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Late Effects of Childhood Cancer

This section has been reviewed and approved by the Cancer.Net Editorial Board, 01/2016

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Watch the [Cancer.Net Video: Late Effects of Childhood Cancer Treatment, with Lisa Diller, MD](#) [1], adapted from this content

There are about 15 million cancer survivors in the United States, many under the age of 21. In the last 30 years, there have been improved treatments and better supportive care. As a result, more than 80% of children treated for cancer are now surviving for 5 years or more after treatment.

However, they are at risk for having long-term and late side effects from cancer treatment. Late effects are conditions that continue or develop 5 or more years after a cancer diagnosis. Some late effects do not show up until many years after cancer treatment ends. It is important to be aware of the possible late effects linked with cancer and its treatment. It is also helpful to know the recommended screening that can help detect conditions earlier, when they may be most treatable.

Causes of late effects

Any cancer treatment may cause late effects, including chemotherapy, radiation therapy, surgery, and stem cell/bone marrow transplantation. A child's risk of developing late effects

depends on many factors:

- Type and location of cancer
- Area of the body treated
- Type and dose of treatment
- Child's age when treated
- Genetics and family history
- Other health problems that existed before the cancer diagnosis

Types of late effects

Late effects can be physical or emotional. Below is a listing of specific late effects of childhood cancer. Not all survivors will develop all of these long-term side effects. It depends on the type of treatment a child had and their age when treated.

You might be concerned about late effects of cancer. Talk with a doctor to understand what the risks are and ways to manage them.

If you were treated for a childhood cancer or you have a child who no longer in treatment, then consult with a [survivorship center of excellence](#) [2]. They are located at many National Cancer Institute Comprehensive Cancer Centers. Or, consult with follow-up care clinics listed at the [Pediatric Oncology Resource Center](#) [3] and the [National Children's Cancer Society](#) [4] websites.

Researchers continue to make progress in preventing, managing, and treating late effects from childhood cancer. They provide a growing body of information to children and their families about this disease. Many suggestions below are from the [clinical guidelines from the Children's Oncology Group](#) [5].

- **Emotional troubles.** No matter what age a child is during treatment, long-term emotional effects may occur. This may include anxiety, depression, and fear of recurrence. Often, many survivors of childhood cancer avoid doctors and health care settings. This may harm their health as an adult.

- **Second cancers.** Childhood cancer survivors have a slightly increased risk of having a second cancer. This is a different type of cancer that appears after the first cancer diagnosis. This is often also called a secondary cancer. Radiation therapy and some types of chemotherapy have the strongest links to secondary cancers. These include the drugs cyclophosphamide (Neosar), ifosfamide (Ifex), etoposide (Toposar, VePesid), daunorubicin (Cerubidine), and doxorubicin (Adriamycin). For example, children and teens who received radiation therapy for Hodgkin lymphoma have a higher risk of second cancers. Common secondary cancers include skin, breast, and thyroid cancers.
- **Reproductive and sexual development problems.** Boys and girls are both at risk for these problems.
 - In boys, radiation therapy to the lower abdomen, pelvis, or testicles may cause infertility, the inability to father a child. Chemotherapy with alkylating agents, such as cyclophosphamide and ifosfamide, can also cause this. These treatments may also change levels of the male hormone, testosterone, which can affect puberty and sexual functioning. Learn more about [fertility concerns and cancer treatment](#) [6] for men.
 - In girls, chemotherapy and radiation treatment to the abdomen, pelvis, or lower spine can affect the ovaries. This may cause infertility, which is the inability to conceive a child or maintain a pregnancy, irregular periods, and early menopause. These treatments also changes levels of the female hormone, estradiol, which can affect puberty and sexual functioning. Learn more about [fertility concerns and cancer treatment](#) [7] for women.
 - For both boys and girls, radiation to the head can affect glands that regulate the male and female hormone levels. As a result, it could affect fertility.
- **Growth, development, and hormone problems.** Cancer treatments may affect the endocrine system. This is a group of hormone-producing glands that controls body functions, such as growth, energy, and puberty.
 - Radiation therapy near the brain, eyes, or ears can affect the pituitary gland, which helps control growth and puberty. Children who received radiation therapy to these areas who have not reached adult height may have growth problems. In addition, they may reach puberty earlier or later than usual. Kids who have had radiation therapy to the pituitary gland also have a higher chance of being obese and overweight. An endocrinologist can test for these conditions and provide hormone

treatments. An endocrinologist is a doctor who specializes in treating hormone problems.

