



Bone tumours occur when abnormal cells in the bones grow in an uncontrolled way. There are 2 main types of bone tumours in children:

- **Osteosarcoma** forms from cells called osteoblasts. It usually develops at the ends of the long bones, such as the arms or legs.
- **Ewing sarcoma** (also called Ewing family of tumours) forms from a type of stem cell in the bone marrow. It can form in the bones of the arms, legs, hands, feet, spine, skull, ribs, shoulder blades or hips. Ewing sarcomas can also form in soft tissues near bones. These are called extrasosseous or extraskelatal Ewing tumours, and are not discussed in this summary.

Osteosarcoma often develops in bones that are growing quickly, so it can be associated with the teenage growth spurt. Ewing tumours are also more common in teenagers.

## 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 bone tumours are not well understood, but factors associated with a higher chance of developing bone tumours include the following.

### Genetic conditions

Some bone diseases (such as Paget disease or hereditary multiple osteochondromas ) can increase the chance of your child developing osteosarcoma.

Genetic conditions that predispose people to cancer can also increase your child's risk of developing osteosarcoma. These include:

- hereditary retinoblastoma
- Diamond–Blackfan anaemia
- Li–Fraumeni syndrome
- Rothmund–Thomson syndrome
- Bloom syndrome
- Werner syndrome.





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

If your child has had treatment with radiation therapy in the past, they may have a higher chance of developing osteosarcoma in the area that was treated.

## Symptoms

Symptoms of osteosarcoma may include:

- pain or swelling over a bone or joint
- a bone that breaks for no reason.

Symptoms of Ewing tumours in bone may include:

- pain or swelling, usually in the arms, legs, chest, back or hips; pain may be worse at night
- a lump that might feel soft and warm, often in the arms, legs, chest or hips
- a bone that breaks for no reason
- fever
- tiredness
- weight loss.

## Note about symptoms

Many conditions – including common childhood infections – can cause these symptoms, not just bone tumours. 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 a bone tumour, including:

- medical history and physical examination
- medical imaging, which may include
  - X-ray
  - computed tomography (CT) scan
  - magnetic resonance imaging (MRI)
  - bone scan
  - positron emission tomography (PET) scan
- biopsy – where a small sample of the cancer is removed to be examined under a microscope. The sample can also be tested for genetic changes that can help determine the best type of treatment for your child.

In addition, diagnosis of Ewing tumours might also involve:

- blood tests
- 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.

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

## Staging

If your child is diagnosed with a bone tumour, some of the diagnostic tests will also help to stage the tumour. Staging determines where the tumour is, how big it is, which nearby organs are involved and whether it has spread to other parts of the body. This is important to determine the outlook (prognosis) for your child, and to decide on the best options for treatment.

There are different ways to assess the stage or extent of disease. Osteosarcoma and Ewing tumours are commonly staged as either localised (the cancer has not spread beyond the bone it started in) or metastatic (the cancer has spread to other parts of the body, usually to other bones or the lungs).

The American Cancer Society has more information about staging for [osteosarcoma](#) and [Ewing tumours](#).





## 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 bone tumours depends on the age of your child, the stage of the disease, 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

Your child is likely to have surgery at some point in their treatment for a bone tumour.

For bone tumours in the arms or legs, doctors can usually remove the tumour and some of the surrounding healthy tissue, and replace it with a graft or implant – this is called limb-sparing surgery. Most implants can be made longer as your child grows, without needing further surgery. After limb-sparing surgery, your child will have intensive rehabilitation and physical therapy to make sure the limb continues to work normally. If the surgery was on a leg, it can take many months for your child to learn to walk again.

In some cases, doctors may need to remove (amputate) all or part of the arm or leg. Your child will be fitted with an artificial limb or prosthesis, and will have intensive rehabilitation therapy to help them learn to use it.

Tumours in other bones (such as the spine, skull, chest or hips) where surgery might not be possible are usually treated with a combination of chemotherapy and radiation therapy.

### 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 to treat bone tumours is usually given both before surgery (to shrink the tumour and





make it easier to remove) and after surgery (to destroy any remaining cancer cells). Chemotherapy is usually part of treatment for all children with Ewing tumours, and may be given in combination with surgery and radiation therapy.

## 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.

Osteosarcoma cells are not easily destroyed by radiation, so this treatment is not used in all cases of osteosarcoma. Radiation therapy might be used to treat osteosarcoma in combination with other treatments such as chemotherapy, or on its own if a small amount of cancer is left after surgery. It might also be used to relieve symptoms of bone tumours (such as pain and swelling) if surgery is not a good option, or if the cancer has come back.

Ewing tumours can be treated with radiation therapy either alone or along with surgery, and usually in combination with chemotherapy.

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.

Clinical trials are exploring the use of targeted therapies to treat osteosarcoma and Ewing tumours.

## 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 bone tumours.





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 bone tumours, see:

- National Cancer Institute (United States)
  - [Osteosarcoma and malignant fibrous histiocytoma of bone treatment \(PDQ®\)](#)
  - [Ewing sarcoma treatment \(PDQ®\)](#)
- American Cancer Society
  - [Osteosarcoma](#)
  - [Ewing family of tumors.](#)

