Types of Cancer

# Blood Cancers

What are blood cancers?

Cancer develops when cells grow out of control. Blood or hematologic cancers affect blood cells, bone marrow or the lymphatic system. Most blood cancers involve white blood cells, but red blood cells (responsible for carrying oxygen) and platelets (responsible for blood clotting) may also be affected. Compared with many other types of cancer, blood cancers affect a wider range of ages, including children.

Leukemia, lymphoma and multiple myeloma are the major types of blood cancer. These are classified according to the type of cells involved, how fast they grow and whether they affect adults or children. The various types of blood cancer are treated differently and have different prognosis, or expected outcomes.

Leukemia

Leukemia affects blood-forming stem cells or immature blood cells, usually white blood cells that carry out immune responses. Abnormal cells can grow out of control in the bone marrow and enter the bloodstream before they are fully developed, crowding out mature, functional blood cells. “Watchful waiting” may be an option for chronic leukemia, but acute leukemia requires prompt treatment. Leukemia can often be put into remission, which sometimes can last for years or even a lifetime.

Leukemia is classified according to the type of cells affected, whether it is acute (fast-progressing) or chronic (slow-growing) and whether it affects adults or children.

The four main types are acute lymphoblastic leukemia (ALL), chronic lymphocytic leukemia (CLL), acute myeloid leukemia (AML) and chronic myeloid leukemia (CML).

Acute anemia involves overgrowth of immature blood cell precursors, known as blasts, that cannot carry out normal functions. Chronic leukemia involves overproduction of more mature but abnormal blood cells that are only partially functional. Lymphocytic or lymphoblastic leukemia involves precursor cells that give rise to B cells, T cells and natural killer cells. Myeloid or myelogenous leukemia involves precursors that give rise to neutrophils and other granulocyte white blood cells.

Most types of leukemia are more common among people over age 60. AML and CLL are the most common types of leukemia in adults. ALL occurs more often in children and accounts for around

30% of childhood cancers. (Click here for more information about leukemia.)

### Lymphoma

Lymphoma occurs when white blood cells known as lymphocytes grow out of control. It usually involves B cells, but some forms affect T cells or natural killer (NK) cells. Lymphoma begins in the lymphatic system—a network of lymph vessels and organs that play a role in immune function and waste removal—but it can spread throughout the body, a process known as metastasis. There are two types, Hodgkin lymphoma and non-Hodgkin lymphoma (NHL), each of which has multiple subtypes.

In Hodgkin lymphoma, large abnormal lymphocytes called Reed-Sternberg cells build up in the lymph nodes. NHL may be either aggressive (fast-growing) or indolent (slow-growing). Diffuse large B cell lymphoma is the most common type of aggressive NHL in the United States, while follicular lymphoma is the most common indolent type. Burkitt lymphoma is an aggressive type linked to Epstein-Barr virus.

NHL is about 10 times more common than Hodgkin lymphoma in the United States. Hodgkin lymphoma is more likely to occur among teens and young adults, but the risk rises again for seniors. A majority of people with NHL are over 60, and it is more common among men than women. Together, Hodgkin and non-Hodgkin lymphomas account for about 10% of all childhood cancers. People with compromised immunity—such as those with untreated HIV and those taking immune-suppressing drugs—are at higher risk for lymphoma, as are people with certain autoimmune diseases. (Click here for more information about lymphoma.)

### Multiple Myeloma

Multiple myeloma is an uncommon type of blood cancer that affects the bone marrow, where new blood cells are produced. It occurs when the body makes too many plasma cells, mature B cells that produce antibodies. In multiple myeloma, abnormal plasma cells multiply in the bone marrow and make dysfunctional antibody-like M proteins, which can build up in the blood and organs. Abnormal plasma cells can clump together to form tumors in bones or soft tissue, and they can crowd out normal blood-forming cells. This can lead to bone fractures, low blood cell counts and increased risk of infection; over time the disease can damage the kidneys and other organs.

