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About Osteosarcoma

Overview and Types

If you have been diagnosed with osteosarcoma or worried about it, you likely have a lot of questions. Learning some basics is a good place to start.

- [What Is Osteosarcoma?](#)

Research and Statistics

See the latest estimates for new cases of osteosarcoma in the US and what research is currently being done.

- [Key Statistics for Osteosarcoma](#)
 - [What's New in Osteosarcoma Research?](#)
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Key Statistics for Osteosarcoma

Osteosarcoma is not a common cancer. Each year, about 800 to 900 new cases of osteosarcoma are diagnosed in the United States. About half of these are in children and teens.

Most osteosarcomas occur in children and young adults between the ages of 10 and 30. Teens are the most commonly affected age group, but people of any age can develop osteosarcoma. About 10% of all osteosarcomas occur in people older than 60.

About 2% of childhood cancers are osteosarcomas, but they make up a much smaller percentage of adult cancers.

The prognosis (outlook) for people with osteosarcoma depends on many factors, including the location of the tumor, whether the cancer has spread (metastasized) when it's first found, and the person's age. Statistics related to survival are discussed in [Survival Rates for Osteosarcoma](#).¹

Visit the [American Cancer Society's Cancer Statistics Center](#)² for more key statistics.

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/detection-diagnosis-staging/survival-rates.html
2. <https://cancerstatisticscenter.cancer.org/>

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What's New in Osteosarcoma Research?

Research on osteosarcoma is now being done at medical centers, university hospitals, and other institutions across the world.

Understanding osteosarcoma

Researchers are learning more about what makes osteosarcoma cells different from normal bone cells. Knowing more about the changes in osteosarcoma cells might eventually result in specific treatments that exploit these changes. For example, researchers have found that osteosarcoma cells often have large amounts of a substance called GD2 on their surfaces. Drugs that target GD2 are already used to treat [neuroblastoma](#)¹ (another cancer often seen in children), and are now being studied for use against osteosarcoma.

Tests of gene changes might help predict the behavior of each tumor, such as how they will respond to certain types of chemotherapy. These are now being tested in clinical trials.

Treatment

Great advances have been made in treating osteosarcoma in the past few decades. Still, more research is needed to learn how best to manage hard-to-treat osteosarcomas, such as those that have already spread when they are found. Many clinical trials are focusing on treating osteosarcoma using a variety of strategies.

Surgery

Doctors now have a much better understanding of the typical growth and spread of osteosarcomas than they did in the past. This, along with newer imaging tests that better define the extent of tumors, lets them plan surgeries to remove the cancer while sparing as much normal tissue as possible.

Some newer types of internal prostheses (man-made devices used to replace pieces of bone) can now be expanded without the need for more surgery. This is especially important for children, who in the past often needed several operations to replace the prosthesis with a larger one as they grew.

Radiation therapy

Osteosarcoma cells are not killed easily by radiation, so high doses are needed to have an effect. This has limited the use of radiation, because high doses can often cause unacceptable side effects. Newer forms of radiation let doctors focus the radiation more precisely on the tumor. This limits the doses received by nearby healthy tissues and may allow higher doses to be used on the tumor itself.

Intensity-modulated radiation therapy (IMRT) is an example of an advanced form of therapy. In this technique, radiation beams are shaped to fit the tumor and aimed at it from several angles. The intensity (strength) of the beams can also be adjusted to limit the dose reaching nearby normal tissues. This may let the doctor deliver a higher dose to the tumor. Many major hospitals and cancer centers now use IMRT, especially for tumors in hard-to-treat areas such as the spine or pelvis (hip bones).

Stereotactic radiosurgery (SRS) gives a large dose of radiation to a small tumor area, usually in one session. Once imaging tests show the exact location of the tumor, radiation is sent to the area from many different angles. The radiation is very precisely aimed so that it has as little effect on nearby tissues as possible. Sometimes doctors give the radiation in several smaller treatments to deliver the same or slightly higher dose. This is called **fractionated stereotactic radiotherapy**.

Another newer approach is to use radioactive particles instead of x-rays to deliver the radiation. One example is **conformal proton beam therapy**, which uses positive parts of atoms. Unlike x-rays, which release energy both before and after they hit their target, protons cause little damage to tissues they pass through and then release their energy after traveling a certain distance. Doctors can use this property to deliver more radiation to the tumor and to do less damage to nearby normal tissues. Proton beam therapy may be helpful for hard-to-treat tumors, such as those on the spine or pelvic bones. The machines needed to make protons are expensive, and there are only a handful of them in the United States at this time.

An even newer approach uses **carbon ions**, which are heavier than protons and cause more damage to cancer cells. This therapy is still in the earliest stages of development and is only available in a few centers around the world.

Doctors are also studying newer forms of **radioactive drugs** to treat osteosarcoma that has spread to many bones. One example is radium-223 (Xofigo), which works slightly differently than the other drugs now being used.

Chemotherapy

Clinical trials are being done to determine the best combinations of [chemotherapy](#)² (chemo) drugs, as well as the best time to give them. Newer chemo drugs are being studied as well.

The lungs are the most common place for osteosarcoma to spread. Inhaled forms of some chemo drugs (such as cisplatin) are being studied for patients whose cancer has spread to their lungs. Early results have been promising.

Other forms of treatment

Chemo drugs are often effective against osteosarcoma, but sometimes they don't work or the cancer becomes resistant to them over time. Researchers are studying newer types of drugs that attack osteosarcoma cells in different ways.

Immunotherapy drugs

Clinical trials are looking into ways to help the patient's own immune system recognize and attack the osteosarcoma cells. For example:

- Drugs called **immune checkpoint inhibitors** can sometimes help the body's immune system recognize and attack cancer cells. These drugs have already been shown to be helpful against many types of cancer, and some of them are now being studied for use against osteosarcoma.
- An experimental immune-modulating drug called **muramyl tripeptide** (also known as MTP or mifamurtide) has been shown to help some patients when added to chemotherapy.

Targeted therapy drugs

Doctors are also studying new medicines that target specific molecules on the cancer cells. These are known as [targeted therapies](#)³. Some of these are man-made versions of immune system proteins, known as monoclonal antibodies. These antibodies attach to certain proteins on the cancer cell and help to stop the growth or kill the cancer cells. An example is **dinutuximab** (Unituxin), which attaches to GD2, a protein that is important for cancer cell growth.

Many other targeted drugs are being studied for use against osteosarcoma, including:

- Drugs that affect a tumor's ability to make new blood vessels, such as sorafenib (Nexavar) and pazopanib (Votrient).

- Drugs that target the mTOR protein, such as temsirolimus (Torisel) and everolimus (Afinitor).

Drugs that affect the bones

Other drugs that target bone cells called osteoclasts may also be useful against osteosarcoma:

- **Bisphosphonates** are a group of drugs that are already used to treat osteoporosis (bone thinning) and certain cancers that have spread to the bone. Some of these drugs, such as pamidronate and zoledronic acid, are now being studied for use in osteosarcoma as well.
- **Denosumab** is a monoclonal antibody that targets the RANKL protein, which normally helps bones grow. It is now being studied for use against osteosarcoma.
- Another drug that affects bones, known as **saracatinib** (AZD0530), is also being studied.

Hyperlinks

1. www.cancer.org/cancer/neuroblastoma.html
2. www.cancer.org/cancer/vulvar-cancer/treating/chemotherapy.html
3. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/targeted-therapy.html

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Osteosarcoma Causes, Risk Factors, and Prevention

Risk Factors

A risk factor is anything that affects your chance of getting a disease such as cancer. Learn more about the risk factors for osteosarcoma.

- [Osteosarcoma Risk Factors](#)
- [What Causes Osteosarcoma?](#)

Prevention

The risk of many adult cancers can be reduced with certain lifestyle changes (such as staying at a healthy weight or quitting smoking), but at this time there are no known ways to prevent osteosarcoma.

Most known [risk factors](#) for osteosarcoma cannot be changed. Other than radiation therapy, there are no known lifestyle-related or environmental causes of osteosarcoma, so at this time there is no way to protect against most of these cancers.

Osteosarcoma Risk Factors

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

Lifestyle-related risk factors such as body weight, physical activity, diet, and tobacco use play a major role in many adult cancers. But these factors usually take many years to influence cancer risk, and they are not thought to play much of a role in childhood cancers, including childhood osteosarcomas. So far, lifestyle-related factors have not been linked to osteosarcomas in adults, either. Still, there are some factors that affect osteosarcoma risk.

Age

The risk of osteosarcoma is highest for those between the ages of 10 and 30, especially during the teenage growth spurt. This suggests there may be a link between rapid bone growth and risk of tumor formation. The risk goes down in middle age, but rises again in older adults (usually over the age of 60). Osteosarcoma in older adults is often linked to another cause, such as a long-standing bone disease.

Height

Children with osteosarcoma are usually tall for their age. This also suggests that osteosarcoma may be related to rapid bone growth.

Gender

Osteosarcoma is more common in males than in females. Females tend to develop it slightly earlier, possibly because they tend to have their growth spurts earlier.

Race/ethnicity

Osteosarcoma is slightly more common in African Americans and Hispanic/Latinos than in whites.

Radiation to bones

People who were treated with radiation therapy for another cancer might have a higher risk of later developing osteosarcoma in the area that was treated. Being treated at a younger age and being treated with higher doses of radiation both increase this risk.

