



[cancer.org](https://www.cancer.org) | 1.800.227.2345

Treating Bone Cancer

How is bone cancer treated?

The main ways to treat bone cancer are:

- [Surgery for Bone Cancer](#)
- [Radiation Therapy for Bone Cancer](#)
- [Chemotherapy for Bone Cancer](#)
- [Targeted Therapy for Bone Cancer](#)

Common treatment approaches

Often, more than one type of treatment is used to treat bone cancer. Your treatment plan will depend on the type of bone cancer and its stage.

- [Treating Specific Bone Cancers](#)

Who treats bone cancer?

Based on your treatment options, you might have different types of doctors on your treatment team. These doctors could include:

- An **orthopedic surgeon**: a doctor who uses surgery to treat bone and joint problems
- An **orthopedic oncologist**: an orthopedic surgeon that specializes in treating cancer of the bones and joints
- A **radiation oncologist**: a doctor who uses radiation to treat cancer
- A **medical oncologist**: a doctor who uses chemotherapy and other medicines to treat cancer

Many other specialists may be involved in your care as well, including nurse practitioners, nurses, psychologists, social workers, rehabilitation specialists, and other health professionals.

- [Health Professionals Associated With Cancer Care¹](#)

Making treatment decisions

It's important to discuss all of your treatment options, including treatment goals and possible side effects, with your doctors to help make the decision that best fits your needs. It's also very important to ask questions if there's anything you're not sure about.

If time permits, it is often a good idea to seek a second opinion. A second opinion can give you more information and help you feel more confident about the treatment plan you choose.

- [Questions to Ask About Bone Cancer²](#)
- [Seeking a Second Opinion³](#)

Thinking about taking part in a clinical trial

Clinical trials are carefully controlled research studies that are done to get a closer look at promising new treatments or procedures. 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're not right for everyone.

If you would like to learn more about clinical trials that might be right for you, start by asking your doctor if your clinic or hospital conducts clinical trials.

- [Clinical Trials⁴](#)

Considering complementary and alternative methods

You may hear about alternative or complementary methods that your doctor hasn't mentioned to treat your cancer or relieve symptoms. 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 a doctor's medical treatment. Although some of these methods might be helpful in relieving symptoms or helping you 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](#)⁵

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 are an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help.

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.

- [Find Support Programs and Services in Your Area](#)⁶

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 and 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](#)⁷
- [Palliative or Supportive Care](#)⁸

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 Bone Cancer

Surgery is the primary (main) treatment for most [kinds of bone cancer](#)¹. Surgery may also be needed to do a [biopsy](#)² of the cancer (take out some of the tumor so it can be tested in the lab). The biopsy and the surgical treatment are separate operations, but it's very important that the doctor plans both together. It's best if the same surgeon does both the biopsy and the main surgery. A biopsy taken from the wrong place can lead to problems when the surgeon does the operation to remove the cancer. Sometimes a poorly done biopsy can make it impossible to remove the cancer without cutting off the limb.

The main goal of surgery is to remove all of the cancer. If even a few cancer cells are left behind, they can grow and make a new tumor. To try to be sure that this doesn't happen, surgeons remove the tumor plus some of the normal tissue around it. This is called **wide-excision**. Taking out some normal tissue helps ensure that all of the cancer is removed.

After surgery, a pathologist will look at the tissue that was removed to see if the margins (outer edges) have cancer cells. 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 is seen at the edges of the tissue, the margins are said to be negative, clean, or clear. A wide-excision with clean margins minimizes the risk that the cancer will grow back where it started.

Tumors in the arms or legs

Sometimes the entire limb needs to be removed in order to do a good wide-excision and remove all of the cancer. This operation is called an **amputation**. But most of the time the surgeon can remove the cancer without amputation. This is called **limb-salvage** or **limb-sparing surgery**.

When taking about treatment options, it's important to discuss the advantages and disadvantages with 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. Both 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. Still, emotional issues can be very important and support and encouragement are needed for all patients.

No matter which type of surgery is done, rehabilitation will be needed afterward. This can be the hardest part of treatment. If possible, the patient should meet with a rehab specialist before surgery to understand what will be involved.

Amputation

Amputation is surgery to remove part or all of a limb (an arm or leg). When used to treat cancer, amputation removes the part of the limb with the tumor, some healthy tissue above it, and everything below it. In the past, amputation was the main way to treat bone cancers in the arms or legs. Now, this operation is only needed if there's a reason not to do limb-salvage surgery. For example, an amputation may be needed if removing all of the cancer also means removing key nerves, arteries, or muscles that would leave the limb without good function.

