My Drift

Title: Leukemia
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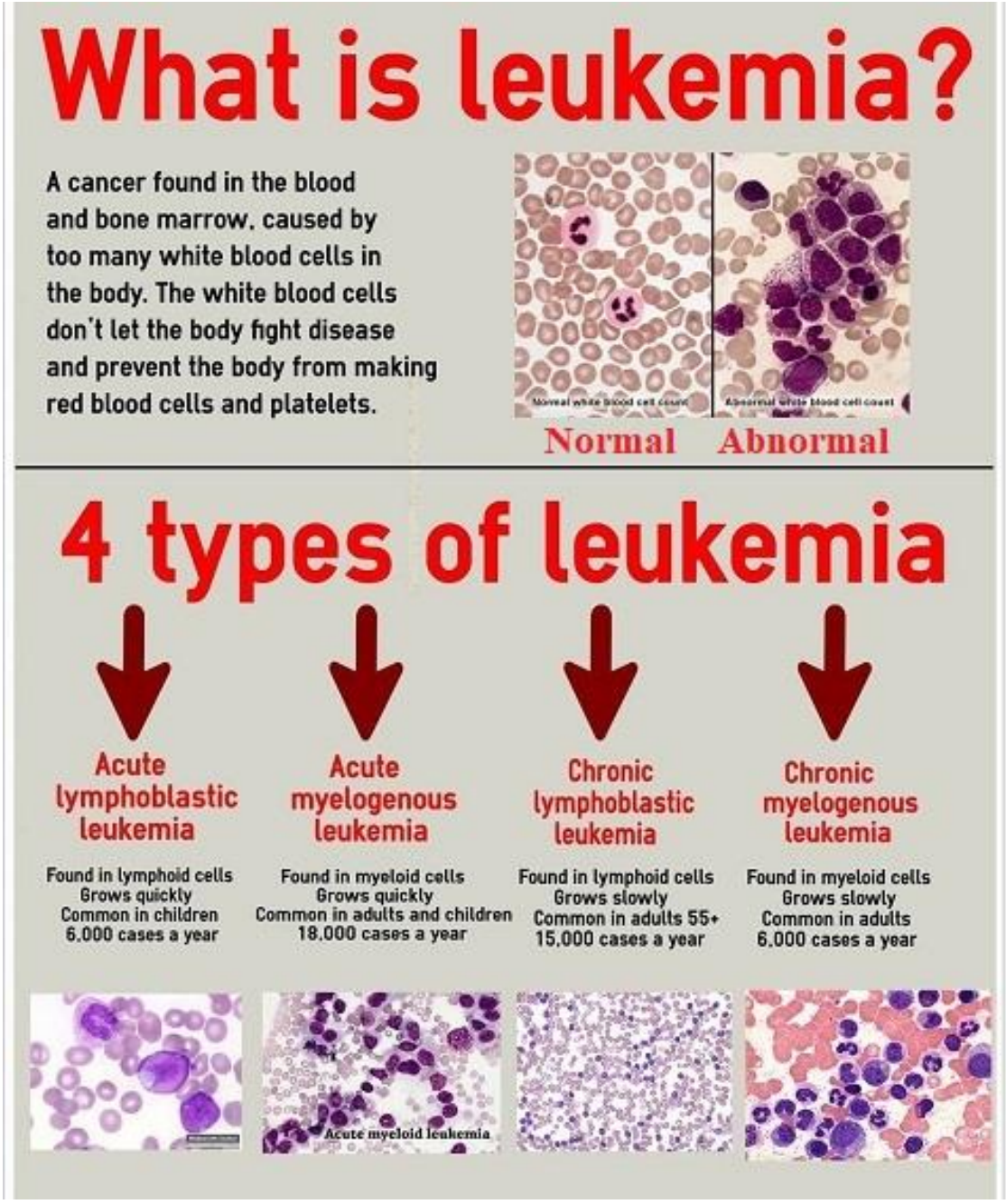
Date: 10 Jun 2022
Article Number: 391-2022-12



(Reference the above chart)