It's not clear if [imaging tests](#)¹ that use radiation, such as x-rays, CT scans, and bone scans, raise the risk of developing osteosarcoma. The amount of radiation used for these tests is many times lower than that used for radiation therapy. If there is any increased risk it is likely to be very small, but doctors try to limit the use of these types of tests whenever possible, especially in children, just in case.

Certain bone diseases

People with certain non-cancerous bone diseases have an increased risk of developing osteosarcoma.

Paget disease of the bone: In this condition, abnormal bone tissue forms in one or more bones. It mostly affects people older than 50. The affected bones are heavy and thick but are weaker than normal bones and are more likely to break. Usually this condition by itself is not life-threatening. But bone sarcomas (mostly osteosarcoma) develop in about 1% of people with Paget disease, usually when many bones are affected.

Hereditary multiple osteochondromas: Osteochondromas are benign bone tumors formed by bone and cartilage. Each osteochondroma has a very small risk of developing into a bone sarcoma (most often a [chondrosarcoma](#)², but less often it can be an osteosarcoma).

Most osteochondromas can be cured by surgery. However, some people inherit a tendency to develop many osteochondromas starting when they are young, and it may not be possible to remove them all. The more osteochondromas a person has, the greater the risk of developing a bone sarcoma.

Inherited cancer syndromes

People with certain rare, inherited cancer syndromes have an increased risk of developing osteosarcoma.

- [Retinoblastoma](#)³ is a rare eye cancer of children. Some children have the inherited form of retinoblastoma (**hereditary retinoblastoma**), in which all the cells of the body have a mutation (change) in the *RB1* gene. These children also have an increased risk of developing bone or soft tissue sarcomas, including osteosarcoma. If radiation therapy is used to treat retinoblastoma, the risk of osteosarcoma in the bones around the eye is even higher.
- The **Li-Fraumeni syndrome** makes people much more likely to develop certain types of cancer, including [breast](#)⁴ cancer, [brain tumors](#)⁵, osteosarcoma, and other types of sarcoma. This syndrome is usually caused by a mutation of the *TP53* gene.
- Children with **Rothmund-Thomson syndrome** are short and tend to have skin and skeletal problems. They also are more likely to develop osteosarcoma. This syndrome is usually caused by abnormal changes in the *REQL4* gene.

- Other rare inherited conditions, including **Bloom syndrome**, **Werner syndrome**, and **Diamond-Blackfan anemia**, have also been linked to an increased risk of osteosarcoma.

The way in which inherited gene changes make some people more likely to develop osteosarcoma is discussed in [What Causes Osteosarcoma?](#)

Hyperlinks

1. www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html
2. www.cancer.org/cancer/bone-cancer/about/what-is-bone-cancer.html
3. www.cancer.org/cancer/retinoblastoma.html
4. www.cancer.org/cancer/breast-cancer.html
5. www.cancer.org/cancer/brain-spinal-cord-tumors-adults.html

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What Causes Osteosarcoma?

Researchers have found that osteosarcoma is linked with a number of other conditions, which are described in [Osteosarcoma Risk Factors](#). But the cause of most osteosarcomas is not clear at this time.

Scientists have learned how certain changes in the DNA in bone cells can cause them to become cancerous. DNA is the chemical in each of our cells that makes up our genes, which control how our cells function. We usually look like our parents because they are the source of our DNA. But DNA affects more than how we look. It influences our risks for developing certain diseases, including some kinds of cancer.

Some genes (parts of our DNA) control when our cells grow, divide to make new cells, and die:

- Genes that help cells grow, divide, or stay alive are called **oncogenes**.
- Genes that slow down cell division or make cells die at the right time are called **tumor suppressor genes**.

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

Some people inherit gene mutations (changes) from a parent that increase their risk of cancer. In this situation, all of the cells in the body carry the same gene change. These are called **germline** or **inherited** mutations. But more often, cancer-causing changes are acquired during life rather than inherited before birth. In this case, the change occurs only in the cells that will develop into cancer. These are called **somatic** or **acquired** gene changes.

Inherited gene changes

Some inherited DNA mutations cause [syndromes](#) that are linked with an increased risk of osteosarcoma. For example:

- The **Li-Fraumeni syndrome** is usually caused by inherited mutations that turn off the *TP53* tumor suppressor gene. These mutations give a person a very high risk of developing one or more types of cancer, including [breast cancer](#)¹, [brain tumors](#)², osteosarcoma, and other cancers.
- Inherited changes in the **retinoblastoma** (*RB1*) tumor suppressor gene increase the

risk of developing [retinoblastoma](#)³, a type of eye cancer that affects children. Children with this gene change also have an increased risk for developing osteosarcoma, especially if they are treated with radiation.

If you are concerned you or your child might possibly have an inherited gene change, talk with your doctor about whether genetic testing might be helpful. You can also read more about this in [Genetics and Cancer](#)⁴.

Acquired gene changes

Most osteosarcomas are not caused by inherited gene mutations, but instead are the result of gene changes acquired during the person's lifetime.

Sometimes these gene changes are caused by radiation therapy used to treat another form of cancer, because radiation therapy can damage the DNA inside cells.

But many gene changes are probably just random events that sometimes happen inside a cell, without having an outside cause. Cells that are dividing quickly are more likely to create new cells with mistakes in their DNA, which increases the risk that a cancer such as osteosarcoma may develop. This may be why some normal situations (such as the teenage growth spurt) and some diseases (such as Paget disease of bone) that cause rapid bone growth increase the risk of osteosarcoma.

Other than radiation, there are no known lifestyle-related or environmental causes of osteosarcoma, so it's important to remember that in most cases there is nothing people with these cancers could have done to prevent them.

Researchers now understand some of the gene changes that occur in osteosarcomas, but it's not always clear what causes these changes. As we learn more about what causes osteosarcoma, hopefully we will be able to use this knowledge to develop ways to better prevent and treat it.

Hyperlinks

1. www.cancer.org/cancer/breast-cancer.html
2. www.cancer.org/cancer/brain-spinal-cord-tumors-adults.html
3. www.cancer.org/cancer/retinoblastoma.html
4. www.cancer.org/cancer/cancer-causes/genetics.html

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Can Osteosarcoma Be Prevented?

The risk of many adult cancers can be reduced with certain [lifestyle changes](#)¹ (such as staying at a healthy weight or quitting smoking), but at this time there are no known ways to prevent osteosarcoma.

Most known [risk factors](#) for osteosarcoma (age, height, race, gender, and certain bone diseases and inherited conditions) cannot be changed. Other than exposure to radiation (usually during [radiation therapy](#)²), there are no known lifestyle-related or environmental causes of osteosarcoma, so at this time there is no way to protect against most of these cancers.

Hyperlinks

1. www.cancer.org/healthy.html

2. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html

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Osteosarcoma Early Detection, Diagnosis, and Staging

Detection and Diagnosis

Catching cancer early often allows for more treatment options. Some early cancers may have signs and symptoms that can be noticed, but that is not always the case.

- [Can Osteosarcoma Be Found Early?](#)
- [Signs and Symptoms of Osteosarcoma](#)
- [Tests for Osteosarcoma](#)

Stages of Osteosarcoma

After a cancer diagnosis, staging provides important information about the extent of cancer in the body and anticipated response to treatment.

- [Osteosarcoma Stages](#)

Outlook (Prognosis)

Doctors often use survival rates as a standard way of discussing someone's outlook (prognosis). Some people want to know about survival statistics, while others might not find the numbers helpful, or might even not want to know them.

- [Survival Rates for Osteosarcoma](#)

Questions to Ask About Osteosarcoma

Here are some questions you can ask your cancer care team to help you better understand the diagnosis and treatment options.

- [Questions to Ask the Doctor About Osteosarcoma](#)

Can Osteosarcoma Be Found Early?

At this time, there are no widely recommended screening tests for this cancer. (Screening is testing for cancer in people without any symptoms.)

Still, most osteosarcomas are found at an early stage, before they have clearly spread to other parts of the body. Symptoms such as bone pain or swelling often prompt a visit to a doctor. (For more on this, see [Signs and Symptoms of Osteosarcoma](#).)

Some people who are at increased risk for osteosarcoma because of certain bone diseases or inherited conditions (listed in [Osteosarcoma Risk Factors](#)¹) might need increased monitoring for this disease. This type of cancer usually does not run in families, but looking out for the early signs is important if it is to be treated successfully.

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/causes-risks-prevention/risk-factors.html

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Signs and Symptoms of Osteosarcoma

Osteosarcomas are usually found because of the symptoms they are causing.

Pain and swelling

Pain in the affected bone (usually around the knee or in the upper arm) is the most common symptom of osteosarcoma. At first, the pain might not be constant and might be worse at night. The pain often increases with activity and might result in a limp if the tumor is in a leg bone.

Swelling in the area is another common symptom, although it might not occur until later. Depending on where the tumor is, it might be possible to feel a lump or mass.

Limb pain and swelling are very common in normal, active children and teens. They are much more likely to be caused by normal bumps and bruises, so they might not prompt a doctor visit right away. This can delay a diagnosis. If your child has these symptoms and they don't go away within a few weeks (or they get worse), see a doctor so that the cause can be found and treated, if needed.

These symptoms are less common in adults, so they should be a sign to see a doctor even sooner.

