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Treating Bone Cancer

The content here focuses on primary bone cancers (cancers that start in bones) that most often are seen in adults. We have separate information on [Osteosarcoma](#), [Ewing Tumors](#) (Ewing sarcomas), and [Bone Metastasis](#).

If you've been diagnosed with bone cancer, 46 've rcer, 46cereenteamh bllgnoss os've r0 g 1 0 0 1 72

extensive experience with them. Treating these cancers can be complex, so they are often best treated by a team of doctors (and often at major medical centers). Doctors on the treatment team might include:

An **orthopedic surgeon**: a doctor who uses surgery to treat bone and joint problems. Often this is an **orthopedic oncologist**

asking your doctor if your clinic or hospital conducts clinical trials.

- [Clinical Trials](#)

Considering complementary and alternative methods

You may hear about alternative or complementary methods to relieve symptoms or treat your cancer that your 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 you

connect with one of our specialists.

- [Palliative Care](#)
- [Programs & Services](#)

Choosing to stop treatment or choosing no treatment at all

For some people, when treatments have been tried and are no longer controlling the cancer, it could be time to weigh the benefits and risks of continuing to try new treatments. Whether or not you continue treatment, there are still things you can do to help maintain or improve your quality of life.

Some people, especially if the cancer is advanced, might not want to be treated at all. There are many reasons you might decide not to get cancer treatment, but it's important to talk to your doctors as you make that decision. Remember that even if you choose not to treat the cancer, you can still get supportive care to help with pain or other symptoms.

- [If Cancer Treatments Stop Working](#)

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 your cancer care team any questions you may have about your treatment options.

Surgery for Bone Cancer

Surgery is an important part of treatment for most [types of bone cancer](#)¹. It typically includes:

- The [biopsy](#)² to diagnose the cancer
- The surgical removal of the tumor(s)

Whenever possible, it's very important that the biopsy and the surgery to remove

- **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

When discussing your options with the treatment team, it's important to consider the pros and cons of either type of surgery. For example, most people prefer limb-salvage over amputation, but it's a more complex operation and can have more complications. If a limb is amputated, the patient will need to learn to live with and use a prosthetic limb.

Both types of operations have the same overall survival rates when done by expert surgeons. Studies looking at quality of life have shown little difference in how people react to the final result of the different procedures. And when researchers have looked at the results of the different surgeries in terms of a person's quality of life afterward, there has been little difference between them. Still, emotional issues can be very important, and support and encouragement are needed for all patients.

No matter which type of surgery is done, physical rehabilitation will be needed afterward (see below).

Limb-salvage surgery

Most people with arm or leg tumors can have limb-sparing surgery, but this depends on where the tumor is, how big it is, and if it has grown into nearby structures.

The goal of limb-salvage surgery is to remove all of the cancer and still leave a working

Amputation

For some patients, amputation of part or all of a limb is the best option. For example, if the tumor is very large or if it has grown into important nerves and/or blood vessels, it might not be possible to remove all of it and still leave behind a functional limb.

The surgeon determines how much of the arm or leg needs to be amputated based on the results of [MRI scans](#)⁶ and examination of removed tissue by the pathologist at the time of surgery.

Surgery is usually planned so that muscles and the skin will form a cuff around the amputated bone. This cuff fits into the end of an artificial limb (external prosthesis). Another option might be to implant a prosthesis into the remaining bone, the end of which remains outside the skin. This can then be attached to an external prosthesis.

Reconstructive surgery can help some patients who lose a limb to function as well as possible. For instance, 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 joint functions as a new knee joint. This surgery is called **rotationplasty**. A prosthetic limb would still be needed to replace the lower part of the leg.

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

Tumors in the pelvic (hip) bones can often be hard to remove completely with surgery. Some types of tumors can be treated with [chemotherapy](#) first to help shrink the cancer and make the operation easier. 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 bone 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 might not be possible to remove all of the tumor safely. Cancers in these bones could require a combination of treatments such as curettage (removal by scraping - see below), [cryosurgery](#)⁷, and radiation.