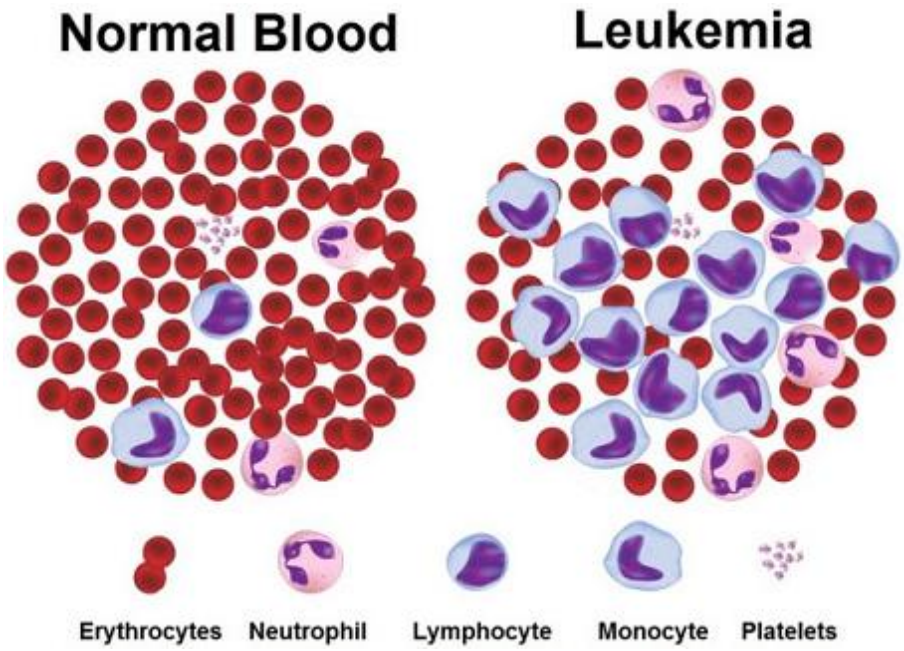
Doctors categorize leukemia based on which type of white blood cell is involved — lymphocytes or myeloid cells — and whether the illness is developing very quickly (acute disease) or slowly over time (chronic disease).

Lymphocytic leukemias develop from cells that give rise to T lymphocytes (T cells), B lymphocytes (B cells), or natural killer (NK) cells. Each of these cell types has a specialized role in the immune system; some produce antibodies, whereas others directly fight or direct other immune cells to fight infections.

Myeloid leukemias develop from cells that give rise to white blood cells called granulocytes and monocytes. Granulocytes get their name from the enzyme-packed granules they carry inside them. They release these enzymes when encountering invading bacteria or fungi. Monocytes eventually become macrophages, which engulf and destroy bacteria and fungi.

In acute leukemias, which develop rapidly, the malignant cells (called blasts) are immature and incapable of performing their immune system functions. Chronic leukemias develop in more-mature cells, which can perform some of their duties — but not very well. These abnormal cells usually multiply at a slower rate than acute leukemias.

Of the four common types of leukemia in adults, acute myeloid leukemia (AML) and chronic lymphocytic leukemia (CLL) occur most frequently.



How does leukemia happen?

Blood has three types of cells: white blood cells that fight infection, red blood cells that carry oxygen, and platelets that help blood clot.

Every day, your bone marrow makes billions of new blood cells, and most of them are red cells. When you have leukemia, your body makes more white cells than it needs.

These leukemia cells can't fight infection the way normal white blood cells do. And because there are so many of them, they start to affect the way your organs work. Over time, you may not have enough red blood cells to supply oxygen, enough platelets to clot your blood, or enough normal white blood cells to fight infection.

What are the causes of leukemia?

Leukemia is a type of cancer that develops in the lymphoid cells in the bone marrow or lymphatic system. It most commonly affects white blood cells, making it harder for a body's immune system to fight infection. Signs of leukemia include:

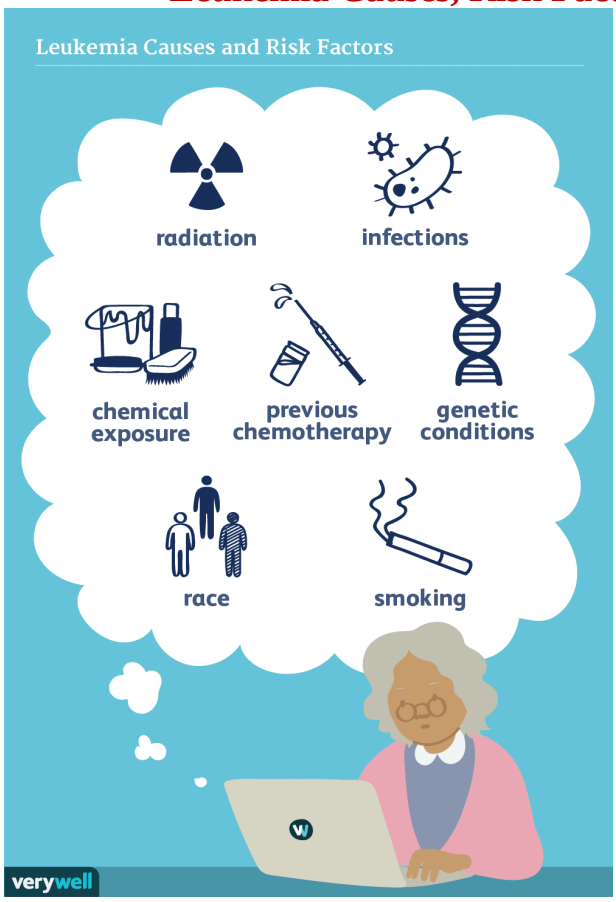
- **Having a fever, chills, body aches and other flu-like symptoms**
- **Excessive tiredness and weakness**
- **Loss of appetite**
- **Recurrent infections**
- **Easy bleeding, bruising and nosebleeds**
- **Swollen lymph nodes**
- **Unexplained weight loss**

