



Leukemia: Types and Treatment

What is leukemia?

Leukemia is a cancer of the blood or blood cells. It is classified by two factors:

- How quickly the leukemia develops, called either acute (developing quickly) or chronic (developing more slowly).
- What type of white blood cells are affected (either lymphoid or myeloid).

Cells affected by leukemia are made in your bone marrow. Bone marrow is the spongy area in the center of bones. Larger bones have more bone marrow. This means they make more cells. Larger bones are the femur (top part of the leg or thigh), the hip bones, and parts of the rib cage. Some cells in the bone marrow are still developing and are not yet mature. These cells are called “blasts.” Once the cell has matured, it moves out of the bone marrow and into the bloodstream. The body knows when more cells are needed and makes them.

In leukemia, a certain type of blood cell does not work as it should, and the body makes too many of these cells. When looked at under a microscope, these cells look different than healthy cells and do not work the way they should. The body keeps making these non-working cells, leaving little space for healthy cells. This imbalance of healthy and unhealthy cells causes leukemia and its symptoms:

- Fever or chills.
- Fatigue and/or weakness that does not get better.
- Frequent or severe infections.
- Losing weight without trying.
- Swollen lymph nodes.
- Enlarged liver or spleen.
- Easy bleeding or bruising.
- Frequent nosebleeds.
- Tiny red spots on your skin (petechiae).
- Sweating a lot, especially at night.
- Bone pain or tenderness.

Most cancers are staged based on where the cancer started, how big the tumor is, and where it has spread (metastasized). Leukemia is a cancer of the blood and is not staged like most cancers. Most leukemias are classified into types instead of stages. When deciding treatment for leukemia, your provider will look at:

- Blood cell counts.
- Your age.
- If your liver or spleen is larger than normal.
- If you have had any blood disorders or cancers in the past.
- Any gene mutations (changes) you may have.

What are the types of leukemia?

There are a few subtypes of leukemia, based on which cells are affected in the bone marrow. Some of them are staged and others are not.

Acute Lymphocytic Leukemia (ALL)

ALL is classified by the World Health Organization (WHO) system based on the type of cells it starts in, B-cell ALL (beginning in immature B-cells) or T-cell ALL (beginning in immature T-cells). It is further classified depending on the changes seen in the genes and chromosomes of the cells. Talk with your care team about the specific classification of your diagnosis.

Acute Myelogenous Leukemia (AML)

AML may also be called acute myelocytic leukemia, acute granulocytic leukemia, or acute non-lymphocytic leukemia. The French-American-British (FAB) classification and the newer World Health Organization (WHO) system are used to classify AML. To classify AML, the World Health Organization (WHO) system considers:

- AML with certain genetic abnormalities (gene or chromosome changes).
- AML with myelodysplasia-related changes.
- AML related to previous chemotherapy or radiation.
- AML not otherwise specified (This includes cases of AML that don't fall into one of the above groups).
- Myeloid proliferations related to Down syndrome.
- Undifferentiated and biphenotypic acute leukemias are leukemias that have both lymphocytic and myeloid features. They are sometimes called mixed phenotype acute leukemias (MPALs).

You can talk with your care team about the specific classification of your leukemia.

Chronic Lymphocytic leukemia (CLL)

There are two different staging systems for CLL:

Rai Staging System- Based on results of blood tests (especially the number of white blood cells) and physical exam.

In each stage, there is lymphocytosis. Lymphocytosis is a higher-than-normal white blood cell (WBC) count. The extra WBCs are found in the blood and bone marrow.

- **Stage 0:** Lymphocytosis with no enlargement of lymph nodes, spleen, or liver, and red blood cell and platelet counts are almost normal.
- **Stage I:** Lymphocytosis with enlarged lymph nodes. The spleen and liver are not affected, and red blood cell and platelet counts are almost normal.
- **Stage II:** Lymphocytosis with an enlarged spleen and in some cases an enlarged liver. Lymph nodes may or may not be enlarged. Red blood cell and platelet counts are almost normal.
- **Stage III:** Lymphocytosis plus the lymph nodes. The spleen or liver may or may not be enlarged. Red blood cell count is low, and platelets are near normal.
- **Stage IV:** Lymphocytosis plus enlarged lymph nodes, spleen, or liver. Red blood cell counts may be low or near normal and the platelet count is low.

Each stage is also put into a risk group that helps decide which treatments are best:

- **Stage 0:** Low risk.
- **Stage I and II:** Intermediate (middle) risk.

- **Stage III and IV:** High Risk.

Binet Staging System- Based on the number of affected lymphoid tissue groups and if you have [anemia](#) or [thrombocytopenia](#).

The Binet system looks at lymphoid tissue, anemia (not having enough healthy red blood cells), and thrombocytopenia (low platelets). Lymphoid tissue groups include the neck lymph nodes, groin lymph nodes, underarm lymph nodes, spleen, and liver.

- **Stage A:** Fewer than 2 areas of lymphoid tissue are enlarged, no anemia, and no thrombocytopenia.
- **Stage B:** 3 or more areas of enlarged lymphoid tissue, no anemia, and no thrombocytopenia.
- **Stage C:** Any number of lymphoid areas are enlarged, and anemia and thrombocytopenia are present.

Chronic myelogenous leukemia (CML)

CML is broken down into three phases. The phases are based mainly on the number of immature white blood cells (blasts) in the blood or bone marrow. There is no set system for CML, but common classifications (by the World Health Organization) are:

- **Chronic:** Less than 10% blasts in the blood or bone marrow. This phase often causes fairly mild symptoms, if any. Most patients are diagnosed in the chronic phase.
- **Accelerated:** 15% - 29% blasts in the blood. Basophils (white blood cells that work with your immune system) make up 20% and blasts and promyelocytes (a type of immature white blood cells) make up 30% or more of the blood. There are also very low platelet counts that are not caused by treatment. There are new chromosome changes in the leukemia cells with the Philadelphia chromosome. There may be symptoms such as fever, poor appetite, and weight loss.
- **Blast (also called acute phase or blast crisis) :** 20% or more blast cells in the blood. This is the most aggressive phase of the disease. The blast cells have spread to tissues and organs outside the bone marrow. Symptoms may include fever, poor appetite, and weight loss.

How is leukemia treated?

Treatment for leukemia depends on many factors, such as your age and overall health, the type of leukemia you have, and whether it has spread to other parts of your body, including the central nervous system (CNS). Your treatment may include some or all of the following:

- [Chemotherapy](#).
- [Targeted therapy](#).
- [Immunotherapy](#).
- [Radiation therapy](#).
- [Bone marrow transplant](#).
- [CAR-T cell therapy](#).
- [Clinical trials](#).

Talk with your care team about the subtype of leukemia you have, which stage or phase it is, and what the best treatment options are for you. You can read more about each [leukemia subtype](#) at [OncoLink.org](https://www.oncolink.org).

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