries oxygen from the lungs to tissues and organs in the body and carries carbon dioxide back to the lungs. A lower than normal HGB means the patient has a low red blood cell count (anemia).
<b>Platelets (PLTs)</b>	Small cells that stick to the site of a blood vessel injury where they clump up and seal off the injured blood vessel to stop bleeding. The platelet count measures the number of platelets in a sample of blood.
<b>Red Blood Cells (RBCs)</b>	Red blood cells contain a protein called “hemoglobin” which carries oxygen to the cells and tissues of the body. The RBC count is the amount of red blood cells in the blood.
<b>White Blood Cells (WBCs)</b>	White blood cells (leukocytes) help the body to fight infections. There are several different types of white blood cells; each type has a different function. The WBC count is the total of all the white blood cells in the blood.