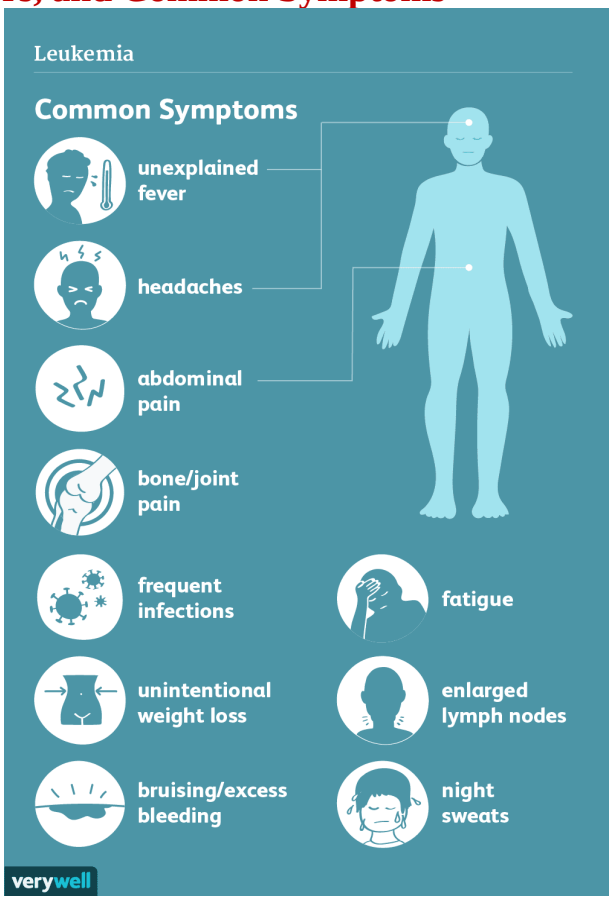
Many people wonder what causes leukemia. While extensive studies have been conducted and others are still underway, researchers have not yet identified the precise causes of the condition.

How does leukemia form?

Some scientists believe that leukemia results from an as-of-yet undetermined combination of genetic and environmental factors that can lead to mutations in the cells that make up the bone marrow. These mutations, known as leukemic changes, cause the cells to grow and divide very rapidly. The resulting unhealthy cells can outnumber the healthy white blood cells, red blood cells and platelets within the body, rendering the blood less effective at doing its job. Because of this, a leukemia patient might bleed, bruise, or become fatigued very easily, and might be highly susceptible to infection.

Leukemia Causes, Risk Factors, and Common Symptoms





How do doctors diagnose leukemia?

Doctors may find chronic leukemia in a routine blood test before symptoms begin. If this happens, or if you have signs or symptoms that suggest leukemia, you may undergo the following diagnostic exams:

Physical Examination

Physical examination. **Your doctor will look for physical signs of leukemia, such as pale skin from anemia, swelling of your lymph nodes, and enlargement of your liver and spleen.**

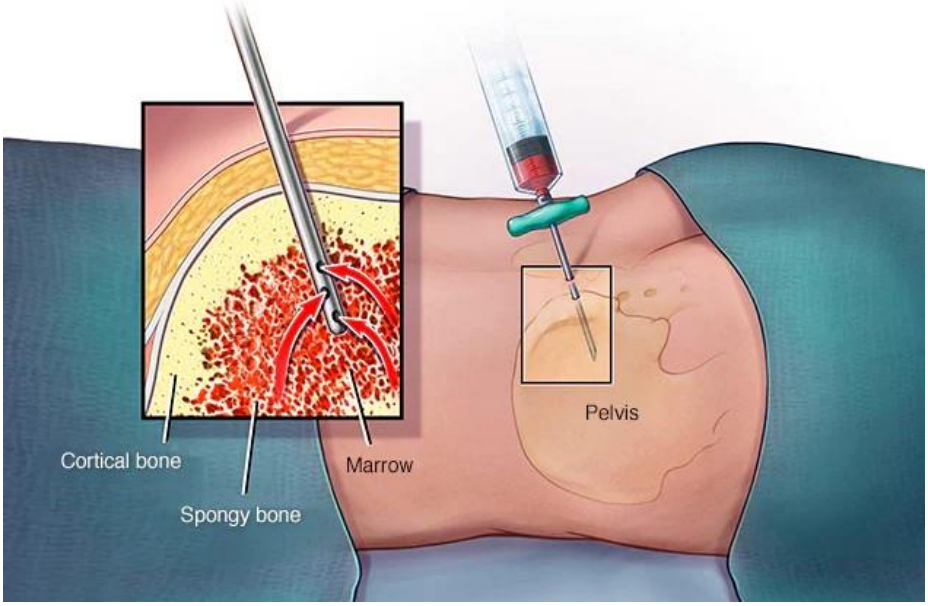
Blood Tests

Complete Blood Count (CBC). This blood test is used to evaluate your overall health and detect a wide range of disorders, including anemia, autoimmune disorders, bone marrow disorders, dehydration, infections, inflammation, leukemia, lymphoma, myeloproliferative neoplasms, myelodysplastic syndrome, sickle cell disease, thalassemia, and nutritional deficiencies.

