Cancer in Children

What are the differences between cancers in adults and children?

Cancer starts when cells in the body begin to grow out of control. Cells in nearly any part of the body can become cancer, and can spread to other areas of the body. To learn more about how cancers start and spread, see What Is Cancer?

The cancers that develop in children are often different from the types that develop in adults. Childhood cancers are often the result of DNA changes in cells that take place very early in life, sometimes even before birth. Unlike many cancers in adults, childhood cancers are not strongly linked to lifestyle or environmental risk factors.

With some exceptions, childhood cancers tend to respond better to certain treatments, such as chemotherapy (also called chemo). Children’s bodies also tend to handle chemotherapy better than adults’ bodies do. On the other hand, children (especially very young children) are more likely to be affected by radiation therapy if it is needed as part of treatment. Both chemo and radiation therapy can also cause long-term side effects, so children who have had cancer need careful follow-up for the rest of their lives.

In the United States, most children and teens with cancer are treated at a center that is a member of the Children’s Oncology Group (COG). All of these centers are associated with a university or children’s hospital. These centers offer the advantage of being treated by a team of specialists who know the differences between adult and childhood cancers, as well as the unique needs of children and teens with cancer and their families. This team usually includes pediatric oncologists (childhood cancer doctors), surgeons, radiation oncologists, pediatric oncology nurses, physician assistants (PAs), and nurse practitioners (NPs). As we have learned more about treating childhood cancer, it has become even more important that treatment be given by experts in this area.

These centers also have psychologists, social workers, child life specialists, nutritionists, rehabilitation and physical therapists, and educators who can support and educate the
entire family. (See *Children Diagnosed With Cancer: Understanding the Health Care System* for more on the professionals who help treat children with cancer.)

Any time a child is diagnosed with cancer, it affects every family member and nearly every aspect of the family’s life. You can read more about coping with these changes in *Children Diagnosed With Cancer: Dealing With Diagnosis*.

**Key statistics for childhood cancers**

Childhood cancers make up less than 1% of all cancers diagnosed each year. About 10,380 children in the United States under the age of 15 will be diagnosed with cancer in 2016. Childhood cancer rates have been rising slightly for the past few decades.

Because of major treatment advances in recent decades, more than 80% of children with cancer now survive 5 years or more. Overall, this is a huge increase since the mid-1970s, when the 5-year survival rate was about 58%. Still, survival rates vary depending on the type of cancer and other factors. The survival rates for a specific type of childhood cancer can be found in our information on that cancer type.

After accidents, cancer is the second leading cause of death in children aged 1 to 14. About 1,250 children younger than 15 years old are expected to die from cancer in 2016.

**Cancers that develop in children**

The types of cancers that develop most often in children are different from those in adults.

- Leukemia
- Brain and other central nervous system tumors
- Neuroblastoma
- Wilms tumor
- Lymphoma (including both Hodgkin and non-Hodgkin)
- Rhabdomyosarcoma
- Retinoblastoma
- Bone cancer (including osteosarcoma and Ewing sarcoma)

In very rare cases, children may even develop cancers that are much more common in adults. Other types of cancers are rare in children, but they do happen sometimes. The most common cancers in children are:
Leukemias

Leukemias, which are cancers of the bone marrow and blood, are the most common childhood cancers. They account for about 30% of all cancers in children. The most common types in children are acute lymphocytic leukemia (ALL) and acute myelogenous leukemia (AML). These leukemias can cause bone and joint pain, fatigue, weakness, pale skin, bleeding or bruising, fever, weight loss, and other symptoms. Acute leukemias can grow quickly, so they need to be treated (typically with chemotherapy) as soon as they are found.

For more information see *Childhood Leukemia*.

Brain and spinal cord tumors

Brain and central nervous system tumors are the second most common cancers in children, making up about 26% of childhood cancers. There are many types of brain tumors, and the treatment and outlook for each is different.

Most brain tumors in children start in the lower parts of the brain, such as the cerebellum or brain stem. They can cause headaches, nausea, vomiting, blurred or double vision, dizziness, seizures, trouble walking or handling objects, and other symptoms. Spinal cord tumors are less common than brain tumors in both children and adults.

For more information see *Brain and Spinal Cord Tumors in Children*.

Neuroblastoma

Neuroblastoma starts in early forms of nerve cells found in a developing embryo or fetus. About 6% of childhood cancers are neuroblastomas. This type of cancer develops in infants and young children. It is rarely found in children older than 10. The tumor can start anywhere but usually starts in the belly (abdomen), where it is noticed as swelling. It can also cause bone pain and fever.