Bone fractures (breaks)

Although osteosarcoma might weaken the bone it develops in, fractures (breaks) are not common. Exceptions are rare telangiectatic osteosarcomas, which tend to weaken bones more than other forms of osteosarcoma and are more likely to cause breaks at the tumor site.

People with a fracture next to or through an osteosarcoma often describe a limb that

was sore for a few months and suddenly became very painful when the fracture occurred.

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Tests for Osteosarcoma

Osteosarcomas are usually found because of [signs or symptoms](#) a person is having, which prompts a visit to a doctor. If a bone tumor is suspected, exams and tests will be needed to find out for sure.

Medical history and physical exam

If a person has signs or symptoms that suggest they might have a tumor in or around a bone, the doctor will want to take a complete **medical history** to find out more about the symptoms.

A **physical exam** can provide information about a possible tumor, as well as other health problems. For example, the doctor may be able to see or feel an abnormal mass.

The doctor may also look for problems in other parts of the body. When people (especially adults) have cancer in the bones, it's often the result of cancer that started somewhere else and then spread to the bones.

If the doctor suspects a person could have osteosarcoma (or another type of bone tumor), more tests will be done. These might include imaging tests, biopsies, and/or lab tests.

Imaging tests

Imaging tests use x-rays, magnetic fields, or radioactive substances to create pictures of the inside of the body. Imaging tests might be done for a number of reasons, including:

- To help find out if a suspicious area might be cancer
- To help determine if a cancer might have started in another part of the body
- To learn how far cancer has spread
- To help determine if treatment is working
- To look for signs that the cancer might have come back

Patients who have or might have osteosarcoma will have one or more of these tests.

Bone x-ray

This is often the first test done if a bone tumor is suspected. Doctors can often recognize a bone tumor such as osteosarcoma based on plain x-rays of the bone. But other imaging tests might be needed as well.

Even if results of an x-ray strongly suggest a person has osteosarcoma, a biopsy will still be needed to confirm that it is cancer rather than some other problem, such as an infection.

Magnetic resonance imaging (MRI) scan

[MRI scans](#)¹ create detailed images of soft tissues in the body using radio waves and strong magnets instead of x-rays, so no radiation is involved. A contrast material called *gadolinium* may be injected into a vein before the scan to better see details.

An MRI scan is often done to get a more detailed look at a bone mass seen on an x-ray. MRI scans can usually show if the mass is likely to be a tumor, an infection, or some

type of bone damage from other causes.

MRI scans can also help show the exact extent of a tumor, as they can show the marrow inside bones and the soft tissues around the tumor, including nearby blood vessels and nerves. Sometimes, the MRI can help find small bone tumors several inches away from the main tumor (called *skip metastases*). Knowing the extent of an osteosarcoma is very important when planning [surgery](#)².

An MRI scan usually gives better details than a CT scan (described below).

Computed tomography (CT) scan

A [CT scan](#)³ combines many x-ray pictures to make detailed cross-sectional images of parts of the body. If a bone x-ray shows a tumor, CT scans are sometimes used to see if the tumor has grown into nearby muscle, fat, or tendons, although MRI is often better for this.

A CT scan of the chest is often done to look for spread of the cancer to the lungs. CT scans may also be done to look for the spread of the cancer to other parts of the body.

Chest x-ray

This test is sometimes done to see if cancer has spread to the lungs. It can find larger tumors, but it is not as good as a CT scan for spotting smaller tumors. If a CT scan of the chest is done, a chest x-ray probably won't be needed.

Bone scan

A [bone scan](#)⁴ can help show if a cancer has spread to other bones, and is often part of the workup for people with osteosarcoma. This test is useful because it can show the entire skeleton at once. (A positron emission tomography [PET] scan, described below, can often provide similar information, so a bone scan might not be needed if a PET scan is done.)

For this test, a small amount of low-level radioactive material is injected into the blood and travels to the bones. A special camera can detect the radioactivity and create a picture of the skeleton.

Areas of active bone changes appear as “hot spots” on the skeleton because they attract the radioactivity. Hot spots may suggest areas of cancer, but other bone diseases can also cause the same pattern. To make an accurate diagnosis, other tests

such as plain x-rays, MRI scans, or even a bone biopsy might be needed.

Positron emission tomography (PET) scan

For a [PET scan](#)⁵, a form of radioactive sugar (known as *FDG*) is injected into the blood. Because cancer cells in the body are growing quickly, they absorb large amounts of the sugar. A special camera can then create a picture of areas of radioactivity in the body. The picture is not detailed like a CT or MRI scan, but it provides useful information about the whole body.

PET scans can help show the spread of osteosarcomas to the lungs, other bones, or other parts of the body, and can also help in seeing how well the cancer is responding to treatment.

Some newer machines can do a PET and CT scan at the same time (PET/CT scan). This lets the doctor compare areas of higher radioactivity on the PET scan with the more detailed appearance of that area on the CT scan.

To learn more about this and other imaging tests, see [Imaging \(Radiology\) Tests](#)⁶.

Biopsy

The results of imaging tests might strongly suggest that a person has some type of bone cancer, but a biopsy (removing some of the tumor for viewing under a microscope and other lab testing) is the only way to be certain. A biopsy is also the best way to tell osteosarcoma from other types of bone cancer.

If the tumor is in a bone, it is very important that an orthopedic surgeon experienced in treating bone tumors does the biopsy. Whenever possible, the biopsy and surgical treatment should be planned together, and the same surgeon should do both. Proper planning of the biopsy can help prevent later complications and might reduce the amount of surgery needed later on.

There are 2 main types of biopsies.

Needle biopsy

For these biopsies, the doctor uses a hollow needle to remove a small sample of the tumor. The biopsy is usually done with local anesthesia, where numbing medicine is injected into the skin and other tissues over the biopsy site. In some cases, sedation or general anesthesia (where the patient is asleep) may be needed.

Often, the doctor can aim the needle by feeling the suspicious area if it's near the surface of the body. If the tumor can't be felt because it's too deep, the doctor can guide the needle into the tumor using an imaging test such as a CT scan. This is called a **CT-guided needle biopsy**.

Core needle biopsy: In a core needle biopsy, the doctor uses a large, hollow needle to remove a small cylinder of tissue from the tumor.

Fine needle aspiration (FNA) biopsy: For an FNA biopsy, the doctor uses a very thin needle attached to a syringe to withdraw (aspirate) a small amount of fluid and some cells from the tumor. This type of biopsy is rarely used to diagnose a bone tumor.

Surgical (open) biopsy

In an open biopsy, the surgeon cuts through the skin, exposes the tumor, and then cuts out a piece of it. These biopsies are usually done in an operating room with the patient under general anesthesia (in a deep sleep). They can also be done using a nerve block, which numbs a large area of the body.

This type of biopsy must be done by an expert in bone tumors, or it could result in problems later on. For example, if the tumor is on the arm or leg, the chances of saving the limb might be lowered. If possible, the incision in the skin used in the biopsy should be lengthwise along the arm or leg because this is the way the incision will be made during the operation to remove the cancer. The entire scar of the original biopsy will also have to be removed, so making the biopsy incision this way lessens the amount of tissue that needs to be removed later on.

Lab tests

Testing the biopsy samples

All samples removed by biopsy are sent to a pathologist (a doctor specializing in lab tests) to be looked at with a microscope. Tests looking for chromosome or gene changes in the tumor cells might also be done. These tests can help tell osteosarcoma from other cancers that look like it under the microscope, and they can sometimes help predict whether the osteosarcoma is likely to respond to therapy.

If osteosarcoma is diagnosed, the pathologist will assign it a **grade**, which is a measure of how quickly the cancer is likely to grow and spread, based on how its cells look. Cancers that look somewhat like normal bone tissue are described as low grade, while those that look very abnormal are called high grade. For more on grading, see

Osteosarcoma Stages.

Blood tests

Blood tests are not needed to diagnose osteosarcoma, but they may be helpful once a diagnosis is made. For example, high levels of chemicals in the blood such as **alkaline phosphatase** and **lactate dehydrogenase (LDH)** can suggest that the osteosarcoma may be more advanced than it appears.

Other tests such as blood cell counts and blood chemistry tests are done before surgery and other treatments to get a sense of a person's overall health. These tests are also used to monitor a person's health while they are getting chemotherapy.

Finding out that you or a loved one has cancer can be overwhelming. [Coping with Cancer](#)⁷ describes the emotions and concerns you might face and things you can do to help work through them.

Hyperlinks

1. www.cancer.org/treatment/understanding-your-diagnosis/tests/mri-for-cancer.html
2. www.cancer.org/cancer/osteosarcoma/treating/surgery.html
3. www.cancer.org/treatment/understanding-your-diagnosis/tests/ct-scan-for-cancer.html
4. www.cancer.org/treatment/understanding-your-diagnosis/tests/nuclear-medicine-scans-for-cancer.html
5. www.cancer.org/treatment/understanding-your-diagnosis/tests/nuclear-medicine-scans-for-cancer.html
6. www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html
7. www.cancer.org/treatment/treatments-and-side-effects/emotional-side-effects.html

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Osteosarcoma Stages

After someone is diagnosed with osteosarcoma, doctors will try to figure out if it has spread, and if so, how far. This process is called *staging*. The stage of a cancer describes how much cancer is in the body. It helps determine how serious the cancer is and how best to treat it. Doctors also use a cancer's stage when talking about survival statistics.