A complete blood count test measures several components and features of your blood, including:

- **Red blood cells, which carry oxygen**
- **White blood cells, which fight infection**
- **Hemoglobin, the oxygen-carrying protein in red blood cells**
- **Hematocrit, the proportion of red blood cells to the fluid component, or plasma, in your blood**
- **Platelets, which help with blood clotting**

Abnormal increases or decreases in cell counts as revealed in a complete blood count may indicate that you have an underlying medical condition that calls for further evaluation. If you have leukemia, you will have lower than normal counts of red blood cells and platelets, and higher than normal counts of white blood cells. This blood test may also show the presence of leukemia cells, though not all types of leukemia cause the leukemia cells to circulate in the blood. Sometimes the leukemia cells stay in the bone marrow.



Bone Marrow Test

Bone marrow test. Your doctor may recommend a procedure to remove a sample of bone marrow from your hipbone. The bone marrow is removed using a long, thin needle. The sample is sent to a laboratory to look for leukemia cells. Specialized tests of your leukemia cells may reveal certain characteristics that are used to determine your treatment options.

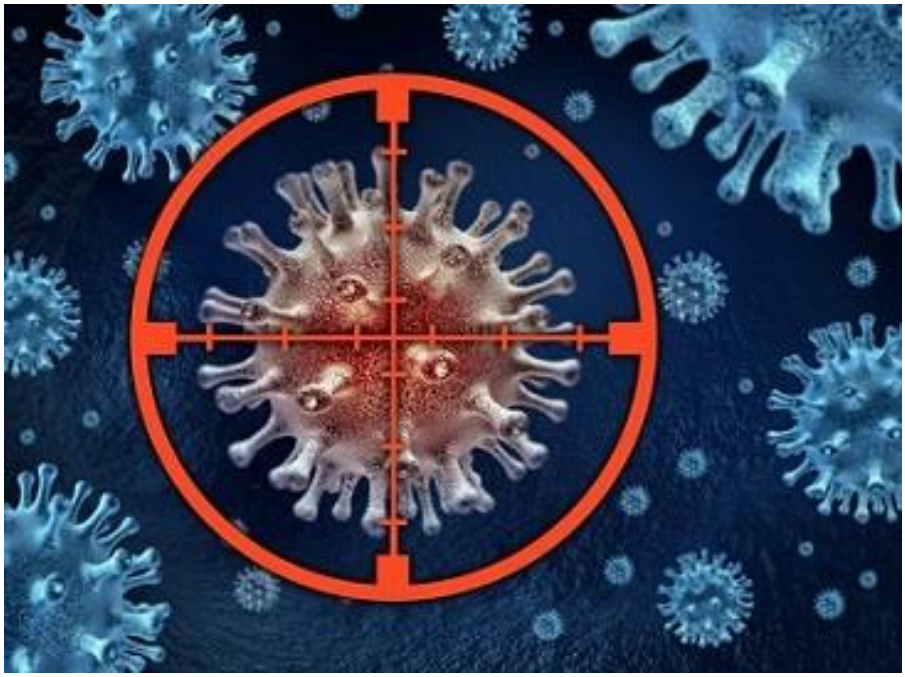
Treatment options for leukemia

Treatment for leukemia depends on many factors. Your doctor determines your leukemia treatment options based on 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.

Common treatments used to fight leukemia include:

Chemotherapy. Chemotherapy is the major form of treatment for leukemia. This drug treatment uses chemicals to kill leukemia cells. Depending on the type of leukemia you have, you may receive a single drug or a combination of drugs. These drugs may come in a pill form, or they may be injected directly into a vein.

Targeted therapy. Targeted drug treatments focus on specific abnormalities present within cancer cells. By blocking these abnormalities, targeted drug treatments can cause cancer cells to die. Your leukemia cells will be tested to see if targeted therapy may be helpful for you.