Joint fusion (arthrodesis): Sometimes, after the removal of a tumor that involves a joint (an area where two bones come together), it might not be possible to reconstruct the joint. In this case, surgery might be done to fuse the two bones together. This is most often used for tumors in the spine, but it might also be used in other parts of the body, such as a shoulder or hip. While it can help stabilize the joint, it results in loss of motion, which the person will have to learn to adjust to.

Curettage (intralesional excision)

For some types of bone tumors that are less likely to spread or to come back after treatment, the surgeon might scrape out the tumor without removing a section of the bone. This is done with a sharp instrument called a curette, and it leaves a hole in the bone. After as much of the tumor is removed as possible, the surgeon might treat the nearby bone tissue with other techniques such as chemicals or extreme cold (cryosurgery) to try to kill any remaining tumor cells.

Bone cement

The bone cement PMMA (polymethylmethacrylate) starts out as a liquid and hardens over time. It can be put into the hole in the bone in liquid form after curettage. As it hardens, it gives off a lot of heat, which might help kill any remaining tumor cells.

Surgical treatment of bone tumor metastasis

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

When bone cancer spreads, it most often goes to the lungs. If surgery can be done to remove these metastases, it must be planned very carefully. Before the operation, the surgeon will consider the number of tumors, where they are (in one or both lungs), their size, and the person's overall health.

[Imaging tests](#)⁸ such as a chest CT scan might not show all of the tumors, so the surgeon will have a treatment plan ready in case more tumors are found during the operation.

Some bone cancers might spread to other bones or to organs like the kidneys, liver, or brain. Whether these tumors can be removed with surgery depends on their size, location, and other factors.

Unfortunately, not all cancers that have spread can be removed with surgery. Some metastases might be too big or too close to important structures (such as large blood vessels) to be removed safely. People whose overall health isn't good (for example, because of heart, liver, or kidney problems) might not be able to withstand the stress of anesthesia and surgery to remove the metastases. If this is the case, other treatments might be offered to try to control these tumors for as long as possible.

Side effects of surgery

Short-term risks and side effects: Surgery to remove bone cancer can often be 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 it 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. Many bone cancers 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 loose or broken bone grafts or prostheses. 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. It's also possible that the surgery could damage nerves in the limb, which might affect the function of the limb or cause pain (known as **neuropathic pain**).

As mentioned above, physical therapy and rehabilitation are very important after

surgery for bone cancer. 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.

More information about Surgery

For more general information about surgery as a treatment for cancer, see [Cancer Surgery](#)⁹.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)¹⁰.

Hyperlinks

1. www.cancer.org/cancer/types/bone-cancer/about/what-is-bone-cancer.html
 2. www.cancer.org/cancer/types/bone-cancer/detection-diagnosis-staging/how-diagnosed.html
 3. www.cancer.org/cancer/types/osteosarcoma.html
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 5. www.cancer.org/cancer/managing-cancer/advanced-cancer/bone-metastases.html
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Radiation Therapy for Bone Cancer

Radiation therapy uses high-energy rays or particles to kill cancer cells.

For most types of bone cancer, the cancer cells are not easily killed by radiation, so high doses are needed. This can damage nearby healthy tissues, including key structures (like nerves and blood vessels) in the area. Because of this, radiation therapy isn't used as a main treatment for most types of bone tumors (although it's often used for Ewing tumors).

- [Getting external beam radiation therapy](#)
- [When might radiation therapy be used?](#)

most often are seen in adults. Information on [Osteosarcoma](#),¹ [Ewing Tumors](#)² (Ewing sarcomas), and [Bone Metastasis](#)³ is covered separately.

Getting external beam radiation therapy

External beam radiation therapy is radiation delivered from outside the body that's focused on the cancer. This is the type of radiation therapy used most often to treat bone cancer.

Before treatment starts, the radiation team takes careful measurements of the area to be treated 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 is given in more than one treatment. Each treatment is much like

the tumor and spare the nearby tissues.

Intensity-modulated radiation therapy (IMRT)

With IMRT, a computer program is used to shape and aim radiation beams at the tumor from several different angles, as well as to adjust the strength (intensity) of the beams. This makes it possible to reduce radiation damage to nearby normal tissues while increasing the radiation dose to the cancer.