The stage of an osteosarcoma is based on the results of physical exams, imaging tests, and any biopsies that have been done, which are described in [Tests for Osteosarcoma](#).

A staging system is a standard way for the cancer care team to sum up the extent of the cancer. When trying to figure out the best course of [treatment](#)¹, doctors often use a simple system that divides osteosarcomas into 2 groups: **localized** and **metastatic**. Doctors can also use more formal staging systems (see below) to describe the extent of an osteosarcoma in more detail.

Osteosarcoma staging can be confusing. If you have any questions about the stage of the cancer, ask someone on your cancer care team to explain it to you in a way you understand.

Localized osteosarcoma

A localized osteosarcoma is seen only in the bone it started in and possibly the tissues next to the bone, such as muscle, tendon, or fat.

About 4 out of 5 osteosarcomas appear to be localized when they are first found. But even when imaging tests don't show that the cancer has spread to distant areas, most patients are likely to have very small areas of cancer spread that can't be detected with tests. This is why [chemotherapy](#)² is an important part of treatment for most osteosarcomas. If it isn't given, the cancer is more likely to come back after [surgery](#)³.

Doctors further divide localized osteosarcomas into 2 groups:

- **Resectable** cancers are those in which all of the visible tumor can be removed by surgery.
- **Non-resectable** (or **unresectable**) osteosarcomas can't be removed completely by surgery.

Metastatic osteosarcoma

A metastatic osteosarcoma has clearly spread to other parts of the body. Most often it spreads to the lungs, but it can also spread to other bones, the brain, or other organs.

About 1 out of 5 osteosarcomas has spread at the time of diagnosis. These cancers are harder to treat, but some can be cured if the metastases can be removed by surgery. The cure rate for these cancers improves markedly if chemotherapy is also given.

Musculoskeletal Tumor Society (MSTS) Staging System

A system commonly used to stage osteosarcoma is the MSTS system, also known as the **Enneking system**. It is based on 3 key pieces of information:

- The **grade (G)** of the tumor, which is a measure of how likely it is to grow and spread, based on how it looks under the microscope. Tumors are either low grade

(G1) or high grade (G2). Low-grade tumor cells look more like normal cells and are less likely to grow and spread quickly, while high-grade tumor cells look more abnormal.

- The **extent of the primary tumor (T)**, which is classified as either intracompartmental (T1), meaning it has basically remained within the bone, or extracompartmental (T2), meaning it has extended beyond the bone into other nearby structures.
- If the tumor has **metastasized (M)**, which means it has spread to nearby lymph nodes (bean-sized collections of immune system cells) or other organs. Tumors that have not spread to the lymph nodes or other organs are considered M0, while those that have spread are M1.

These factors are combined to give an overall stage, using Roman numerals from I to III. Stages I and II are further divided into A for intracompartmental tumors or B for extracompartmental tumors.

Stage	Grade	Tumor	Metastasis
IA	G1	T1	M0
IB	G1	T2	M0
IIA	G2	T1	M0
IIB	G2	T2	M0
III	G1 or G2	T1 or T2	M1

In summary:

- Low-grade, localized tumors are stage I.
- High-grade, localized tumors are stage II.
- Metastatic tumors (regardless of grade) are stage III.

The TNM staging system

Another system sometimes used to stage bone cancers (including osteosarcomas) is the American Joint Commission on Cancer (AJCC) TNM system. This system is based

on 4 key pieces of information:

- **T** describes the size of the main (primary) **tumor** and if it appears in different areas of the bone.
- **N** describes the extent of spread to nearby (regional) lymph **nodes**. Bone tumors rarely spread to the lymph nodes.
- **M** indicates if the cancer has **metastasized** (spread) to other organs of the body. (The most common sites of spread are to the lungs or other bones.)
- **G** stands for the **grade** of the tumor, which describes how the cells look under a microscope. Low-grade tumor cells look more like normal cells and are less likely to grow and spread quickly, while high-grade tumor cells look more abnormal.

Numbers after T, N, M, and G provide more details about each of these factors.

Once the T, N, and M categories and the grade of the bone cancer have been determined, the information is combined into an overall stage. These stages (which are different from those of the MSTS system) are described by Roman numerals from I to IV (1 to 4), and are sometimes divided further. For more detailed information on the AJCC TNM staging system for bone cancers, see [Bone Cancer Stages](#)⁴.

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/treating.html
2. www.cancer.org/cancer/osteosarcoma/treating/chemotherapy.html
3. www.cancer.org/cancer/osteosarcoma/treating/surgery.html
4. www.cancer.org/cancer/bone-cancer/detection-diagnosis-staging/staging.html

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Survival Rates for Osteosarcoma

Survival rates can give you an idea of what percentage of people with the same type and stage of cancer are still alive a certain amount of time (usually 5 years) after they were diagnosed. They can't tell you how long a person will live, but they may help give you a better understanding of how likely it is that treatment will be successful.

Keep in mind that survival rates are estimates and are often based on previous outcomes of large numbers of people who had a specific cancer, but they can't predict what will happen in any particular person's case. These statistics can be confusing and may lead you to have more questions. Talk with your doctor about how these numbers may apply to you (or your child), as he or she is familiar with your situation.

What is a 5-year relative survival rate?

A **relative survival rate** compares people with the same type and stage of cancer to people in the overall population. For example, if the **5-year relative survival rate** for a specific stage of osteosarcoma is 70%, it means that people who have that cancer are, on average, about 70% as likely as people who don't have that cancer to live for at least 5 years after being diagnosed.

Where do these numbers come from?

The American Cancer Society relies on information from the SEER* database, maintained by the National Cancer Institute (NCI), to provide survival statistics for different types of cancer.

The SEER database tracks 5-year relative survival rates for osteosarcoma in the United States, based on how far the cancer has spread. The SEER database, however, does not group cancers by [MSTS or TNM stages](#) (stage 1, stage 2, stage 3, etc.). Instead, it groups cancers into localized, regional, and distant stages:

- **Localized:** There is no sign that the cancer has spread outside of the bone where it started.
- **Regional:** The cancer has spread outside the bone and into nearby structures, or it has reached lymph nodes.
- **Distant:** The cancer has spread to distant parts of the body, such as to the lungs or to bones in other parts of the body.

5-year relative survival rates for osteosarcoma

These numbers are based on people diagnosed with osteosarcoma between 2008 and 2014.

SEER stage	5-year relative survival rate
Localized	77%
Regional	65%
Distant	27%
All SEER stages combined	60%

Understanding the numbers

- **These numbers apply only to the stage of the cancer when it is first diagnosed.** They do not apply later on if the cancer grows, spreads, or comes back after treatment.
- **These numbers don't take everything into account.** Survival rates are grouped

based on how far the cancer has spread. But other factors, such as those listed below, can also affect a person's outlook.

- **People now being diagnosed with osteosarcoma may have a better outlook than these numbers show.** Treatments improve over time, and these numbers are based on people who were diagnosed and treated at least 5 years earlier.

Other factors that can affect prognosis (outlook)

Factors other than the stage of the cancer can also affect survival rates. For example, factors that have been linked with a better prognosis include:

- Being younger (child or teen, as opposed to adult)
- Being female
- The tumor being on an arm or leg (as opposed to the hip bones)
- The tumor(s) being completely [resectable](#) (removable)
- Normal blood [alkaline phosphatase and LDH](#) levels
- The tumor having a good response to [chemotherapy](#)¹

*SEER = Surveillance, Epidemiology, and End Results

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/treating/chemotherapy.html

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Questions to Ask the Doctor About Osteosarcoma

It's important to have honest, open discussions with your cancer care team. Ask any question, no matter how minor it might seem. For instance, consider these questions:

Before getting a bone biopsy

- How much experience do you have doing this type of biopsy?
- Are you part of a team that treats bone cancers?
- What will happen during the biopsy?
- How long will it take to get the results from the biopsy?

If osteosarcoma has been diagnosed

- What [kind of osteosarcoma](#)¹ do I (does my child) have? Will this affect treatment?
- Has the cancer spread beyond the bone it started in?
- What is the [stage](#) of the cancer and what does that mean?
- Do you think the cancer can be resected (removed) completely?
- Do we need any other tests before we can decide on treatment?
- How much experience do you have treating this type of cancer?
- Who else will be part of the treatment team, and what do they do?

When deciding on a treatment plan

- What are our [treatment options](#)²?
- What do you recommend and why?
- Are there any [clinical trials](#)³ we should consider? How can we find out more about them?
- What's the goal of treatment?
- Should we get a [second opinion](#)⁴? How do we do that? Can you recommend someone?
- How soon do we need to start treatment?
- How long will treatment last? What will it be like? Where will it be done?
- How will treatment affect our daily lives?
- What should I (we) do to be ready for treatment?
- What are the possible risks and side effects of the suggested treatments?
- Which side effects start shortly after treatment and which ones might develop later on?
- Will treatment affect my child's ability to grow and develop?
- Are there fertility issues we need to consider?

During and after treatment

- How will we know if the treatment is working?
- Is there anything we can do to help manage side effects?
- What symptoms or side effects should we tell you about right away?
- How can we reach you or someone on your team on nights, holidays, or weekends?
- Who can we talk to if we have questions about costs, insurance coverage, or social support?
- What are the chances of the cancer [coming back](#)⁵ with these treatment plans? What might our options be if this happens?
- What type of [follow up](#)⁶ and rehab will be needed after treatment?
- Are there nearby support groups or other families who have been through this that we could talk to?