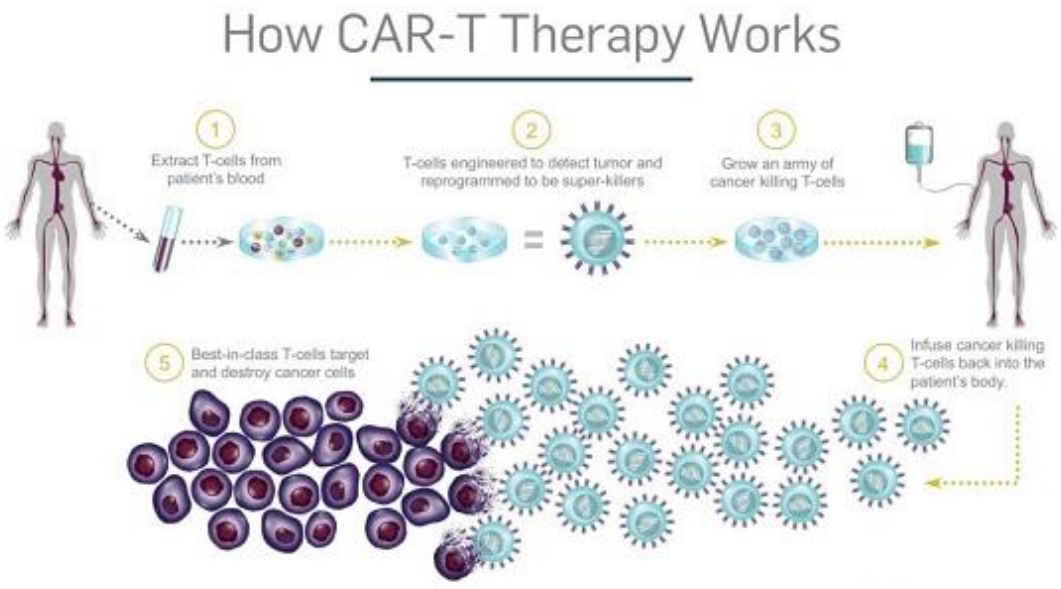
Targeted Therapy

Radiation therapy. Radiation therapy uses X-rays or other high-energy beams to damage leukemia cells and stop their growth. During radiation therapy, you lie on a table while a large machine moves around you, directing the radiation to precise points on your body. You may receive radiation in one specific area of your body where there is a collection of leukemia cells, or you may receive radiation over your whole body. Radiation therapy may be used to prepare for a bone marrow transplant.

Bone marrow transplant. A bone marrow transplant, also called a stem cell transplant, helps reestablish healthy stem cells by replacing unhealthy bone marrow with leukemia-free stem cells that will regenerate healthy bone marrow. Prior to a bone marrow transplant, you receive very high doses of chemotherapy or radiation therapy to destroy your leukemia-producing bone marrow. Then you receive an infusion of blood-forming stem cells that help rebuild your bone marrow. You may receive stem cells from a donor, or you may be able to use your own stem cells.

Immunotherapy. Immunotherapy uses your immune system to fight cancer. Your body's disease-fighting immune system may not attack your cancer because the cancer cells produce proteins that help them hide from the immune system cells. Immunotherapy works by interfering with that process.

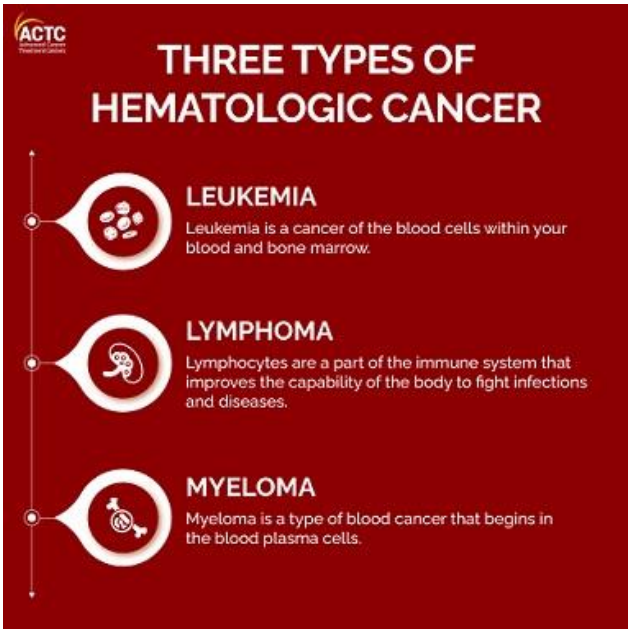
Engineering immune cells to fight leukemia. **A specialized treatment called chimeric antigen receptor (CAR)-T cell therapy takes your body's germ-fighting T cells, engineers them to fight cancer and infuses them back into your body. CAR-T cell therapy might be an option for certain types of leukemia.**



Clinical trials. **Clinical trials are experiments to test new cancer treatments and new ways of using existing treatments. While clinical trials give you or your child a chance to try the latest cancer treatment, treatment benefits and risks may be uncertain. Discuss the benefits and risks of clinical trials with your doctor.**

Types of blood cancer diseases

I learned while researching for this article that leukemia is not the only blood cancer disease. In fact, there are five types of cancer that can affect the bone marrow, the blood cells, the lymph nodes, and other parts of the lymphatic system. These include the three main types which are leukemia, lymphoma, and myeloma. There are also two other rarer types called myelodysplastic syndromes (MDS), and Myeloproliferative Neoplasms (MPNs).



Let's view some statistics about blood cancers in general and each disease:

General blood cancers

New cases. Approximately every 3 minutes, one person in the US is diagnosed with leukemia, lymphoma, or myeloma. An estimated combined total of 186,400 people in the US were diagnosed with leukemia, lymphoma or myeloma in 2021. New cases of leukemia, lymphoma and myeloma are expected to account for 9.8 percent of the estimated 1,898,160 new cancer cases that were diagnosed in the US in 2021.

Prevalence is the estimated number of people alive on a certain date in a population who previously had a diagnosis of the disease. An estimated 1,520,000 people in the US are living with or in remission from leukemia, lymphoma, myeloma, myelodysplastic syndromes (MDS) or myeloproliferative neoplasms (MPNs).