MRI scans and examination of the tissue by the pathologist at the time of surgery can help the surgeon decide how much of the arm or leg needs to be removed. Surgery is 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 (or prosthesis). After surgery, a person must learn how to use the prosthesis in rehabilitation. With proper physical therapy, people are often walking again 3 to 6 months after leg amputation.

Limb-salvage surgery

The goal of limb-salvage surgery is to remove all of the cancer and still leave a working leg or arm. Most patients with bone cancer in a limb are able to have their limb spared. This type of surgery is very complex and requires surgeons with special skills and experience. The challenge for the surgeon is to remove the entire tumor while still saving the nearby tendons, nerves, and vessels. This is not always possible. If a cancer has grown into these structures, they will need to be removed along with the tumor. This can sometimes result in a limb that's painful or can't be used. In that case, amputation may be the best option.

In limb-salvage surgery, a wide-excision is done to remove the tumor. A bone graft or

an **endoprosthesis** (meaning internal prosthesis) is used to replace the bone that's lost. Endoprostheses are made of metal and other materials. Some used in growing children can be made longer without any extra surgery as the child grows.

Further surgery could be needed if the bone graft or endoprosthesis becomes infected, loose, or broken. Limb-salvage surgery patients may need more surgery over the next 5 years, and at some point may need an amputation.

Rehab is much more intense after limb-salvage surgery than it is after amputation. It takes about a year for patients to learn to walk again after limb-salvage of a leg. If the patient does not take part in the rehabilitation program, the salvaged arm or leg could become useless.

Reconstructive surgery

After amputation, surgery can be done to rebuild or reconstruct a new limb. For instance, if the leg must be amputated mid-thigh, the lower leg and foot can be rotated and attached to the thigh bone. The old ankle joint then becomes the new knee joint. This surgery is called **rotationplasty**. A prosthesis is used to make the new leg the same length as the other (healthy) leg.

If the bone tumor is located in the upper arm, the tumor may be removed and then the lower arm attached again. This leaves the patient with an arm that works but is much shorter.

Tumors in other areas

Bone cancer in the pelvis is treated with a wide-excision when possible. If needed, bone grafts can be used to rebuild the pelvic bones.

For a tumor 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.

For tumors in areas like the spine or the skull, it may not be possible to safely do a wide-excision. Cancers in these bones may require a combination of treatments such as curettage, cryosurgery, and radiation.

Curettage

In curettage, the doctor scrapes out the tumor without removing a section of the bone. This leaves a hole in the bone. In some cases, after most of the tumor has been

removed, the surgeon will treat the nearby bone tissue to kill any remaining tumor cells. This can be done with cryosurgery or by using bone cement.

Cryosurgery

For this treatment, liquid nitrogen is poured into the hole that's left in the bone after the tumor was removed. This extreme cold kills tumor cells by freezing them. This treatment is also called **cryotherapy**. After cryosurgery, the hole in the bone can be filled by bone grafts or with bone cement.

Bone cement

The bone cement PMMA (polymethylmethacrylate) starts out as a liquid and hardens over time. It's put into the hole in the bone in liquid form. As it hardens, it gives off a lot of heat. The heat helps kill any remaining tumor cells. This allows PMMA to be used without cryosurgery for some types of bone tumors.

Surgical treatment of metastasis

To be able to cure a bone cancer, it and any existing [metastases](#)³ must be removed completely with surgery. The lungs are the most common site of distant spread for bone cancer. Surgery to remove bone cancer metastases to the lungs must be planned very carefully. Before the operation, the surgeon will consider the number of tumors, where they are (in one lung or both lungs), their size, and the person's overall health.

The chest [CT scan](#)⁴ might not show all the tumors. The surgeon will have a treatment plan ready just in case more tumors are found during the operation than can be seen on the chest CT scan.

Removing all the lung metastases is probably the only chance for a cure. Still, not all lung metastases can be removed. Some tumors are too big or are too close to important structures in the chest (such as large blood vessels) to be removed safely. People whose general health is not good (due to poor nutritional status or problems with the heart, liver, or kidneys) may not be able to deal with the stress of anesthesia and surgery to remove metastases.

For more information, see [Cancer Surgery](#)⁵.