Along with these sample questions, be sure to write down some of your own. For instance, you might want more information about recovery times so you can plan work or school schedules.

Keep in mind that doctors aren't the only ones who can give you information. Other health care professionals, such as nurses and social workers, can answer some of your questions. To find more about speaking with your health care team, see [The Doctor-Patient Relationship](#)⁷.

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/about/what-is-osteosarcoma.html
2. www.cancer.org/cancer/osteosarcoma/treating.html
3. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html
4. www.cancer.org/treatment/finding-and-paying-for-treatment/choosing-your-treatment-team/seeking-a-second-opinion.html
5. www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html
6. www.cancer.org/cancer/osteosarcoma/after-treatment.html
7. www.cancer.org/treatment/understanding-your-diagnosis/talking-about-cancer/the-doctor-patient-relationship.html

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Treating Osteosarcoma

If you or your child has been diagnosed with Ewing tumor, your treatment team will discuss the options with you. It's important to weigh the benefits of each treatment option against the possible risks and side effects.

How is osteosarcoma treated?

The types of treatment used for osteosarcoma include:

- [Surgery for Osteosarcoma](#)
- [Chemotherapy for Osteosarcoma](#)
- [Radiation Therapy for Osteosarcoma](#)

Common treatment approaches

Most often, chemotherapy is given both before and after surgery. It can help lower the risk that the cancer will come back after treatment. It might also allow for a less extensive operation to remove the cancer. Radiation therapy is used less often.

- [Treatment Based on the Extent of the Osteosarcoma](#)

Who treats osteosarcoma?

Because osteosarcoma is rare, only doctors in major cancer centers have a lot of experience treating these cancers.

For children and teens, a team approach is recommended that includes the child's pediatrician as well as children's cancer specialists. Treatment is best done at a children's cancer center. For adults with osteosarcoma, the treatment team typically includes the patient's primary care doctor, as well as specialists at a major cancer

center. Doctors on the treatment team might include:

- An **orthopedic surgeon** (a surgeon who specializes in muscles and bones) who is experienced in treating bone tumors
- A **medical or pediatric oncologist** (a doctor who treats cancer with chemotherapy and other drugs)
- A **radiation oncologist** (a doctor who treats cancer with radiation therapy)
- A **pathologist** (a doctor specializing in lab tests to diagnose and classify diseases)
- A **physiatrist** (a doctor specializing in rehabilitation and physical therapy)

For both adults and children, the team might also include other doctors, physician assistants (PAs), nurse practitioners (NPs), nurses, psychologists, social workers, rehabilitation specialists, and other health professionals.

- [Health Professionals Associated With Cancer Care¹](#)
- [How to Find the Best Cancer Treatment for Your Child²](#)
- [Navigating the Health Care System When Your Child Has Cancer³](#)

Making treatment decisions

The treatment for osteosarcoma is often effective, but it can also cause serious side effects. It's important to discuss all treatment options as well as their possible side effects with the cancer care team so you can make an informed decision. It's also very important to ask questions if you're not sure about anything.

If time allows, getting a second opinion from another doctor experienced with your child's type of tumor is often a good idea. This can give you more information and help you feel more confident about the treatment plan you choose. If you aren't sure where to go for a second opinion, ask your doctor for help.

The treatment team will also help you take care of the side effects and can help you work closely with nutritionists, psychologists, social workers, and other professionals to understand and deal with medical problems, stress, and other issues related to the treatment.

For cancer in children and teens, many of these issues can be more complex. As a parent, taking care of a child with cancer can be a very big job. It's important to remember that you will have a lot of help. Many people will be involved in your child's overall care. It's also important for you to know that the health professionals who treat children with osteosarcoma are using the experience and knowledge gained from many

decades of studying the treatment of this disease.

- [Questions to Ask the Doctor About Osteosarcoma](#)⁴
- [How to Talk to Your Child's Cancer Care Team](#)⁵
- [Seeking a Second Opinion](#)⁶

Thinking about taking part in a clinical trial

Today, most children and teens with cancer are treated at specialized children's cancer centers. 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.

Adults with cancer also typically have the option to participate in a clinical trial. Clinical trials are one way to get state-of-the-art cancer treatment. In some cases they may be the only way to get access to newer treatments. They are also the best way for doctors to learn better methods to treat cancer. Still, they might not be right for everyone. Talk to your treatment team to learn about possible clinical trials, and ask about the pros and cons of enrolling in one of them.

If you would like to learn more about clinical trials, start by asking the treatment team if your clinic or hospital conducts clinical trials.

- [Clinical Trials](#)⁷

Considering complementary and alternative methods

You may hear about alternative or complementary methods that the doctor hasn't mentioned. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

Complementary methods refer to treatments that are used *along with* your regular medical care. Alternative treatments are used *instead of* standard medical treatment. Although some of these methods might be helpful in relieving symptoms or helping people feel better, many have not been proven to work. Some might even be harmful.

Be sure to talk to your cancer care team about any method you are thinking about using. They can help you learn what is known (or not known) about the method, which can help you make an informed decision.

- [Complementary and Alternative Medicine](#)⁸

Preparing for treatment

Before treatment, the doctors and other members of the team will help you understand the tests that will need to be done. The team's social worker will also counsel you about some of the issues that might come up during and after treatment, and might be able to help you find housing and financial aid if needed.

- [When Your Child Has Cancer](#)⁹

Help getting through cancer treatment

Your cancer care team will be your first source of information and support, but there are other resources for help when you need it. Hospital- or clinic-based support services can also be an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help. For children and teens with cancer and their families, other specialists can be an important part of care as well.

The American Cancer Society also has programs and services – including rides to treatment, lodging, and more – to help you get through treatment. Call our National Cancer Information Center at 1-800-227-2345 and speak with one of our trained specialists.

- [Finding Help and Support When Your Child Has Cancer](#)¹⁰
- [Find Support Programs and Services in Your Area](#)¹¹

The treatment information given here is not official policy of the American Cancer Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor. Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

Surgery for Osteosarcoma

Surgery is an important part of treatment for virtually all osteosarcomas. It includes:

- The [biopsy](#)¹ to diagnose the cancer
- The surgical treatment to remove the tumor(s)

Whenever possible, it's very important that the biopsy and surgical treatment be planned together, and that the same orthopedic surgeon at a cancer center does both the biopsy and the surgery to remove the tumor. The biopsy should be done in a certain way to give the best chance that less extensive surgery will be needed later on.

The main goal of surgery is to remove all of the cancer. If even a small number of cancer cells are left behind, they might grow and multiply to make a new tumor. To lower the risk of this happening, surgeons remove the tumor plus some of the normal tissue that surrounds it. This is known as *wide excision*.

A doctor called a pathologist will look at the removed tissue under a microscope to see if there are cancer cells at the margins (outer edges).

- If cancer cells are seen at the edges of the tissue, the margins are called **positive**. Positive margins can mean that some cancer was left behind.
- When no cancer cells are seen at the edges of the tissue, the margins are said to be **negative, clean, or clear**. A wide excision with clean margins helps limit the risk that the cancer will grow back in the place where it started.

The type of surgery done depends mainly on the location and size of the tumor. Although all operations to remove osteosarcomas are complex, tumors in the limbs (arms or legs) are generally not as hard to remove as those in the jaw bone, at the base of the skull, in the spine, or in the pelvic (hip) bone.

Tumors in the arms or legs

Tumors in the arms or legs might be treated with either:

- **Limb-salvage (limb-sparing) surgery:** removing the cancer and some surrounding normal tissue but leaving the limb basically intact
- **Amputation:** removing the cancer and all or part of an arm or leg

Limb-salvage surgery: Most patients with tumors in the arms or legs can have limb-

sparing surgery, but this depends on where the tumor is, how big it is, and whether it has grown into nearby structures.

Limb-salvage surgery is a very complex operation. The surgeons who do this type of operation must have special skills and experience. The challenge for the surgeon is to remove the entire tumor while still saving the nearby tendons, nerves, and blood vessels to keep as much of the limb's function and appearance as possible. If the cancer has grown into these structures, they will need to be removed along with the tumor. In such cases, amputation may sometimes be the best option.

The section of bone that is removed along with the osteosarcoma is replaced with a bone graft (piece of bone from another part of the body or from another person) or with an internal prosthesis (a man-made device used to replace part or all of a bone) made of metal and other materials. Some newer devices combine a graft and a prosthesis.

Complications of limb-salvage surgery can include infections and grafts or rods that become loose or broken. Patients who have limb-salvage surgery might need more surgery in the following years, and some might still eventually need an amputation.

Using an internal prosthesis in growing children is especially challenging. In the past, it required occasional operations to replace the prosthesis with a longer one as the child grew. Newer prostheses have become very sophisticated and can often be made longer without any extra surgery. They have tiny devices in them that can lengthen the prosthesis when needed to make room for a child's growth. But even these prostheses may need to be replaced with a stronger adult prosthesis once the child's body stops growing.

It takes about a year, on average, for patients to learn to walk after limb-salvage surgery on a leg. Physical rehabilitation after limb-salvage surgery is more intense than after amputation, but it's extremely important. If the patient doesn't actively take part in the rehabilitation program, the salvaged arm or leg can become useless.

Amputation: For some patients, amputation may be the best option. For example, if the patient has a large tumor that extends into the nerves and/or the blood vessels, it might not be possible to save the limb.