Survival. Relative survival compares the survival rate of a person diagnosed with a disease to that of a person without the disease. The most recent survival data available may not fully represent the outcomes of all current therapies and, as a result, may underestimate survival to a small degree.

Deaths. Approximately every 9 minutes, someone in the US dies from a blood cancer. This statistic represents approximately 158 people each day or more than six people every hour. Leukemia, lymphoma, and myeloma caused the deaths of an estimated 58,000 people in the US in 2021. These diseases accounted for 9.5 percent of all the deaths from cancer in 2021, based on the estimated total of 609,000 cancer deaths.

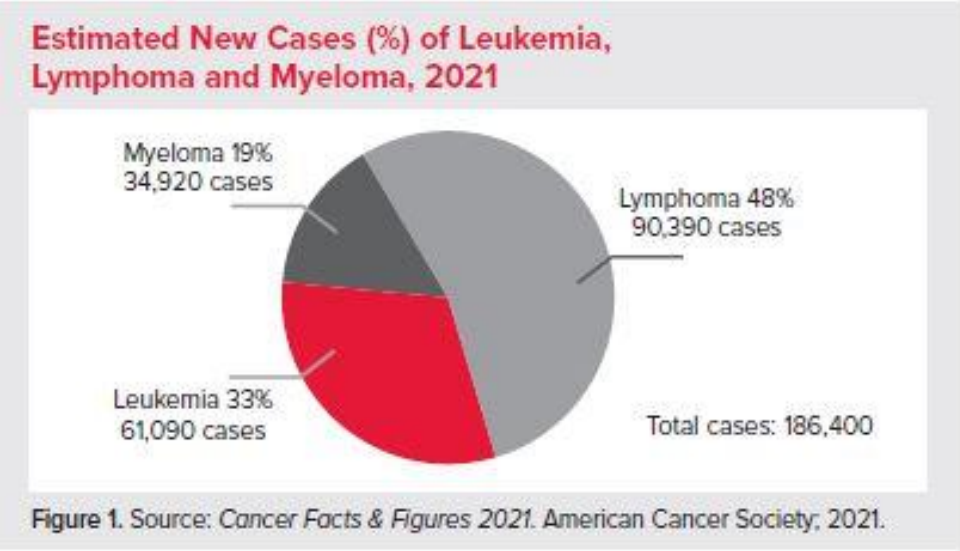


Figure 1. Source: *Cancer Facts & Figures 2021.* American Cancer Society; 2021.

Leukemia

Brief description. Leukemia is cancer of the body's blood-forming tissues, including the bone marrow and the lymphatic system.

New cases. In 2021, 61,090 people in the US were diagnosed with leukemia.

Prevalence. An estimated 398,000 people are living with or in remission from leukemia in the US.

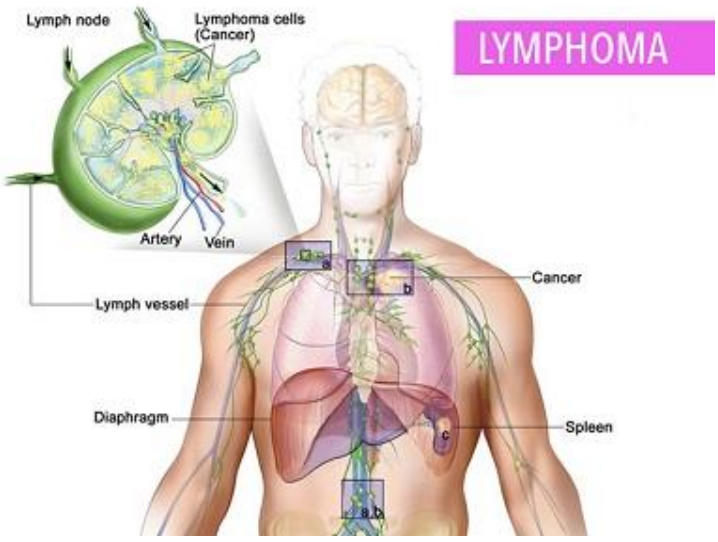
Survival. The 5-year relative survival rate for leukemia has more than quadrupled, from 14 percent in whites from 1960 to 1964 (the only data available) to 66.4 percent for all races from 2012 to 2016.

From 2012 to 2016, the five-year relative survival rates overall were:
Acute lymphocytic leukemia (ALL) – 72.1%
Acute myelogenous leukemia (AML) – 29.8%
Chronic lymphocytic leukemia (CLL) – 88.6%
Chronic myelogenous leukemia (CML) – 71.7%

Deaths. Approximately 23,660 deaths (13,900 males and 9,760 females) in the US was attributed to leukemia in 2021. Leukemia is the sixth most common cause of cancer deaths in males and the seventh most common cause of cancer deaths in females in the US.

Lymphoma

Brief description. Lymphoma is a cancer of the lymphatic system. It develops in lymphocytes, which are a type of white blood cell. These cells help fight disease in the body and play an essential role in the body's immune defenses.