Stereotactic radiosurgery (SRS)

This technique lets doctors give a large dose of radiation to a small tumor area, usually in one session. Once imaging tests have been done to show the exact location of the tumor, a very thin beam of radiation is focused on the area from many different angles. This is typically done with a radiation source on the end of a computer-controlled robotic arm, which rotates around the person as they lie on a table.

Sometimes doctors give the radiation in several smaller treatments to deliver the same

Possible side effects of radiation therapy depend on what area of the body is being treated and how much radiation is used.

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, diarrhea, and urinary problems. Talk with your doctor about the possible side effects because there may be ways to relieve some of them.

Depending on where the radiation is given, 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 a year or two 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, so doctors do their best to protect these organs by shielding them from the radiation or moving them out of the way whenever possible.
- Radiation that includes a **joint** (a place where two bones come together) might damage the joint, which could result in pain, scarring, and/or limited range of motion.

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

More information about radiation therapy

To learn more about how radiation is used to treat cancer, see [Radiation Therapy](#)⁴.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)⁵.

Hyperlinks

1. www.cancer.org/cancer/types/osteosarcoma.html
2. www.cancer.org/cancer/types/ewing-tumor.html
3. www.cancer.org/cancer/managing-cancer/advanced-cancer/bone-metastases.html
4. www.cancer.org/cancer/managing-cancer/treatment-types/radiation.html
5. www.cancer.org/cancer/managing-cancer/side-effects.html

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Chemotherapy for Bone Cancer

Chemotherapy (chemo) is the use of drugs to treat cancer. These drugs are usually given into a vein (IV) and can reach and destroy cancer cells anywhere in the body, so chemo is most likely to be useful for cancers that have spread to other organs.

Chemo is often an important part of treatment for Ewing sarcoma, osteosarcoma, and undifferentiated pleomorphic sarcoma (UPS). But it's used less often for most other [types of bone cancers](#)¹, like giant cell tumors and most types of chordomas and chondrosarcomas. These types aren't very sensitive to chemo, so [other medicines](#) might be tried first instead.

- [Chemo drugs commonly used to treat bone cancer](#)
- [Side effects of chemo](#)
- [More information about chemotherapy](#)

The information here focuses on primary bone cancers (cancers that start in bones) that most often are seen in adults. Information on [Osteosarcoma](#)², [Ewing Tumors](#)³ (Ewing sarcomas), and [Bone Metastasis](#)⁴ is covered separately.

Chemo drugs commonly used to treat bone cancer

Some of the chemo drugs that can be used to treat bone cancer include:

- Doxorubicin (Adriamycin)
- Cisplatin
- Etoposide (VP-16)
- Ifosfamide
- Cyclophosphamide
- Methotrexate
- Vincristine

In most cases, 2 or more drugs are given together.

Side effects of chemo

Chemo kills cancer cells, but it also damages some normal cells, which can lead to side effects. These depend on the type of drugs and doses used, and the length of time

they're taken.

Some common short-term side effects can include:

The doctors and nurses will watch you closely for side effects. Most side effects tend to go away in time after treatment is over. Still, it's important to tell your cancer care team about any side effects you have so they can be treated. 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.

More information about chemotherapy

For more general information about how chemotherapy is used to treat cancer, see [Chemotherapy](#)⁶.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)⁷.

Hyperlinks

1. www.cancer.org/cancer/types/bone-cancer/about/what-is-bone-cancer.html
2. www.cancer.org/cancer/types/osteosarcoma.html
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Targeted Therapy and Other Drugs for Bone Cancer

- [Immunotherapy drugs for bone cancer](#)
- [More information about targeted therapy](#)

The information here focuses on primary bone cancers (cancers that start in bones) that most often are seen in adults. Information on [Osteosarcoma](#)², [Ewing Tumors](#)³ (Ewing sarcomas), and [Bone Metastasis](#)⁴ is covered separately.

Targeted drugs for bone cancer

The targeted drugs used to treat some types of bone cancers are known as **kinase inhibitors**. Kinases are proteins in the cell (or on its surface) that normally relay signals (such as telling the cell to grow). Blocking certain kinases can help stop or slow the growth of some tumors.

These drugs are used most often to treat chordomas that have spread or have come back after treatment. Some of these drugs might also be used to treat advanced chondrosarcomas.