The surgeon decides how much of the arm or leg needs to be amputated based on the results of [MRI scans](#)² and an examination of removed tissue by the pathologist during the surgery. Surgery is planned so that muscles and the skin will form a cuff around the remaining bone. This cuff will fit into the end of a prosthetic (artificial) limb.

Reconstructive surgery can help some patients who lose a limb to function as well as

possible. For example, if the leg must be amputated mid-thigh (including the knee joint), the lower leg and foot can be rotated and attached to the thigh bone, so that the ankle functions as a new knee joint. This surgery is called **rotationplasty**. Of course, the patient would still need a prosthetic limb to replace the lower part of the leg.

With proper physical therapy, the patient is often able to walk on his/her own 3 to 6 months after a leg amputation.

If the osteosarcoma is in the upper arm and amputation is needed, in some cases the part of the arm with the tumor can be removed and the lower arm reattached so that the patient has a functional, but much shorter, arm.

Rehabilitation after surgery: This may be the hardest part of all the treatments, and this discussion cannot describe it completely. Patients and parents should meet with a rehabilitation specialist before surgery to learn about their options and what might be required after surgery.

If a limb is amputated, the patient will need to learn to live with and use a prosthetic limb. This can be particularly hard for growing children if the prosthetic limb needs to be changed to keep up with their growth.

When only the tumor and part of the bone is removed in a limb-sparing operation, the situation can sometimes be even more complicated, especially in growing children. Further operations might be needed in the coming years to replace an internal prosthesis with one more suited to their growing body size.

Both amputation and limb-sparing surgery can have pros and cons. For example, limb-sparing surgery, although often more acceptable than amputation, tends to lead to more complications because of its complexity. Growing children who have limb-sparing surgery are also more likely to need further surgery later.

When researchers have looked at the results of the different surgeries in terms of quality of life, there has been little difference between them. Perhaps the biggest problem has been for teens, who may worry about the social effects of their operation. Emotional issues can be very important, and support and encouragement are needed for all patients. (See [Living as an Osteosarcoma Survivor](#)³.)

Tumors that start in other areas

Pelvic tumors can often be hard to remove completely with surgery. But if the tumor responds well to **chemotherapy** first, surgery (sometimes followed by radiation therapy)

may get rid of all of the cancer. Pelvic bones can sometimes be reconstructed after surgery, but in some cases pelvic bones and the leg they are attached to might need to be removed.

For **tumors in the lower jaw bone**, the entire lower half of the jaw may be removed and later replaced with bones from other parts of the body. If the surgeon can't remove all of the tumor, radiation therapy may be used as well.

For **tumors in areas like the spine or the skull**, it may not be possible to remove all of the tumor safely. Cancers in these bones may require a combination of treatments such as chemotherapy, surgery, and [radiation](#).

Surgical treatment of metastases

If the osteosarcoma has spread to other parts of the body, these tumors need to be removed to have a chance at curing the cancer.

If osteosarcoma spreads, most often it goes to the lungs. If surgery can be done to remove these metastases, it must be planned very carefully. Before the operation, the surgeon considers the number of tumors, their location (one lung or both lungs), their size and how they responded to chemotherapy, and the general health of the patient. Since the [chest CT scan](#)⁴ done before surgery might not show all of the lung tumors, the surgeon will have a treatment plan in case more tumors are found during the operation.

Patients who have tumors in both lungs and respond well to chemotherapy can have surgery on one side of the chest at a time. Removing tumors from both lungs at the same time may be another option.

Some lung metastases may not be able to be removed because they are too big or are too close to important structures in the chest (such as large blood vessels). Patients whose overall health isn't good (because of poor nutritional status or heart, liver, or kidney problems) might not be able to withstand the stress of anesthesia and surgery to remove metastases.

A small number of osteosarcomas spread to other bones or to other organs like the kidneys, liver, or brain. Whether these tumors can be removed with surgery depends on their size, location, and other factors.

Side effects of surgery

Short-term risks and side effects: Surgery to remove an osteosarcoma is often a long

and complex operation. Serious short-term side effects are not common, but they can include reactions to anesthesia, excess bleeding, blood clots, and infections. Pain is common after the operation, and might require strong pain medicines for a while after surgery as the site heals.

Long-term side effects: The long-term side effects of surgery depend mainly on where the tumor is and what type of operation is done. Most osteosarcomas occur in bones of the arms or legs, and some of the long-term issues from surgery on these tumors are described above.

Complications of limb-sparing surgery can include bone grafts or prostheses that might become loose or broken. This is more likely than with bone surgery done for other reasons because the chemotherapy used before and after surgery can increase the risk of infection and affect wound healing. Infections are also a concern in people who have had amputations, especially of part of a leg, because the pressure placed on the skin at the site of the amputation can cause the skin to break down over time.

As mentioned above, physical therapy and rehabilitation are very important after surgery for osteosarcoma. Following the recommended rehab program offers the best chance for good long-term limb function. Even with proper rehab, people might still have to adjust to long-term issues such as changes in how they walk or do other tasks, and changes in appearance. Physical, occupational, and other therapies can often help people adjust and cope with these challenges.

For more general information on surgery as a treatment for cancer, see [Cancer Surgery](#)⁵.

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/detection-diagnosis-staging/how-diagnosed.html
2. www.cancer.org/cancer/osteosarcoma/detection-diagnosis-staging/how-diagnosed.html
3. www.cancer.org/cancer/osteosarcoma/after-treatment/follow-up.html
4. www.cancer.org/cancer/osteosarcoma/detection-diagnosis-staging/how-diagnosed.html
5. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html

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Chemotherapy for Osteosarcoma

Chemotherapy (chemo) is the use of drugs to treat cancer. The drugs are usually given into a vein or artery and can reach and destroy cancer cells throughout the body.

Chemo is an important part of the treatment for most people with osteosarcoma (although some patients with low-grade osteosarcoma might not need it). Most osteosarcomas don't appear to have spread beyond the main tumor when they are first

found. But in the past, when doctors tried to treat these cancers with surgery alone, the cancer would often come back in other parts of the body, where it would be very hard to control. Giving chemo along with surgery helps lower the risk of these cancers coming back.

Most osteosarcomas are treated with chemo before surgery (known as neoadjuvant chemotherapy) for about 10 weeks and then again after surgery (known as adjuvant chemotherapy) for up to a year. People with high-grade osteosarcomas that responded well to chemo before surgery usually get the same chemo drugs after surgery. People whose tumors responded poorly usually get different chemo after surgery.

Doctors give chemo in cycles, with each period of treatment followed by a rest period to give the body time to recover. Each cycle typically lasts for a few weeks.

Chemo drugs used to treat osteosarcoma

The drugs used most often to treat osteosarcoma include:

- Methotrexate (given in high doses along with leucovorin to help prevent side effects)
- Doxorubicin (Adriamycin)
- Cisplatin or carboplatin
- Epirubicin
- Ifosfamide
- Cyclophosphamide
- Etoposide
- Gemcitabine
- Topotecan

Usually, 2 or more drugs are given together. Some common combinations of drugs include:

- High-dose methotrexate, doxorubicin, and cisplatin (sometimes with ifosfamide)
- Doxorubicin and cisplatin
- Ifosfamide and etoposide
- Ifosfamide, cisplatin (or carboplatin), and epirubicin

Many experts recommend that the drugs be given in very high doses when possible. This can affect the bone marrow (where new blood cells are made), which can result in

dangerously low white blood cell levels and an increased risk of infections. In these cases, drugs called growth factors (such as filgrastim, also known as G-CSF) may be given along with the chemo to help the body make new white blood cells as quickly as possible.

Before starting chemo, the doctor might advise putting a catheter (a thin, soft tube) into a large vein in the chest. This is sometimes called a venous access device (VAD) or [central venous catheter \(CVC\)](#)¹. The catheter is inserted surgically while the patient is sedated (sleepy) or under general anesthesia (in a deep sleep). One end of the catheter stays in the vein, while the other end lies just under or outside the skin. This lets the health care team give chemo and other drugs and draw blood samples without having to stick needles into the veins each time. The catheter usually remains in place for several months, and can make having chemo less painful. If such a device is used, the health care team will teach you how to care for it to reduce the risk of problems such as infections.

Side effects of chemotherapy

Chemo drugs can cause side effects. Children tend to have less severe side effects from chemo than adults and often recover from side effects more quickly. Because of this, doctors can give them higher doses of chemo to try to kill the tumor.

The side effects of chemo depend on the type and dose of drugs given and the length of time they are taken.

General side effects of chemo:

- [Nausea and vomiting](#)²
- Loss of appetite
- Diarrhea
- Hair loss
- Mouth sores

Because chemo can damage the bone marrow, where new blood cells are made, patients may have low blood cell counts, which can result in:

- Increased chance of [infection](#)³ (from a shortage of white blood cells)
- Bleeding or bruising after minor cuts or injuries (from a shortage of platelets)
- [Fatigue](#)⁴ or shortness of breath (from low red blood cell counts)

Most of these side effects tend to go away after treatment is finished. Often there are ways to make these side effects less severe. For example, drugs can be given to help prevent or reduce nausea and vomiting, or to help get blood counts back to normal levels. Be sure to discuss any questions you have about side effects with the cancer care team, and tell them about any side effects so that they can be controlled.