Most people diagnosed with multiple myeloma are age 65 and older. Men are more likely than women to develop multiple myeloma, and it is more common among African Americans compared with other racial groups. Some people first develop smoldering myeloma (monoclonal gammopathy of undetermined significance, or MGUS), an asymptomatic precursor condition characterized by elevated M proteins and a high percentage of plasma cells in the bone marrow. (Click here for more information about multiple myeloma.)

## What are the risk factors for blood cancers?

Risk factors for blood cancers include certain genetic mutations, family history, smoking and

exposure to radiation. People treated with radiation for other types of cancers are at higher risk for developing blood cancers. People with compromised immunity—such as those with untreated HIV and those taking immune-suppressing drugs—are at higher risk for some blood cancers.

What are the symptoms of blood cancers?

Uncontrolled growth of immature blood cells can crowd out functional blood cells that perform vital functions such as fighting infections, carrying oxygen throughout and enabling blood to clot. General blood cancer symptoms may include:

- Fever, chills and night sweats
- Fatigue
- Loss of appetite or unexplained weight loss
- Frequent infections
- Easy bruising or bleeding

Specific blood cancers cause other symptoms, such as swollen lymph nodes in people with lymphoma and bone pain in those with multiple myeloma.

How are blood cancers diagnosed?

A blood test known as a complete blood count takes an inventory of the different types of blood cells. A sample of lymph node tissue or bone marrow (a biopsy) may be collected to examine in a lab. Blood cancer cells may look abnormal under a microscope and have mutations that can be detected with genomic tests. Once cancer is diagnosed, imaging scans or other tests may be done to see how much it has spread.

How are blood cancers treated?

Treatment for blood cancers varies according to the type of disease, how much the cancer has spread and the patient’s age and previous treatment history. Cancer that has not responded to prior therapy or has relapsed is harder to treat.

Watchful waiting: In some cases, treatment for slow-growing cancer may be delayed while a patient is monitored for signs of disease progression, known as active surveillance.

Surgery: Some localized lymphoma or multiple myeloma tumors can be surgically removed. The spleen, which removes old blood cells from circulation, may be removed if it becomes enlarged.

Radiation: Radiation is used to reduce the number of abnormal blood cells. It is often used in conjunction with other forms of treatment.

Chemotherapy: Traditional chemotherapy works by killing fast-growing cancer cells. It can also destroy healthy cells, leading to side effects. Chemotherapy for blood cancers generally involves a combination of drugs.

Targeted therapy: Targeted drugs work against cancers with specific characteristics. For example, they may target specific genetic mutations or interfere with signaling pathways that regulate cell growth.
Immunotherapy: This type of treatment helps the immune system fight cancer. For example, drugs known as immune checkpoint inhibitors can restore T cells' ability to recognize and destroy cancer cells.

CAR-T: Chimeric antigen receptor T-cell therapy, involves removing a sample of T cells, genetically reprogramming them to recognize and attack cancer cells and putting them back into the body.

Stem cell transplant: Bone marrow contains stem cells that give rise to all types of blood cells. Bone marrow contains stem cells that give rise to all types of blood cells. A patient's cancerous blood cells are destroyed with chemotherapy and sometimes radiation and replaced with either stored stem cells from the same individual (autologous transplant) or new cells from a matched donor (allogeneic transplant).

Blood cancers tend to be easier to treat than other types of cancer that form solid tumors. Targeted therapy that inhibits proteins that spur cancer growth and CAR-T therapy were first approved for leukemia and lyphoma. Some people respond very well to treatment, remaining in remission for years, but others do not respond as well or experience recurrence. Many clinical trials are underway to test new experimental therapies for different types of blood cancer.

For more information about blood cancers, see the following resources:

American Cancer Society

National Cancer Institute

American Society of Clinical Oncology (ASCO)

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