For more information see *Neuroblastoma*.

Wilms tumor

Wilms tumor (also called *nephroblastoma*) starts in one, or rarely, both kidneys. It is most often found in children about 3 to 4 years old, and is uncommon in children older than age 6. It can show up as a swelling or lump in the belly (abdomen). Sometimes the child might have other symptoms, like fever, nausea, or poor appetite. Wilms tumor accounts for about 5% of childhood cancers.

For more information see *Wilms Tumor*. 
Lymphomas

Lymphomas start in immune system cells called lymphocytes. They most often start in lymph nodes and other lymph tissues, like the tonsils or thymus. These cancers can also affect the bone marrow and other organs. Symptoms depend on where the cancer is and can include weight loss, fever, sweats, tiredness (fatigue), and lumps (swollen lymph nodes) under the skin in the neck, armpit, or groin.

The 2 main types of lymphoma are Hodgkin lymphoma (sometimes called Hodgkin disease) and non-Hodgkin lymphoma. Both types occur in children and adults.

**Hodgkin lymphoma** accounts for about 3% of childhood cancers. It is more common, though, in early adulthood (people in their 20s) and late adulthood (after age 55). Hodgkin lymphoma is rare in children younger than 5 years of age. This type of cancer is very similar in children and adults, including which types of treatment work best.

**Non-Hodgkin lymphoma** makes up about 5% of childhood cancers. It is more likely to occur in younger children than Hodgkin lymphoma, but it is still rare in children younger than 3. The most common types of non-Hodgkin lymphoma in children are different from those in adults. These cancers often grow quickly and require intensive treatment, but they also tend to respond better to treatment than most non-Hodgkin lymphomas in adults.

For more information see *Non-Hodgkin Lymphoma in Children* and *Hodgkin Disease*.

Rhabdomyosarcoma

Rhabdomyosarcoma starts in cells that normally develop into skeletal muscles. (These are the muscles that we control to move parts of our body.) This type of cancer can start nearly any place in the body, including the head and neck, groin, belly (abdomen), pelvis, or in an arm or leg. It may cause pain, swelling (a lump), or both. This is the most common type of soft tissue sarcoma in children. It makes up about 3% of childhood cancers.

For more information see *Rhabdomyosarcoma*.

Retinoblastoma

Retinoblastoma is a cancer of the eye. It accounts for about 2% of childhood cancers. It usually occurs in children around the age of 2, and is seldom found in children older than 6. Retinoblastomas are usually found because a parent or doctor notices a child’s eye looks unusual. Normally when you shine a light in a child’s eye, the pupil (the dark spot in the center of the eye) looks red because of the blood in vessels in the back of the eye. In an eye with retinoblastoma, the pupil often looks white or pink. This white glare of the eye may be noticed after a flash picture is taken.
Bone cancers

Cancers that start in the bones (primary bone cancers) occur most often in older children and teens, but they can develop at any age. They account for about 3% of childhood cancers. Two main types of primary bone cancers occur in children:

**Osteosarcoma** is most common in teens, and usually develops in areas where the bone is growing quickly, such as near the ends of the long bones in the legs or arms. It often causes bone pain that gets worse at night or with activity. It can also cause swelling in the area around the bone.

**Ewing sarcoma** is a less common type of bone cancer, which can also cause bone pain and swelling. It is most often found in young teens. The most common places for it to start are the pelvic (hip) bones, the chest wall (such as the ribs or shoulder blades), or in the middle of the long leg bones.

For more information see [Osteosarcoma](#) and [Ewing Family of Tumors](#).

Risk factors and causes of childhood cancer

A risk factor is anything that affects the chance of getting a disease such as cancer. Different cancers have different risk factors.

In adults, lifestyle-related risk factors, such as being overweight, eating an unhealthy diet, not getting enough exercise, and habits like smoking and drinking alcohol, play a major role in many types of cancer. But lifestyle factors usually take many years to influence cancer risk, and they are not thought to play much of a role in childhood cancers.

A few environmental factors, such as radiation exposure, have been linked with some childhood cancers. Some studies have also suggested that some parental exposures (such as smoking) might increase a child’s risk of certain cancers, but more studies are needed to explore these possible links. So far, most childhood cancers have not been shown to have environmental causes.