Side effects of certain drugs: Some side effects are specific to certain drugs. Many of these side effects are rare, but they are possible. Before treatment, ask your cancer care team about the possible side effects of the drugs you or your child will be getting.

- **Ifosfamide** and **cyclophosphamide** can damage the lining of the bladder, which can cause blood in the urine. The chance of this happening can be lowered by giving a drug called *mesna* during chemotherapy, along with plenty of fluids.
- **Cisplatin** and **carboplatin** may cause [nerve damage \(called neuropathy\)](#)⁵ leading to numbness, tingling, or pain in the hands and feet. This often goes away or gets better once treatment is stopped, but it might last a long time in some people. These drugs can sometimes affect hearing, especially of high-pitched sounds. Kidney damage can also occur after treatment. Giving lots of fluid before and after the drug is infused can help prevent this.
- **Etoposide** can also cause nerve damage. It can also increase the risk of later developing a cancer of white blood cells, known as [acute myeloid leukemia](#)⁶(AML). Fortunately, this is not common.
- **High-dose methotrexate** can damage the white matter of the brain (called **leukoencephalopathy**) and the liver or kidneys. Before starting high-dose methotrexate, medicines are given to help protect the kidneys. Methotrexate blood levels may be checked to see how much leucovorin (also called **folinic acid**) should be given to help limit any damage to normal tissues.
- **Doxorubicin (Adriamycin)** and **epirubicin** can cause heart damage over time. This risk goes up as the total amount of the drug that is given goes up, so doctors are careful to limit the total dose. Your (child's) doctor may order a heart function test before and during treatment to see if this drug is affecting the heart. A drug called **dexrazoxane** may be given along with the chemo to help lessen the possible damage.
- Some chemo drugs can affect your (child's) ability to have children later in life. Talk to your (or your child's) cancer care team about the risks of infertility with treatment, and ask if there are options for [preserving fertility](#)⁷, such as sperm banking.

The doctors and nurses will watch closely for side effects. Don't hesitate to ask the cancer care team any questions about side effects.

For more information on the possible late or long-term side effects of chemo, including infertility and second cancers, see [Living as an Osteosarcoma Survivor](#)⁸.

Tests to check for side effects of chemotherapy: Before each treatment, your (or your child's) doctor will check lab test results to be sure the liver, kidneys, and bone marrow are working well. Other tests might be done during and after treatment as well.

- The **complete blood count (CBC)** includes counts of white blood cells, red blood cells, and blood platelets. Chemo can lower the numbers of these blood cells, so blood counts will be watched closely during and after chemo. The white blood cells and platelets usually reach their lowest point about 2 weeks after chemo is given, though this can occur earlier with high-dose regimens.
- **Blood chemistry panels** measure certain blood chemicals that tell doctors how well the liver and the kidneys are working. Some chemo drugs can damage the kidneys and liver.
- An **audiogram** might be done to check hearing, which can be affected by certain chemo drugs.
- If doxorubicin or epirubicin is to be given, tests such as an **echocardiogram** (an ultrasound of the heart) may be done before and during treatment to check heart function.

For more information, see [Chemotherapy](#)⁹.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/central-venous-catheters.html
2. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/nausea-and-vomiting.html
3. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/infections.html
4. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/fatigue.html
5. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/peripheral-neuropathy.html
6. www.cancer.org/cancer/acute-myeloid-leukemia.html
7. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/fertility-and-sexual-side-effects/preserving-fertility-in-children-and-teens-

[with-cancer.html](#)

8. www.cancer.org/cancer/osteosarcoma/after-treatment/follow-up.html
9. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html

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Radiation Therapy for Osteosarcoma

Radiation therapy uses high-energy rays or particles to kill cancer cells. Osteosarcoma cells are not easily killed by radiation, so radiation therapy doesn't play a major role in treating this disease.

Radiation therapy can be useful in some cases where the tumor can't be removed completely by [surgery](#). For example, osteosarcoma can start in hip bones or in the bones of the face, particularly the jaw. In these situations, often it's not possible to remove all of the cancer. As much as possible is removed, and then radiation is given to try to kill the remaining cancer cells. [Chemotherapy](#) is then often given after the radiation.

Radiation can also be used to help slow tumor growth and control symptoms like pain and swelling if the cancer has come back or surgery is not possible.

External beam radiation therapy

This is the type of radiation therapy most often used to treat osteosarcoma. It focuses high-energy beams on the tumor from a machine outside the body to kill the cancer cells.

Before treatments start, the radiation team takes careful measurements with imaging tests such as MRI scans to determine the correct angles for aiming the radiation beams and the proper dose of radiation. This planning session is called *simulation*.

Most often, radiation treatments are given 5 days a week for several weeks. Each treatment is much like getting an x-ray, although the dose of radiation is much higher. The treatment is not painful. For each session, you (or your child) will lie on a special table while a machine delivers the radiation from precise angles.

Each treatment lasts only a few minutes, although the setup time – getting you (or your child) into place for treatment – usually takes longer. Young children may be given medicine to make them sleep so they will not move during the treatment.

Newer radiation techniques, such as intensity modulated radiation therapy (IMRT), conformal proton beam therapy, and stereotactic radiosurgery (SRS), let doctors aim treatment at the tumor more precisely while reducing how much radiation nearby healthy tissues get. This may offer a better chance of increasing the success rate and reducing side effects. Many doctors now recommend using these approaches when they are available. (See [What's New in Osteosarcoma Research?](#)¹)

Possible side effects: The side effects of external radiation therapy depend on the dose of radiation and where it is aimed. Short-term problems can include effects on skin areas that receive radiation, which can range from mild sunburn-like changes and hair loss to more severe skin reactions. Radiation to the abdomen or pelvis can cause [nausea](#)², diarrhea, and urinary problems. Talk with your (child's) doctor about the

possible side effects because there may be ways to relieve some of them.

In children, radiation therapy can slow the growth of the bones. For example, radiation to the bones in one leg might result in it being much shorter than the other. Radiation to the facial bones may cause uneven growth, which might affect how a child looks. But if a child is fully or almost fully grown, this is less likely to be an issue.

Depending on where the radiation is aimed, it can also damage other organs:

- Radiation to the **chest wall or lungs** can affect lung and heart function.
- Radiation to the **jaw area** might affect the salivary glands, which could lead to dry mouth and tooth problems.
- Radiation therapy to the **spine or skull** might affect the nerves in the spinal cord or brain. This could lead to nerve damage, headaches, and trouble thinking, which usually become most serious 1 or 2 years after treatment. Radiation to the spine might cause numbness or weakness in part of the body.
- Radiation to the **pelvis** can damage the bladder or intestines, which can lead to problems with urination or bowel movements. It can also damage reproductive organs, which could affect a child's fertility later in life, so doctors do their best to protect these organs by shielding them from the radiation or moving them out of the way whenever possible.

Another major concern with radiation therapy is that it might cause a new cancer to form in the part of the body that was treated with the radiation. The higher the dose of radiation, the more likely this is to occur, but the overall risk is small and should not keep children who need radiation from getting it.

To lower the risk of serious long-term effects from radiation, doctors try to use the lowest dose of radiation therapy that is still effective. Still, it's important to continue follow-up visits with your (child's) doctor so that if problems come up they can be found and treated as early as possible.

Radioactive drugs (radiopharmaceuticals)

Bone-seeking radioactive drugs, such as samarium-153 or radium-223, are sometimes used to slow tumor growth and treat symptoms such as pain in people with advanced osteosarcoma. These drugs are injected into a vein and collect in the bones. Once there, the radiation they give off kills the cancer cells.

These drugs are especially helpful when cancer has spread to many bones, since

external beam radiation would need to be aimed at each affected bone. In some cases, these drugs are used together with external beam radiation aimed at the most painful bone metastases.

The major side effect of these drugs is a lowering of blood cell counts, which could increase the risk for infections or bleeding, especially if the blood counts are already low.

For more detailed information on radiation therapy, see [Radiation Therapy](#)³.

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/about/new-research.html
2. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/nausea-and-vomiting.html
3. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html

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Treatment Based on the Extent of the Osteosarcoma

Treatment for osteosarcoma depends on several factors, including the [extent, grade](#)¹, and location of the cancer, and on a person's age and overall health.

Localized, resectable osteosarcoma

These cancers have not been found to have spread to other parts of the body, and all of the visible tumor can be removed (resected) completely by [surgery](#).

High grade: Most osteosarcomas are high grade, meaning they will probably grow and spread quickly if not treated. The usual sequence of treatment for these cancers is as follows:

- Biopsy to establish the diagnosis.
- [Chemotherapy](#) (chemo), usually for about 10 weeks.
- Surgery to remove the tumor, preferably by the same surgeon who did the biopsy. If cancer is found at the edge of the surgery specimen (meaning some cancer might have been left behind), a second surgery might be done to try to remove any remaining cancer. [Radiation therapy](#) might be given to the area as well.
- More chemo (for up to a year). If the initial chemo killed most of the cancer cells, the same drugs are often given again after surgery. If the initial chemo didn't work well, different drugs might be tried.

Chemotherapy is a very important part of treatment for these cancers. Even when imaging tests don't show that the cancer has spread to distant areas, many patients are likely to have very small areas of cancer spread that can't be detected with tests. If chemo isn't given, the cancer is more likely to come back after surgery.

In rare cases, surgery might be the first treatment (before chemo), especially for people who are elderly.