Examples of kinase inhibitors include:

- Imatinib (Gleevec)
- Dasatinib (Sprycel)
- Sunitinib (Sutent)
- Erlotinib (Tarceva)
- Lapatinib (Tykerb)
- Sorafenib (Nexavar)
- Regorafenib (Stivarga)
- Pazopanib (Votrient)

These drugs are pills, typically taken once or twice a day.

The **side effects** of these drugs can vary, based on which one is being used, and can include things like diarrhea, nausea, muscle pain, and fatigue. Some of these drugs can cause itchy skin rashes or fluid build-up around the eyes, feet, or belly.

Drugs that affect bone cells

Denosumab (Xgeva)

denosumab can block this.

This drug can be used to treat giant cell tumors of bone that have either come back after surgery or cannot be removed with surgery.

This drug is injected under the skin (sub-q or SQ). Often, the tumor can take months to shrink.

Most **side effects** are mild and can include body aches, fatigue, diarrhea, and nausea. A rare but very serious side effect of denosumab is damage to the jawbone, called **osteonecrosis** of the jaw (ONJ). This can lead to loss of teeth and/or infections of the jaw bone. ONJ can be triggered by having dental work while taking the drug. Maintaining good oral hygiene by flossing, brushing, making sure that dentures fit properly, and having regular dental check-ups may help prevent this. Most doctors recommend that patients have a dental check-up and have any tooth or jaw problems treated before they start taking this drug.

Immunotherapy drugs for bone cancer

Immunotherapy drugs help the body's own immune system recognize and attack cancer

Possible **side effects** of this drug can include feeling tired or weak, cough, nausea, itching, skin rash, loss of appetite, muscle or joint pain, shortness of breath, and constipation or diarrhea.

Other, more serious side effects occur less often:

Infusion reactions: This is like an allergic reaction, and can include fever, chills, flushing of the face, rash, itchy skin, feeling dizzy, wheezing, and trouble breathing. It's important to tell your doctor or nurse right away if you have any of these symptoms while getting this drug.

Autoimmune reactions: This drug works by basically removing one of the safeguards on the body's immune system. Sometimes the immune system starts attacking other parts of the body, which can cause serious or even life-threatening problems in the lungs, intestines, liver, hormone-making (endocrine) glands, kidneys, skin, or other organs.

Interferon alfa-2b

Interferons are a family of substances naturally made by our immune system. Interferon alfa-2b may be used to treat giant cell tumors of the bone that have come back after treatment or that have spread.

This drug is most often given daily as an injection under the skin. It can also be injected into a muscle or vein.

Interferon can cause significant side effects. These include "flu-like" symptoms like muscle aches, bone pain, fever, headaches, fatigue, nausea, and vomiting. Patients taking this drug might have problems thinking and concentrating. Interferon can also lower blood cell counts. These effects continue as long as the drug is used, but can become easier to tolerate over time. Still, some patients find it hard to deal with these side effects every day and may need to stop treatment because of them.

For more information about drugs that help the immune system attack cancer, see [Immunotherapy⁵](#).

More information about targeted therapy

To learn more about how targeted drugs are used to treat cancer, see [Targeted Cancer Therapy⁶](#).

Treating Specific Types of Bone Cancer

The treatment of bone cancers in adults depends on the [type of bone cancer](#)¹, where the cancer started, its [stage](#)² (extent), a person's overall health and preferences, and other factors.

Often, more than one type of treatment is used. Treating these cancers can be complex, so they are often best treated by a team of different types of doctors who have experience with them.

- [Chondrosarcoma](#)
- [Undifferentiated pleomorphic sarcoma \(UPS\) of bone](#)
- [Fibrosarcoma of bone](#)
- [Giant cell tumor of bone](#)
- [Chordoma](#)

The information here focuses on primary bone cancers (cancers that start in bones) that most often are seen in adults. Information on [Osteosarcoma](#)³, [Ewing Tumors](#)⁴ (Ewing sarcomas), and [Bone Metastasis](#)⁵

For **low-grade chondrosarcomas in other bones** and for all **higher-grade chondrosarcomas**, more extensive surgery will likely be needed. [Limb-sparing surgery](#) might be an option for tumors in the arm or leg bones, although sometimes [amputation](#) might be a better option to completely remove the cancer.

