



Leukaemia is a type of cancer of the blood and bone marrow. It occurs when the bone marrow makes too many white blood cells (lymphocytes), which are part of the body's immune system to fight infections. Leukaemia cells do not function properly as white blood cells, and they do not fight infections very well. They can also crowd the bone marrow, meaning less room for healthy blood cells.

Different types of leukaemia are named after the type of stem cells that are affected (either lymphoid stem cells or myeloid stem cells), and how quickly the abnormal cells grow:

- **Acute lymphocytic leukaemia**, also known as acute lymphoblastic leukaemia, affects lymphoid stem cells and grows quickly. It is the most common type of leukaemia in children, occurring mostly in younger children (aged 2–4 years).
- **Acute myeloid leukaemia** affects myeloid stem cells and grows quickly. It is also called acute myelogenous leukaemia, acute myeloblastic leukaemia, acute granulocytic leukaemia or acute nonlymphocytic leukaemia.
- **Chronic lymphocytic leukaemia** affects lymphoid stem cells and usually grows slowly. It is the most common type of leukaemia in adults and is rare in children.
- **Chronic myeloid leukaemia** affects myeloid stem cells and grows slowly. It is rare in children, but tends to occur more often in teenagers than in younger children.

Risk factors

A risk factor is anything that increases a person's chance of developing a certain condition or disease, such as cancer. In adults, lifestyle and environmental factors (such as smoking or exposure to certain chemicals) can be significant risk factors for developing certain types of cancer. In children, very few risk factors have been identified that increase the chance of developing cancer. For most children with cancer, the underlying cause is unknown.

Even if your child has a risk factor, it does not mean they will develop cancer. Many children with a risk factor will never develop cancer, while others with cancer may have had no known risk factors. Even if a child with a risk factor develops cancer, it is usually hard to know how much that risk factor contributed to the development of their disease.

The causes of leukaemia are not well understood, but factors associated with a higher chance of developing leukaemia include the following:

Family history

Children who have a brother or sister – especially a twin – with leukaemia have a slightly higher chance of developing leukaemia themselves.

Genetic conditions





Some changes in a child's chromosomes or genes can lead to leukaemia. Certain genetic conditions can also increase a child's risk of developing leukaemia, including:

- Down syndrome
- Klinefelter syndrome
- Shwachman syndrome
- Bloom syndrome
- Li–Fraumeni syndrome
- Noonan syndrome
- Wiscott–Aldrich syndrome
- neurofibromatosis type
- Fanconi anaemia
- ataxia-telangiectasia.

If your child is diagnosed with one of these genetic conditions, they will need specific follow-up. The health care team will advise which ongoing tests your child will need.

Cancers in children that are linked to genetic conditions may also affect the risk for other family members. Speak to your child's treatment team to see whether genetic counselling is recommended for you or your family.

For more information about genetic conditions, see the [children's cancer glossary](#) or the [Centre for Genetics Education](#).

Exposure to radiation

Children who are exposed to radiation, or who were exposed to X-rays before they were born, have a higher risk of developing leukaemia. Children who have previously had radiation therapy (radiotherapy) to treat cancer also have a higher chance of developing leukaemia.

Previous chemotherapy

Children who have been treated with chemotherapy before, either for leukaemia or for another type of cancer, have a higher risk of developing leukaemia.

Symptoms

Symptoms of leukaemia may include:



- fever
- night sweats
- bruising or bleeding easily
- flat, pinpoint red spots under the skin (called petechiae), caused by bleeding under the skin
- pain in the bones or joints, or under the ribs
- tiredness or weakness
- pale skin
- dry skin rash
- loss of appetite
- painless lumps in the neck, underarm, stomach or groin, or around the eyes
- feeling of fullness or swelling in the belly.

Note about symptoms

Many conditions – including common childhood infections – can cause these symptoms, not just leukaemia. If your child has any of these symptoms and you are concerned, talk to your child's doctor.

Diagnosis

Your child will have a number of tests to investigate their symptoms and confirm a diagnosis of leukaemia, including:

- medical history and physical examination
- blood tests
- lumbar puncture (spinal tap) – where a sample of cerebrospinal fluid is taken to be examined under a microscope
- bone marrow aspiration and biopsy – where a sample of bone marrow and a small piece of bone are taken to be examined under a microscope
- medical imaging, which may include
 - chest X-ray
 - ultrasound
 - bone scan
 - computed tomography (CT) scan
 - magnetic resonance imaging (MRI)
 - positron emission tomography (PET) scan.

These tests are explained in more detail in [How is cancer diagnosed?](#)

Staging





If your child is diagnosed with leukaemia, it is very important to accurately classify the cancer. This information is used to determine the precise therapy the child requires and estimate their outlook (prognosis).

Other childhood cancers use a process called staging to determine where the cancer is, how big it is, which nearby organs are involved and whether the cancer has spread to other parts of the body. Leukaemia is different, because the cancer starts in the bone marrow and spreads to the blood very quickly – this means that the leukaemia cells are already widespread throughout the body.

Your child will have tests (see [How is cancer diagnosed?](#)) to determine whether the leukaemia cells have built up in certain organs or areas of the body, such as the liver, spleen, lymph nodes or central nervous system. These diagnostic tests will also show the types and subtypes of cells that are involved in the leukaemia.

Your child's doctor will also take into account whether the leukaemia is newly diagnosed, or whether it has been treated before but has come back (relapsed).

Treatment

Treatment and care of children with cancer is usually provided by a team of health professionals called a multidisciplinary team. Members of this team are specialists in children's cancers – they understand the differences between children's cancer and adult cancer, and each team member brings different skills in managing care to meet the needs of both you and your child.