Hyperlinks

1. www.cancer.org/cancer/bone-cancer/about/what-is-bone-cancer.html
2. www.cancer.org/treatment/understanding-your-diagnosis/tests/testing-biopsy-and-cytology-specimens-for-cancer.html
3. www.cancer.org/treatment/understanding-your-diagnosis/advanced-cancer.html
4. www.cancer.org/treatment/understanding-your-diagnosis/tests/ct-scan-for-cancer.html
5. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html

References

Gutowski CJ, Basu-Mallick A, Abraham JA. Management of Bone Sarcoma. *Surg Clin N Am*. 2016;2016:1077–1106.

National Cancer Institute. Osteosarcoma and Malignant Fibrous Histiocytoma of Bone Treatment (PDQ®)—Patient Version. September 1, 2017. Accessed at www.cancer.gov/types/bone/patient/osteosarcoma-treatment-pdq on December 5, 2017.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology. Bone Cancer. Version 1.2018 -- August 29, 2017.

Van Gompel JJ, Janus JR. Chordoma and Chondrosarcoma. *Otolaryngol Clin N Am*. 2015;48:501–514.

Zheng K, Yu X, Hu Y, et al. Surgical treatment for pelvic giant cell tumor: a multi-center study. *World J Surg Onc*. 2016;14:104.

See all references for Bone Cancer (www.cancer.org/cancer/bone-cancer/references.html)

Last Medical Review: November 28, 2017 Last Revised: February 5, 2018

Radiation Therapy for Bone Cancer

Radiation therapy uses high-energy rays or particles to kill cancer cells. **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 to treat [bone cancer](#)¹.

Most bone cancers are not easily killed by radiation, and high doses are needed. High doses, however, can damage nearby healthy tissues, as well as key structures (like nerves and blood vessels) in the area. This is why radiation therapy is not used as a main treatment for most types of bone tumors. (It is often used for [Ewing tumors](#).²)

Most of the time, radiation is used to treat bone cancers that are **unresectable**. This means they cannot be completely removed with surgery.

Radiation may also be used after surgery if cancer cells were found in the edges (margin) of the removed tissue. Another term for this is **positive margins**. (This is discussed in the section about [surgery](#).) In this case, radiation may be given to kill any cancer that may have been left behind.

If bone cancer comes back after treatment, radiation can help control symptoms like pain and swelling.

Types of radiation therapy

Special types of radiation are most commonly used to treat bone cancer. These types give doctors the best control over the size and strength of the radiation beams so that higher doses get to the tumor and spare the nearby tissues.

Intensity-modulated radiation therapy

Intensity-modulated radiation therapy (IMRT) is an advanced form of external beam radiation therapy. With this technique, a computer matches the radiation beams to the shape of the tumor and can adjust the intensity (strength) of the beams. The radiation is delivered to the tumor from many directions to reduce the amount of radiation that goes through any one area of normal tissue. This makes it possible to reduce radiation damage to normal tissues while increasing the radiation dose to the cancer.

Proton-beam radiation

Proton-beam radiation is a special form of radiation that uses protons instead of regular

x-rays to kill cancer cells. Protons are positively charged particles that are found inside all atoms. They cause little damage to the tissues they pass through but are very good at killing cells at the end of their path. This allows a high dose of radiation to be given to the tumor without hurting the normal tissue around it. Proton-beam radiation therapy requires highly specialized equipment and is not available at all medical centers. This form of radiation is very helpful in treating skull, spine, rib, or sternum (breast bone) chondrosarcomas and chordomas.

Extracorporeal radiation

Though not commonly used, another option is extracorporeal radiation. This may be used when trying to save a limb as part of [limb-salvage surgery](#). It involves taking the bone with cancer out of the body, treating it with radiation, and then putting it back in.

Side effects linked to this include wound healing problems, loss of joint movement, change in limb length, and fractures (breaks) in the treated piece of bone.

Side effects

Side effects of radiation therapy depend on what area of the body is being treated and how much radiation is used. Common [side effects](#)³ include:

- Fatigue (tiredness)
- Loss of appetite
- Skin changes in the area being treated, ranging from redness and hair loss to blistering and peeling
- Low blood counts
- Nausea, vomiting, and diarrhea (these are more common if radiation is given to the belly)

You can learn more in the [radiation section](#)⁴ of our website.