Low grade: A small number of osteosarcomas are low grade, meaning they are likely to grow slowly. Patients with low-grade, resectable osteosarcomas can often be cured with surgery alone (without chemo). However, if the tumor removed by surgery is found to be high grade, chemo might be recommended.

Localized, non-resectable osteosarcoma

These cancers have not been found to have spread to other parts of the body, but they can't be removed (resected) completely by [surgery](#). For example, they may be too large or too close to vital structures in the body to be resected completely.

As with other osteosarcomas, a biopsy is needed first to establish the diagnosis.

[Chemotherapy](#) is usually the first treatment for these cancers. If the tumor shrinks enough to become resectable, it is then removed with surgery. This is followed by more chemotherapy for up to a year.

If the tumor is still unresectable after chemotherapy, [radiation therapy](#) can often be used to try to keep the tumor under control and to help relieve symptoms. More chemotherapy might be another option, either instead of or after radiation therapy. If the first chemo regimen didn't work very well, different chemo drugs might be tried.

Metastatic osteosarcoma

These cancers have already been found to have spread to distant parts of the body when they are diagnosed. Most often they have spread to the lungs. As with other osteosarcomas, a biopsy is needed first to establish the diagnosis.

[Chemotherapy](#) is usually the first treatment for these cancers. If all of the tumors are thought to be resectable after chemotherapy, they are removed with [surgery](#), sometimes in more than one operation. This is followed by more chemo for up to a year.

If some of the tumors remain unresectable after chemo, [radiation therapy](#) can often be used to try to keep them under control and to help relieve symptoms. More chemotherapy might be another option, either instead of or after radiation therapy. If the first chemo regimen didn't work very well, different chemo drugs might be tried.

Because these tumors can be hard to treat, [clinical trials](#)² of newer treatments may be a good option in many cases.

Recurrent osteosarcoma

Recurrent cancer means that the cancer has come back after treatment. It may come back locally (near where the first tumor was) or in other parts of the body. Most of the time, if osteosarcoma recurs it will be in the lungs.

If possible, [surgery](#) to remove the tumor(s) is the preferred treatment, as it offers the best chance for long-term survival. If the cancer recurs at the original site on an arm or leg after limb-sparing surgery, amputation of the limb may be recommended.

[Chemotherapy](#) may be used for recurrent cancers as well. If the cancer is resectable, chemo might be given after surgery. If the cancer is not resectable, chemo might be used to try to shrink the tumor(s) and/or relieve symptoms. [Radiation therapy](#) may also be used to help keep its growth in check and help relieve symptoms. Some newer [targeted therapy](#)³ drugs might also be an option in some cases, although more research is needed to see how effective these drugs are (see [What's New in Osteosarcoma Research?](#)⁴).

Because these tumors can be hard to treat, [clinical trials](#)⁵ of newer treatments may be a good option.

The treatment information given here is not official policy of the American Cancer Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor. Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/detection-diagnosis-staging/staging.html
2. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html
3. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/targeted-therapy.html
4. www.cancer.org/cancer/osteosarcoma/about/new-research.html
5. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html

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After Treatment for Osteosarcoma

Living as a Cancer Survivor

For many people, cancer treatment often raises questions about next steps as a survivor.

- [Living as an Osteosarcoma Survivor](#)

Living as an Osteosarcoma Survivor

During [treatment](#)¹ for osteosarcoma, the main concerns for most people the daily aspects of just getting through treatment and beating the cancer. After treatment, the concerns tend to shift toward the short- and long-term effects of the cancer and its treatment, and the cancer coming back.

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

Follow-up care

After treatment is over, it's very important to go to all follow-up appointments. During these visits, doctors will ask about symptoms and do physical exams, and might order [blood tests or imaging tests](#)² such as MRI, CT scans or x-rays. Follow-up visits are

needed to check for cancer [recurrence or spread](#)³, as well as possible side effects of treatment. This is a good time for you to ask the health care team any questions and to discuss any concerns you might have.

You or your child will probably see the oncologist and the orthopedic surgeon and get [imaging tests](#)⁴ every few months during the first couple of years after treatment, and less often after that if there are no issues.

Physical therapy and rehabilitation are typically a very important part of recovery after treatment for osteosarcoma, and your doctors and other health providers will continue to monitor your (child's) progress as time goes on.

Some [chemotherapy](#)⁵ drugs can cause problems with hearing or heart damage. People who get these drugs may also have tests to check hearing or heart function.

Almost any cancer treatment can have side effects. Some may last for only a short time, but others can last longer or might not show up until months or even years later. For example, in younger people, treatment might affect fertility (the ability to have children) later in life. It's important to talk to the cancer care team to learn about what to look for, and to tell them about any symptoms or side effects so they can help manage them.

Ask the cancer care team for a survivorship care plan

Talk with the treatment team about developing a [survivorship care plan](#)⁶. This plan might include:

- A suggested schedule for follow-up exams and tests
- A schedule for other tests that might be needed in the future, such as early detection (screening) tests for other types of cancer, or tests to look for long-term health effects from the cancer or its treatment
- A list of possible late- or long-term side effects from treatment, including what to watch for and when to contact the doctor

Keeping health insurance and copies of medical records

As much as you may want to put the experience behind you once treatment is completed, it's also very important to keep good records of your (child's) medical care during this time. Gathering these details soon after treatment may be easier than trying to get them at some point in the future. This can be very helpful later on if you (or your child) change doctors. Learn more about this in [Keeping Copies of Important Medical](#)

[Records](#)⁷.

It's also very important to keep [health insurance](#)⁸ coverage. Tests and doctor visits can cost a lot, and even though no one wants to think of the tumor coming back, this could happen.

Late and long-term effects of treatment

Osteosarcoma treatment might affect a person's health later in life. Young people in particular are at risk for possible late effects of their treatment. This risk depends on many factors, such as the specific treatments they received, doses of treatment, and their age when treated.

For example, the after-effects of [surgery](#)⁹ can range from small scars to the loss of a limb, which would require both physical rehabilitation and emotional adjustment.

Other late effects of treatment can include:

- Heart or lung problems (due to certain chemo drugs or radiation therapy to the chest)
- Loss of hearing (due to certain chemo drugs)
- Slowed growth and development (in the bones or overall)
- Changes in sexual development and ability to have children
- Learning problems in younger children
- Development of second cancers

Other possible complications might come up as well. Your child's doctor should carefully review any possible problems with you before your child starts treatment. For more information, see [Late Effects of Childhood Cancer Treatment](#)¹⁰.

To help increase 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 types of screening tests should be done to look for problems, and how late effects are treated.

It's very important to discuss possible long-term complications with your child's health care team, and to make sure there is a plan in place 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 download them for free at the COG website:

www.survivorshipguidelines.org¹¹. 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 a doctor.

Social and emotional issues

Most osteosarcomas develop during the teenage or young adult years, a very sensitive time in a person’s life. Osteosarcoma and its treatment can have a profound effect on how a person looks and how they view themselves and their body. It can also affect how they do some everyday tasks, including certain school, work, or recreational activities. These effects are often greatest during the first year of treatment, but they can be long-lasting in some people. It’s important that the treating center assess the family situation as soon as possible, so that any areas of concern can be addressed.

These types of issues can often be addressed with support and encouragement. Doctors and other members of the health care team can also often recommend special support programs and services to help children after cancer treatment. For more information, see [When Your Child's Treatment Ends](#)¹².

No one chooses to have osteosarcoma, but for many people, the experience can eventually be positive, helping to establish strong self-values. Other people may have a harder time recovering, adjusting to life after cancer, and moving on. It is normal to have some anxiety or other emotional reactions after treatment, but feeling overly worried, depressed, or angry can affect many parts of a young person’s growth. It can get in the way of relationships, school, work, and other aspects of life.

With support from family, friends, other survivors, mental health professionals, and others, many people who have survived cancer can thrive in spite of the challenges they’ve had to face. If needed, doctors and other members of the health care team can often recommend special support programs and services to help after cancer treatment.

Although osteosarcoma and its treatment can have social and emotional effects on children and teens (and their families), adults with this disease face many of the same challenges, and are also encouraged to take advantage of the cancer center’s physical therapy, occupational therapy, and counseling services.

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/treating.html
2. www.cancer.org/cancer/osteosarcoma/detection-diagnosis-staging/how-diagnosed.html

3. www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html
4. www.cancer.org/cancer/osteosarcoma/detection-diagnosis-staging/how-diagnosed.html
5. www.cancer.org/cancer/osteosarcoma/treating/chemotherapy.html
6. www.cancer.org/treatment/survivorship-during-and-after-treatment/survivorship-care-plans.html
7. www.cancer.org/treatment/survivorship-during-and-after-treatment/be-healthy-after-treatment/keeping-copies-of-important-medical-records.html
8. www.cancer.org/treatment/finding-and-paying-for-treatment/understanding-health-insurance.html
9. www.cancer.org/cancer/osteosarcoma/treating/surgery.html
10. www.cancer.org/treatment/children-and-cancer/when-your-child-has-cancer/late-effects-of-cancer-treatment.html
11. <http://www.survivorshipguidelines.org>
12. [/content/cancer/en/treatment/children-and-cancer/when-your-child-has-cancer/when-your-childs-treatment-ends.html](http://content.cancer/en/treatment/children-and-cancer/when-your-child-has-cancer/when-your-childs-treatment-ends.html)

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