The team will be led by a childhood cancer specialist (paediatric oncologist). Other members of the team depend on the age of your child and their type of disease, and may change over time as your child's needs change. A list of team members who might make up the multidisciplinary team can be found in [The treatment team](#).

Treatment for leukaemia depends on the age of your child, the biological features of the cancer and other factors identified during diagnosis. Treatment will be tailored to your child's particular situation, and may involve one or more of the following (see [How is cancer treated](#) for more detail).

Surgery

Because leukaemia cells spread throughout the body in the blood, surgery is not used to treat leukaemia. However, your child might have surgery to insert a venous access device (also called a central venous catheter, portacath or central venous line) into a large blood vessel, usually in their chest or upper arm. This is a small plastic tube that either sticks out of the body or sits just under the skin. It allows medicines, including chemotherapy, to be given intravenously, and can also be used to





take blood samples for testing.

Chemotherapy

Chemotherapy uses anti-cancer medicines to destroy cancer cells. It is often given as a combination of medicines to try to prevent the cancer cells from becoming resistant to just one or two medicines.

Chemotherapy medicines are given together in courses, often over a few days. Once the body has recovered from the side effects, the next course is given. Most children receive multiple courses of chemotherapy.

Chemotherapy is often used to treat leukaemia, and can be given by mouth or injected into a vein, under the skin or into a muscle.

If your child's doctor thinks that the leukaemia may have spread to the brain or spinal cord, chemotherapy can also be given directly into the cerebrospinal fluid through a device called a ventricular access catheter, which is inserted during a minor operation. This device has a small tube that passes into the area of the brain where the cerebrospinal fluid flows. The treatment team can inject chemotherapy medicines directly into it, and also take samples of fluid out of it to run tests.

Radiation therapy

Radiation therapy (also called radiotherapy) uses high-energy X-rays or other types of radiation to destroy cancer cells or stop them from growing. External beam radiation therapy may be used to treat leukaemia if the cancer has spread (or if it might spread) to the brain or other parts of the central nervous system.

Radiation therapy can have long-term side effects in children. If radiation therapy is included in your child's treatment, special care will be taken to reduce these risks.

Targeted therapy

Some medicines can target the specific changes in cancer cells that make them different from normal cells. This means that they work differently from standard chemotherapy, and they usually have fewer side effects, or the side effects are not as severe.

Drugs known as tyrosine kinase inhibitors (TKIs), such as imatinib, may be used to treat certain types of acute lymphocytic leukaemia. Monoclonal antibodies may be used to treat acute myeloid leukaemia.

Targeted therapies are often used in combination with other treatments such as chemotherapy.

Stem cell transplant





Some children may be treated using a stem cell transplant (also known as a bone marrow transplant), in combination with high-dose chemotherapy or radiation therapy. However, this is usually only done for children whose leukaemia has come back after the initial treatment (relapsed). It is rarely used as the first treatment for acute lymphocytic leukaemia.

Other treatments

Some children are very ill when they are first diagnosed with leukaemia. These children might have immediate treatment such as blood or platelet transfusions (where blood or platelets from a donor are given intravenously) before they begin other treatments.

Support

Diagnosis of cancer in a child is a very difficult time for the child, their family and their friends. You might feel overwhelmed, scared, anxious or angry. These are all normal feelings. It is very important to seek support from family, friends, health professionals or other services to help you, your child and your family cope with cancer.

Talk to your child's treatment team if you are having difficulties coping.

[Living with children's cancer](#) has information about physical, emotional and practical issues during and after diagnosis and treatment. There is also a page with helpful links on [where to find support](#).

The [Cancer Council](#) in your state or territory can give you general information about cancer, as well as information on resources and support groups in your local area. Call the Cancer Council Helpline from anywhere in Australia for the cost of a local call on **13 11 20**.

For additional specific information about childhood cancer, contact any of the major [children's hospitals and networks](#) in your state or territory.

Chance of cure

Many children with cancer are cured of the disease. Children's bodies have great capacity for healing. Also, huge improvements have been made in the treatment of childhood cancer in the past few





decades. In the 1980s, around 65% of children diagnosed with cancer were alive more than 5 years after their diagnosis. Today, around 83% of children are successfully treated and become long-term survivors.

Long-term survival (also called the outlook or prognosis) and treatment options depend on a range of factors, including:

- age of your child at diagnosis
- extent or stage of the cancer
- appearance of the cancer cells under the microscope (the shape, function and structure of the cells)
- how the cancer responds to treatment
- cancer or tumour biology, which includes
 - the patterns of the cancer cells
 - how different the cancer cells are from normal cells
 - how fast the cancer cells are growing.

Talk to your child's doctor about your child's individual disease, treatment options and outlook.

Clinical trials

Researchers are trialling new ways to diagnose and treat different types of cancer. Your child may be invited to be part of a clinical trial to test new ways of treating leukaemia.

New treatments have to go through very strict regulation and approval processes before they can be used in a clinical trial. Your child's doctor will explain everything about the trial and give you detailed written information. You will need to give special permission for your child to be part of the trial.

Participating in a clinical trial may or may not directly benefit your child, but the results of clinical trials today will help children with cancer in the future.

See [Clinical trials and research](#) for more information, including whether there are any clinical trials your child can join.

More information

For more information about leukaemia, see:



- [Childhood leukaemia](#), from the American Cancer Society
- [Childhood acute lymphoblastic leukemia treatment \(PDQ®\)](#), [Childhood acute myeloid leukemia/other myeloid malignancies treatment \(PDQ®\)](#) and [What you need to know about leukaemia – patient booklet](#) from the National Cancer Institute (United States).