In recent years, scientists have begun to understand how certain changes in the DNA inside our cells can cause them to become cancer cells. DNA is the chemical that makes up our *genes*, which control nearly everything our cells do. We usually look like our parents because they are the source of our DNA. But DNA affects more than just how we look. It also influences our risks for developing certain diseases, including some kinds of cancer.

Some genes control when our cells grow, divide into new cells, and die:

- Genes that help cells grow, divide, or stay alive are called *oncogenes*. 

Genes that slow down cell division or cause cells to die at the right time are called **tumor suppressor genes**.

Cancers can be caused by DNA changes that turn on oncogenes or turn off tumor suppressor genes.

### Inherited versus acquired gene mutations

Some children inherit DNA changes (mutations) from a parent that increase their risk of certain types of cancer. These changes are in every cell of the child’s body, and can often be tested for in the DNA of blood cells or other body cells. Some of these DNA changes are linked only with an increased risk of cancer, while others can cause syndromes that also include other health or developmental problems.

But most childhood cancers are not caused by inherited DNA changes. They are the result of DNA changes that happen early in the child’s life, sometimes even before birth. Every time a cell divides into 2 new cells, it must copy its DNA. This process isn’t perfect, and errors sometimes occur, especially when the cells are growing quickly. This kind of gene mutation can happen at any time in life and is called an **acquired mutation**.

Acquired mutations start in one cell. That cell then passes the mutation on to all the cells that come from it. These acquired DNA changes are only in the person’s cancer cells and will not be passed on to his or her children.

Sometimes the causes of gene changes in certain adult cancers are known (such as cancer-causing chemicals in cigarette smoke), but the reasons for DNA changes that cause most childhood cancers are not known. Some may have outside causes like radiation exposure, and others may have causes that have not yet been found. But many are likely to be caused by random events that sometimes happen inside a cell, without having an outside cause.

### Can childhood cancers be prevented?

Unlike many cancers of adults, lifestyle-related risk factors (such as smoking) don’t influence a child’s risk of getting cancer. A few environmental factors, such as radiation exposure, have been linked with childhood cancer risk. But in many cases exposure to radiation might be unavoidable, such as if the child needs radiation therapy to treat another cancer. If your child does develop cancer, it’s important to know that it’s extremely unlikely there is anything you or your child could have done to prevent it.

Very rarely, a child might inherit gene changes that make them very likely to get a certain kind of cancer. In such cases, doctors may sometimes recommend preventive surgery to remove an organ before cancer has a chance to develop there. Again, this is very rare.
Finding cancer in children

Screening for cancer in children

Screening is testing for a disease such as cancer in people who don’t have any symptoms. Childhood cancers are rare, and there are no widely recommended screening tests to look for cancer in children who are not at increased risk.

Some children have a higher chance of developing a specific type of cancer because of certain gene changes they inherit from a parent. These children may need careful, regular medical check-ups that include special tests to look for early signs of cancer.

Possible signs and symptoms of cancer in children

Many cancers in children are found early, either by a child’s doctor or by parents or relatives. But cancers in children can be hard to recognize right away because early symptoms are often like those caused by much more common illnesses or injuries. Children often get sick or have bumps or bruises that might mask the early signs of cancer. Cancer in children is not common, but it’s important to have your child checked by a doctor if they have unusual signs or symptoms that do not go away, such as:

- An unusual lump or swelling
- Unexplained paleness and loss of energy
- Easy bruising
- An ongoing pain in one area of the body
- Limping
- Unexplained fever or illness that doesn’t go away
- Frequent headaches, often with vomiting
- Sudden eye or vision changes
- Sudden unexplained weight loss

Most of these symptoms are much more likely to be caused by something other than cancer, such as an injury or infection. Still, if your child has any of these symptoms, see a doctor so that the cause can be found and treated, if needed.

Other symptoms are also possible, depending on the type of cancer. You can find more information on common symptoms for specific types of childhood cancer in Cancers that develop in children.
Seeing a doctor

The doctor will ask about the medical history and symptoms, and examine your child. If cancer is a possible cause, the doctor might order imaging tests (such as x-rays) or other tests. Sometimes if an abnormal lump or tumor is found, the doctor might need to remove some or all of it so that it can be looked at under a microscope for cancer cells. This is known as a biopsy.

If your child is found to have cancer, Children With Cancer: Dealing With Diagnosis offers ideas for coping and moving forward after the diagnosis is made.

Treating children with cancer

Treatment for childhood cancer is based mainly on the type and stage (extent) of the cancer. The main types of treatment used for childhood cancers are:

- Surgery
- Radiation therapy
- Chemotherapy

Some types of childhood cancers might be treated with high-dose chemotherapy followed by a stem cell transplant. Newer types of treatment, such as targeted therapy drugs and immunotherapy, have also shown promise in treating some childhood cancers. Often, more than one type of treatment is used.