Hyperlinks

1. www.cancer.org/cancer/bone-cancer/about/what-is-bone-cancer.html
2. www.cancer.org/cancer/ewing-tumor.html
3. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html
4. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html

References

See all references for Bone Cancer (www.cancer.org/cancer/bone-cancer/references.html)

Chauhan S, Manoj K, Rastogi S, Khan SA, Prasad A. Biomechanical investigation of the effect of extracorporeal irradiation on resected human bone. *J Mech Behav Biomed Mater*. 2017;65:791-800.

Gutowski CJ, Basu-Mallick A, Abraham JA. Management of Bone Sarcoma. *Surg Clin N Am*. 2016;2016:1077–1106.

Hong AM, Millington S, Ahern V, et al. Limb preservation surgery with extracorporeal irradiation in the management of malignant bone tumor: the oncological outcomes of 101 patients. *Ann Oncol*. 2013;24(10):2676-2680.

National Cancer Institute. Bone Cancer. March 13, 2008. Accessed at www.cancer.gov/types/bone/bone-fact-sheet on December 5, 2017.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology. Bone Cancer. Version 1.2018 -- August 29, 2017.

Van Gompel JJ, Janus JR. Chordoma and Chondrosarcoma. *Otolaryngol Clin N Am*. 2015;48:501–514.

Last Medical Review: November 28, 2017 Last Revised: February 5, 2018

Chemotherapy for Bone Cancer

Chemotherapy (chemo) is the use of drugs to treat cancer. Chemo is **systemic** treatment. This means that the drugs go into the bloodstream and circulate to reach and destroy cancer cells all over the body.

Chemo is often a part of treatment for [Ewing sarcoma](#)¹ and [osteosarcoma](#)².

It isn't used often for other [bone cancers](#)³, like giant cell tumors, chordomas, and chondrosarcomas. These types aren't very sensitive to chemo, so it doesn't work well. It can be useful for a certain type of chondrosarcoma called mesenchymal and high-grade dedifferentiated chordomas. It may be used along with [targeted therapy](#) for some giant cell tumors.

Chemo is sometimes used for bone cancer that has spread through the bloodstream to the lungs and/or other organs.

Commonly used chemo drugs

The drugs mainly used to treat bone cancer include:

- Doxorubicin (Adriamycin[®])
- Cisplatin
- Etoposide (VP-16)
- Ifosfamide (Ifex[®])
- Cyclophosphamide (Cytosan[®])
- Methotrexate
- Vincristine (Oncovin[®])

In most cases, several drugs (2 or 3) are given together.

Side effects of chemotherapy

Chemo kills cancer cells, but it also damages some normal cells. You will be closely watched during treatment and your team will try to prevent or limit side effects. The [side effects](#)⁴ of chemo depend on the type of drugs, the doses used, and the length of time they're taken.

Some common short-term side effects include:

- Nausea and vomiting
- Loss of appetite
- Hair loss
- Mouth sores

It's important to tell your cancer care team about any side effects you have so they can be treated.

Chemotherapy can damage the blood-producing cells in the bone marrow, so you may have low blood cell counts. Low blood cell counts can result in:

- Increased chance of infection (too few white blood cells)
- Easy bleeding or bruising after minor cuts or injuries (too few platelets)
- Fatigue or shortness of breath (too few red blood cells)

While you're getting chemo, your doctor will order [lab tests](#)⁵ to be sure your blood cell counts are at safe levels.

Some side effects are linked to certain drugs. For example:

- **Ifosfamide** and **cyclophosphamide** can damage the lining of the bladder and cause bloody urine. This is called **hemorrhagic cystitis**. It can be prevented by giving a drug called mesna along with the chemo.
- **Cisplatin** may cause nerve damage (called [peripheral neuropathy](#)⁶) leading to problems with numbness, tingling, and even pain in the hands and feet. Kidney damage (called nephropathy) can also occur after treatment with cisplatin. Giving lots of fluid before and after the drug is infused can help prevent this. Cisplatin can sometimes cause problems with hearing (known as ototoxicity). Most often patients with this problem notice they have trouble hearing high-pitched sounds. Your doctor may have you get a hearing test (called an audiogram) before giving cisplatin.
- Over time, **doxorubicin** can damage the heart. The risk of this goes up as the total amount of the drug given goes up. Before giving doxorubicin, your doctor may test your heart function to make sure that it's safe to give you this drug.