New cases. About 90,390 people in the US were diagnosed with lymphoma in 2021 (8,830 cases of Hodgkin lymphoma (HL) and 81,560 cases of non-Hodgkin lymphoma (NHL)).

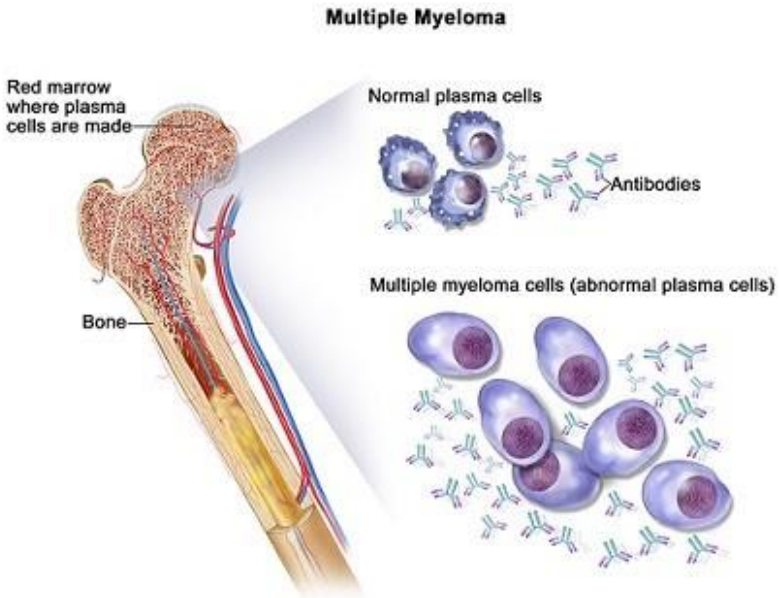
Prevalence. There are an estimated 825,651 people living with, or in remission from, lymphoma in the US. There are 152,671 people living with or in remission from Hodgkin lymphoma. There are 672,980 people living with or in remission from non-Hodgkin lymphoma.

Survival.
The 5-year relative survival rate for people with HL has more than doubled, from 40 percent in whites from 1960 to 1963 to 89.6 percent for all races from 2012 to 2016.

The 5-year relative survival rate for people with NHL has risen from 31 percent in whites from 1960 to 1964 to 75.1 percent for all races from 2012 to 2016.

Deaths. In 2021, an estimated 21,680 people in the US died from lymphoma (960 HL and 20,720 NHL).

Myeloma
Brief description. Myeloma, also called multiple myeloma, is a cancer of the plasma cells. Plasma cells are white blood cells that make antibodies that protect us from infection. In myeloma, the cells grow too much, crowding out normal cells in the bone marrow that make red blood cells, platelets, and other white blood cells.



New cases. An estimated 34,920 new cases of myeloma (19,320 males and 15,600 females) were diagnosed in the US in 2021.

Prevalence. An estimated 138,415 people in the US are living with or in remission from myeloma.

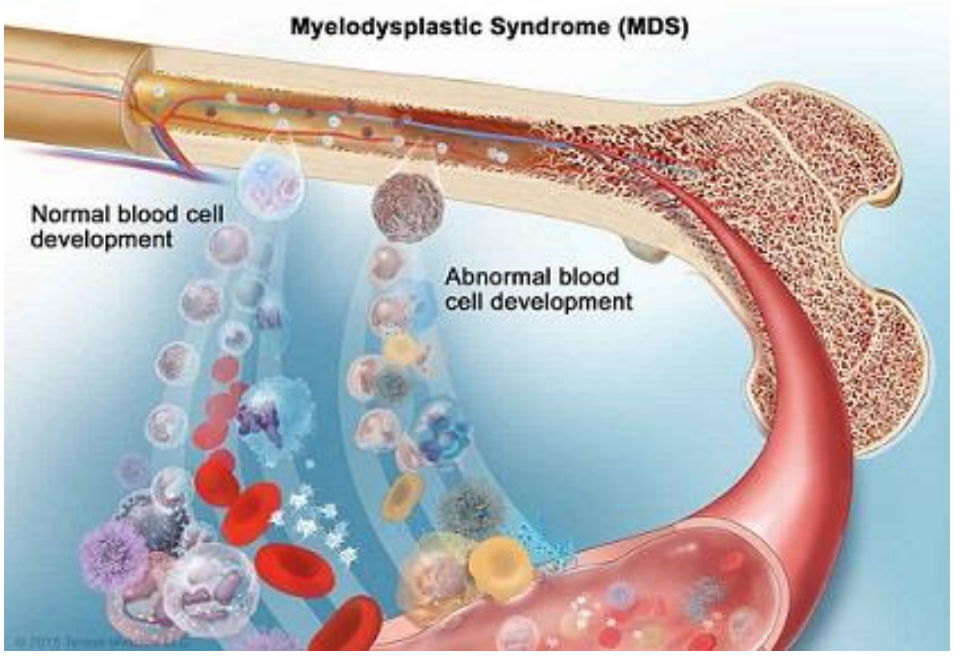
Survival.
Five-year relative survival increased from 12 percent from 1960 to 1964 to 55.1 percent from 2012 to 2016 for all races and ethnicities.