Chondrosarcomas in the skull can be hard to treat. They are often hard to remove completely with surgery, which might cause serious side effects. Some low-grade tumors can be treated with curettage.

For tumors that are harder to remove completely, [radiation therapy](#) might be given before and/or after surgery. Radiation can also be used if surgery can't be done for some reason. Chondrosarcoma cells aren't killed easily by radiation, so high doses are needed. Techniques such as intensity-modulated radiation therapy (IMRT) or proton beam radiation are likely to work best for these tumors.

Chondrosarcomas that have spread to other parts of the body can be hard to treat.

- If there are only a few tumors, they may be removed surgically, along with the main tumor. Radiation therapy might be another option to treat tumors in other parts of the body.
- If there are many tumors, or if it's clear that not all of them can be removed, treatment is more likely to be focused on relieving symptoms from the tumors and controlling their growth for as long as possible. Treatment options might include radiation therapy, surgery, or [targeted drug treatments](#) such as dasatinib or pazopanib.

[Chemotherapy](#) (chemo) is not usually very effective against chondrosarcoma cells, so it's not often used to treat this type of cancer. Still, chemo can be used to treat some uncommon types of chondrosarcoma. For example:

- **Dedifferentiated chondrosarcoma** is often treated like [osteosarcoma](#)⁸, with chemo being given first, followed by surgery and then more chemo.

Undifferentiated pleomorphic sarcoma (UPS) of bone

This cancer was previously known as **malignant fibrous histiocytoma (MFH) of bone**. It's treated basically the same way as osteosarcoma is treated.

[Chemotherapy](#) usually is given first to shrink the tumor and to try to kill any cancer cells that might have spread. Then the tumor and some surrounding normal tissue is removed with [surgery](#). The type of surgery will depend on the location of the tumor and other factors. Once the cancer has been removed, the bone may be reconstructed with a bone graft or with some type of man-made prosthesis. In some cases, chemotherapy is also given after surgery.

For more on how osteosarcoma (and therefore UPS) is treated, see [Treating Osteosarcoma](#)¹¹.

These tumors are not common and can be hard to treat, so taking part in a [clinical trial](#)¹² testing newer treatments might be another option to consider.

Fibrosarcoma of bone

[Surgery](#) is usually the main treatment for this type of bone cancer. The goal is to remove the tumor and a margin of surrounding normal bone. The type of operation will depend on the location of the tumor and other factors.

These tumors tend to come back in the same place they started, so [radiation therapy](#) may be given after surgery to try to keep this from happening. Radiation might also be given if not all of the cancer can be removed, or if the doctor suspects that some cancer might have been left behind.

Radiation can also be used if a fibrosarcoma returns after surgery.

[Chemotherapy](#) might also be part of the treatment for these cancers, as they share some features with osteosarcomas and undifferentiated pleomorphic sarcomas. However, fibrosarcomas of bone are rare tumors, so using chemo against them hasn't been studied thoroughly.

These tumors are not common and can be hard to treat, so taking part in a [clinical trial](#)¹³ testing newer treatments might be another option to consider.

Giant cell tumor of bone

These tumors do not usually spread to other parts of the body, but they are sometimes hard to remove completely.

Giant cell tumors are usually treated with [surgery](#). Different types of operations can be used, depending on the size and location of the tumor.

Tumors that are only in the bone where they started can often be treated with curettage (intralesional excision). The area where the tumor has been removed might then be

For **tumors in the spine**, a wide excision is usually done to remove the tumor along with some nearby normal tissue. It might not be possible to remove all of the tumor in some cases, such as if the spinal cord and nearby nerves are involved.

Tumors at the base of the skull are often hard to remove completely because they're close to critical structures such as the brainstem and spinal cord. Curettage is often done to remove as much of the tumor as possible. This might be done through an incision in the skull, or through a small hole created in the back of the nose.

[Radiation therapy](#) might be given after surgery to lower the chance that the tumor will grow back. Doctors typto rt.901F3 12 Tf 0 0.2 0.62745 rg (Rechniques g 1 0274.90 0 much aontrol0 0

- [trials.html](#)
11. www.cancer.org/cancer/types/osteosarcoma/treating.html
 12. www.cancer.org/cancer/managing-cancer/making-treatment-decisions/clinical-trials.html
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