- Radiation treatment given to the muscles, bones, and soft tissues can lead to reduced or uneven growth and cause other health conditions. For example, it could lead to scoliosis, which is a sideways curving of the spine.
- Steroid drugs called glucocorticoids, such as prednisone and dexamethasone (multiple brand names for both drugs), and methotrexate (multiple brand names) have direct effects on bone formation. This can lead to low bone mineral density, and when severe, can cause osteoporosis. This is a disease that causes weak bones and increases risk of bone fractures. However, most children regain their bone density after stopping these medications.

Children should receive regular check-ups to monitor their growth throughout puberty. Doctors can measure bone mineral density with x-rays. These tests determine whether a child needs dietary supplements, special foods, or exercise to improve bone density.

- **Learning and memory problems.** Children who received radiation therapy to the brain or high doses of certain drugs may be more likely to have these problems. Survivors who are struggling with these issues can ask for referrals to school programs, state or county social services, and other services. These programs can help them assess their abilities and find appropriate accommodations.
- **Heart problems.** Drugs called anthracyclines may cause heart problems, such as abnormal heart beat, weakness of the heart muscle, and congestive heart failure. These drugs include doxorubicin, daunorubicin, and idarubicin (Idamycin). Also, radiation to the chest, spine, or upper abdomen and bone marrow/stem cell transplants may increase the risk of heart late effects.

Childhood cancer survivors should visit their doctor yearly for follow-up care because heart conditions may not cause symptoms early on. They should have noninvasive tests that check how the heart is functioning about two years after treatment. These tests include [an electrocardiogram \(ECG or EKG\) and an echocardiogram](#) [8] or a similar imaging tests. The Children's Oncology Group provides [clinical guidelines](#) [5] on how often a patient should continue to have these tests.

- **Lung and breathing problems.** Certain types of chemotherapy, including bleomycin (Blenoxane), carmustine (BiCNU), and lomustine (CeeNU), may cause lung damage. Chest radiation and surgery to the chest or lungs may also cause lung problems. Children who

received cancer treatment at a younger age have a greater risk of lung and breathing problems. Childhood cancer survivors should have a baseline test of lung function at least two years after treatment. Talk with your doctor about how often to repeat these tests.

- **Dental problems.** Radiation therapy to the mouth, head, or neck may cause problems such as dry mouth, gum disease, and cavities. Chemotherapy, especially when given to a child whose adult teeth have not formed, may cause tooth development problems. Childhood cancer survivors should visit their dentist every 6 months for check-ups. Talk with your child's dentist before and after treatment for guidance on reducing these potential late effects.
- **Digestive system.** Abdominal or pelvic surgery and radiation therapy to the neck, chest, abdomen, or pelvis can affect the gastrointestinal system. Childhood cancer survivors should talk with their doctor if they have stomach pain or long-term constipation, diarrhea, heartburn, or nausea and vomiting.
- **Hearing problems.** Radiation treatment to the head or brain may cause hearing loss. Some chemotherapy, such as cisplatin (Platinol) or carboplatin (Paraplatin), may also affect hearing. Younger children are at greater risk for these problems. All survivors of childhood cancer should have their hearing tested at least once after treatment by an audiologist. This is a medical professional who treats and manages hearing problems. A doctor should test a survivor who has hearing loss every year or as needed.
- **Vision and eye problems.** High doses of radiation to the eye, eye socket, or brain may cause eye problems. This includes cataracts, or clouding of the eye lens, as well as other problems that can affect vision. Radioiodine treatment for thyroid cancer may result in increased tearing, and bone marrow/stem cell transplants increase the risk for dry eyes. An ophthalmologist should evaluate childhood cancer survivors who have had these treatments. An ophthalmologist is a doctor who treats eye diseases.

More Information

[Managing Late Effects of Childhood Cancer](#) [9]

[Life After Cancer](#) [10]

[Side Effects](#) [11]

[Childhood Cancer](#) [12]

Additional Resource

National Cancer Institute: [Late Effects of Treatment for Childhood Cancer](#) [13]

Links

[1] <http://www.cancer.net/node/27136>

[2] <http://www.livestrong.org/what-we-do/our-actions/programs-partnerships/livestrong-survivorship-centers-of-excellence/>

[3] <http://www.acor.org/ped-onc/treatment/surclinics.html>

[4] <https://www.thencs.org/home>

[5] <http://www.survivorshipguidelines.org/>

[6] <http://www.cancer.net/node/25268>

[7] <http://www.cancer.net/node/29096>

[8] <http://www.cancer.net/node/24509>

[9] <http://www.cancer.net/node/24587>

[10] <http://www.cancer.net/node/25400>

[11] <http://www.cancer.net/node/25238>

[12] <http://www.cancer.net/node/31318>

[13] <http://www.cancer.gov/types/childhood-cancers/late-effects-pdq>