There are exceptions, but childhood cancers usually respond well to chemotherapy because they tend to be cancers that grow fast. (Most forms of chemotherapy affect cells that are growing quickly.) Children’s bodies are also generally better able to recover from higher doses of chemotherapy than are adults’ bodies. Using more intensive treatments can offer a better chance of treating the cancer effectively, but it can also lead to more short- and long-term side effects. Unlike chemotherapy, radiation can often cause more serious side effects in children (especially very young children) than in adults, so its use sometimes needs to be limited. Doctors do their best to balance the need for intensive treatment with the desire to limit side effects as much as possible.

For detailed information on how a certain type of childhood cancer is treated, see our information on that specific cancer type.
The cancer treatment team

Children with cancer and their families have special needs that can best be met at children’s cancer centers. Treatment of childhood cancer in these centers is coordinated by a team of experts who know the unique needs of children with cancer and their families. This team usually includes:

- **Pediatric oncologists**: doctors who specialize in using medicines to treat children with cancer
- **Pediatric surgeons**: doctors who specialize in performing surgery in children
- **Radiation oncologists**: doctors who specialize in using radiation to treat cancer
- **Pediatric oncology nurses**: nurses who specialize in caring for children with cancer
- **Nurse practitioners (NPs) and physician assistants (PAs)**: nurses and other professionals who are specially trained and licensed to practice medicine alongside doctors

The team can also include many professionals other than nurses and doctors. Children’s cancer centers have psychologists, social workers, child life specialists, nutritionists, rehabilitation and physical therapists, and educators who can support and care for the entire family. For more information, see *Children Diagnosed With Cancer: Understanding the Health Care System*.

Getting the best treatment possible

Today, most children with cancer are treated at specialized children’s cancer centers. These centers are often members of the Children’s Oncology Group (COG). Going to a hospital that specializes in treating childhood cancer helps ensure that a child gets the best available cancer treatment.

These centers offer the most up-to-date-treatment by conducting clinical trials (studies of promising new therapies). Children’s cancer centers often conduct many clinical trials at any one time, and in fact most children treated at these centers take part in a clinical trial as part of their treatment.

Clinical trials are one way to get state-of-the-art cancer care for your child. They may be the only way to get access to some newer treatments. They are also the best way for doctors to learn better methods to treat cancer. Still, they might not be right for every child. Talk to your child’s cancer care team to learn about possible clinical trials for your child, and ask about the pros and cons of enrolling in one of them.
If your child qualifies for a clinical trial, it’s up to you whether or not to enter (enroll) your child into it. Older children, who can understand more, usually must also agree to take part in the clinical trial before the parents’ consent is accepted.

To learn more about clinical trials, see Clinical Trials: What You Need to Know.

**Late and long-term effects of cancer treatment on children**

During and after cancer treatment, most families are mainly concerned about the short- and long-term effects of the cancer and its treatment, and about the cancer still being present or coming back.

It is certainly normal for families to want to put the cancer and its treatment behind them and to get back to a life that doesn’t revolve around cancer. But it’s important to realize that close follow-up care is a central part of this process that offers children the best chance for recovery and long-term survival.

Once treatment is finished, the health care team will set up a follow-up schedule. For many years after treatment, it is very important that children have regular follow-up exams with the cancer care team. As time goes by, the risk of the cancer coming back goes down. Doctor visits might be needed less often, but they are still important because some side effects of treatment might not show up until years later.

Because of major advances in treatment, more children treated for cancer survive into adulthood. But treatments might affect children’s health later in life, so watching for health effects as they get older has become more of a concern in recent years. The earlier any problems are recognized, the more likely it is they can be treated effectively.

Childhood cancer survivors are at risk, to some degree, for several possible late effects of their cancer treatment. It’s important to discuss what these possible effects might be with your child’s medical team. The risks for each child depend on a number of factors, such as the type of cancer, the specific cancer treatments used, the doses of cancer treatment, and the child’s age at the time of treatment. Some of the possible late effects of cancer treatment include:

- Heart or lung problems (due to certain chemotherapy drugs or radiation therapy to the chest area)
- Slowed or delayed growth and development (in the bones or overall)
- Changes in sexual development and ability to have children
- Learning problems
- Increased risk of other cancers later in life
To learn more about the possible specific long-term side effects for a particular type of cancer, see our information on that specific type of cancer.