The 3-year survival rate as of January 1, 2017, was 69.1 percent for all races and ethnicities.

Deaths. There were approximately 12,410 deaths from myeloma in 2021.

Myelodysplastic Syndromes (MDS)

Brief description. Myelodysplastic syndromes (MDS) are a type of rare blood cancer where you don't have enough healthy blood cells. It's also known as myelodysplasia. There are many different types of MDS. Some types can stay mild for years and others are more serious.



New cases. For the 5-year period from 2013 to 2017, there were 75,497 new cases of MDS throughout the US, averaging 15,099 cases per year.

Prevalence. An estimated 58,471 people in the US are living with or in remission from MDS.

Survival. For 2012-2016, the 5-year relative survival rate for MDS was 38.3 percent.

Myeloproliferative Neoplasms

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

New cases. For the 5-year period from 2013 to 2017, there were 61,572 new cases of MPNs throughout the US, averaging 12,314 cases per year.

Prevalence. An estimated 99,869 people in the US are living with or in remission from MPNs.

Survival. For 2012-2016, the 5-year relative survival rate for MPNs was 85.0 percent.

Some burning questions

What is the doctor called that treats blood cancers? Hematologist: Blood Cancer & Blood Disease Specialist. A hematologist specializes in researching, diagnosing, and treating diseases and conditions that affect the blood. Hematologists treat both adults and children with blood-related disorders, such as anemia, bleeding disorders, clotting disorders, and blood cancers.

Is there a cure for Leukemia or any of the blood cancers? **As with other types of cancer, there's currently no cure for leukemia. People with leukemia sometimes experience remission, a state after diagnosis and treatment in which the cancer is no longer detected in the body. However, the cancer may recur due to cells that remain in your body**

Chronic Lymphocytic Leukemia (CLL) cure: Are we close? **Research doctors and scientists say, "Yes".**

Because CLL is a slow-growing cancer, some people won't need to start treatment for many years. In people whose cancer does spread, treatments can help them achieve long-term periods when there is no sign of cancer in their body. This is called remission. So far, no drug or other therapy has been able to cure CLL.

One challenge is that a small number of cancer cells often remain in the body after treatment. This is called minimal residual disease (MRD). A treatment that can cure CLL will have to wipe out all of the cancer cells and prevent the cancer from ever coming back or relapsing.

However, new combinations of chemotherapy and immunotherapy have already helped people with CLL live longer in remission. The hope is that one or more of the new drugs in development might provide the cure that researchers and people with CLL have been hoping to achieve.

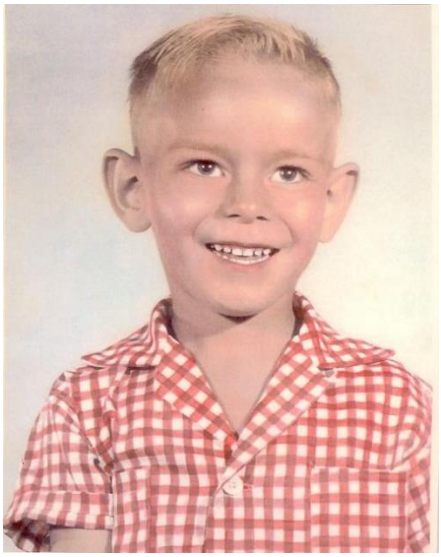
What age group does leukemia affect the most? **The risk of most leukemias increase with age. The median age of a patient diagnosed with acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL) or chronic myeloid leukemia (CML) is 65 years and older. However, most cases of acute lymphocytic leukemia (ALL) occur in people under 20 years old.**

Scary facts.

Statistics from the American Cancer Society (ACS) suggest men have a 40.1 percent chance of getting some type of cancer during his lifetime, while women's odds are 38.7 percent.

Blood cancers account for about 10 percent of all diagnosed cancers in the U.S. each year. Blood cancers (including leukemia, lymphoma, and myeloma) are more common in men than women. Childhood leukemia accounts for about 25 percent of all cancers in children.

Final comment



John Petersen

My younger brother John died on January 17, 1960, at age 6 of leukemia. I remember that I was on a University of Utah basketball trip when I got the call from my mother telling me that John was dead. That was a sad day for our family.

During the early 1950's when John was born, the U.S. Government was still conducting Nuclear Bomb testing 65 miles northwest of Las Vegas. Actually, between 1951 and 1992, there were a total of 928 announced nuclear tests at the Nevada Test Site. The prevailing winds in that area spread the nuclear radiation fallout well into southern and central Utah. The number of cases of leukemia and other cancers skyrocketed during this period. My mother was positive that this radiation fallout caused John to get sick and die. There was a class-action lawsuit against the government because of the large number of cancer deaths, but our government never admitted guilt so my mother and dad (and most other families who suffered death) never received a cent.

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