To help raise awareness of late effects and improve follow-up care of childhood cancer survivors throughout their lives, the Children’s Oncology Group (COG) has developed long-term follow-up guidelines for survivors of childhood cancers. These guidelines can help you know what to watch for, what type of screening tests should be done to look for problems, and how late effects can be treated.

It’s very important to discuss possible late side effects with your child’s health care team, and to make sure there is a plan to watch for these problems and treat them, if needed.

To learn more, ask your child’s doctors about the COG survivor guidelines. You can also read them on the COG website: www.survivorshipguidelines.org. The guidelines are written for health care professionals. Patient versions of some of the guidelines are available (as “Health Links”) on the site as well, but we urge you to discuss them with your doctor.

For more about some of the possible long-term effects of treatment, see *Children Diagnosed With Cancer: Late Effects of Cancer Treatment*.

## Additional resources for cancer in children

### More information from your American Cancer Society

We have a lot more information that you might find helpful. Explore www.cancer.org or call our National Cancer Information Center toll-free number, 1-800-227-2345. We’re here to help you any time, day or night.

### Other national organizations and websites*

Along with the American Cancer Society, other sources of information and support include:

**American Childhood Cancer Organization (formerly Candlelighters)**

Toll-free number: 1-855-858-2226  
Website: [www.acco.org](http://www.acco.org)  

Offers information for children and teens with cancer, their siblings, and adults dealing with children with cancer. Also offers books and a special kit for children newly diagnosed with cancer, as well as some local support groups.

**Children’s Oncology Group (COG)**  
Website: [www.childrensoncologygroup.org](http://www.childrensoncologygroup.org)
Information from the world’s largest organization devoted to childhood cancer research to help support children and their families from the time of diagnosis, through treatment, and beyond. Also has a searchable database to find the COG center closest to you.

**CureSearch for Children’s Cancer**  
Toll-free number: 1-800-458-6223  
Website: [www.curesearch.org](http://www.curesearch.org)

Provides up-to-date information about childhood cancer from pediatric cancer experts. Has sections on the website for patients, families, and friends to help guide them on how to support the child with cancer.

**National Cancer Institute**  
Toll-free number: 1-800-4-CANCER (1-800-422-6237)  
TTY: 1-800-332-8615  
Website: [www.cancer.gov](http://www.cancer.gov)

Provides accurate, up-to-date information about cancer for patients and their families, including clinical trials information. Offers a special booklet for teen siblings of a child with cancer at: [www.cancer.gov/cancertopics/when-your-sibling-has-cancer](http://www.cancer.gov/cancertopics/when-your-sibling-has-cancer).

**National Children’s Cancer Society, Inc.**  
Toll-free number: 1-800-5-FAMILY (1-800-532-6459)  
Website: thenccs.org

Services include an online support network for parents of children with cancer, educational materials, and financial assistance for treatment-related expenses.

**Websites for teens and children**

**Starlight Children’s Foundation**  
Phone number: 1-310-479-1212  
Website: [www.starlight.org](http://www.starlight.org)

Website has animated stories and interactive programs to teach kids about chemo and procedures that may be done in the hospital; also has videos specifically for teens and provides a safe, monitored online support group for teens with cancer.

**Group Loop** (a subsite of the Cancer Support Community just for teens)  
Toll-free number: 1-888-793-9355  
Website: [www.grouploop.org](http://www.grouploop.org)

An online place for teens with cancer or teens who know someone with cancer to connect with other teens – away from the pressures of classes, responsibilities,
and treatment schedules. Has online support groups, chat rooms, information, and more.

**13thirty Cancer Connect**  
Website: 13thirty.org

An online-only resource dedicated to teens (and young adults) coping with a cancer diagnosis and treatment. It focuses on teen issues and provides resources to support teens, their families, and friends.

**SuperSibs! Powered by Alex’s Lemonade Stand**  
Toll-free number: 1-866-333-1213  
Website: [www.supersibs.org](http://www.supersibs.org)

Supports, honors, and recognizes brothers and sisters of children diagnosed with cancer so they may face the future with strength, courage, and hope.

*Inclusion on this list does not imply endorsement by the American Cancer Society.*

No matter who you are, we can help. Contact us anytime, day or night, for information and support. Call us at **1-800-227-2345** or visit www.cancer.org.

**References: Cancer in children**


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For additional assistance please contact your American Cancer Society
1-800-227-2345 or www.cancer.org