It's important to note that many of the serious side effects are rare, but they can happen. Talk with your cancer care team so you know what to expect from the chemo you're getting.

The doctors and nurses will watch closely for side effects. There are treatments for most side effects, but preventing them is important. Most side effects, if not all of them, will go away over time after treatment is over. Do not hesitate to ask your cancer care team any questions about side effects.

To learn more, see the [chemotherapy section](#)⁷ of our website.

Hyperlinks

1. www.cancer.org/cancer/ewing-tumor.html
2. www.cancer.org/cancer/osteosarcoma.html
3. www.cancer.org/cancer/bone-cancer/about/what-is-bone-cancer.html
4. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html
5. www.cancer.org/treatment/understanding-your-diagnosis/tests.html
6. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/peripheral-neuropathy.html
7. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html

References

See all references for Bone Cancer (www.cancer.org/cancer/bone-cancer/references.html)

Benjamin RS, Wagner MJ, Livingston JA, Ravi V, Patel SR. Chemotherapy for Bone Sarcomas in Adults: The MD Anderson Experience. *Am Soc Clin Oncol Educ Book*. 2015:e656-e660.

George B, Bresson D, Herman P, Froelich S. Chordomas: A Review. *Neurosurg Clin N Am*. 2015;26(3):437-452.

Gutowski CJ, Basu-Mallick A, Abraham JA. Management of Bone Sarcoma. *Surg Clin N Am*. 2016;2016:1077–1106.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology. Bone Cancer. Version 1.2018 -- August 29, 2017.

Van Gompel JJ, Janus JR. Chordoma and chondrosarcoma. *Otolaryngol Clin North Am*. 2015;48(3):501-514.

Last Medical Review: November 28, 2017 Last Revised: February 5, 2018

Targeted Therapy for Bone Cancer

As researchers have learned more about the molecular and genetic changes in cells that cause cancer, they have been able to develop newer drugs that specifically target some of these changes. These drugs, called [targeted therapy](#)¹ drugs, work differently from standard chemotherapy (chemo) drugs and have different side effects. Targeted drugs are especially important in diseases like chordomas and other bone cancers, where chemo has not been very useful. They may prove to be a better treatment for these cancers. A lot of researchers are looking at how these drugs might be used to treat primary bone cancers.

Imatinib

Some chordomas have [gene defects](#)² (mutations) that make proteins that signal the cells to grow. The drug imatinib (Gleevec[®]) is a targeted therapy drug that can block the signals from these genes. This can make some tumors stop growing or even shrink a little. Imatinib is used to treat chordomas that have spread or have come back after treatment. Imatinib has been used to treat chordomas for many years, but it isn't approved by the FDA (Food and Drug Administration) to treat this type of cancer. It is approved to treat other cancers.

This drug is a pill, taken with food once a day. Common [side effects](#)³ are mild and can include diarrhea, nausea, muscle pain, and fatigue. These are generally mild. Some people taking the drug have itchy skin rashes. Fluid build-up around the eyes, feet, or belly can also be a problem.

Denosumab

Denosumab (Xgeva[®] or Prolia[®]) is a [monoclonal antibody](#)⁴ (a man-made version of an immune system protein) that binds to a protein called RANK ligand. RANK ligand normally tells cells called osteoclasts to break down bone, but when denosumab binds to it, that action is blocked. In patients with giant cell tumors of bone that have either come back after surgery or cannot be removed with surgery, denosumab can help shrink tumors for a while.

To treat giant cell tumors, this drug is injected under the skin (sub-q or SQ). Often, it can take months for the tumor to shrink.

Most [side effects](#)⁵ are mild and can include body aches, fatigue, and nausea. A rare but very distressing side effect of denosumab is damage to the jawbone called **osteonecrosis of the jaw** (ONJ). ONJ often starts as an open sore in the jaw that won't heal. It can lead to loss of teeth and/or infections of the jaw bone. Doctors don't know why this happens, but it can be triggered by having a tooth removed while taking the

drug. The best treatment is also unclear, other than to stop denosumab. 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.

For more general information about these drugs, see the [targeted cancer therapy](#)⁶ section of our website.

Interferon

Interferons are not exactly targeted therapies. They're a family of substances naturally made by our immune system. Interferon-alpha is the type that may be used to treat giant cell tumors of the bone that have come back after treatment (recurred) or spread (metastasized).

This drug is most often given as a daily 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. They do improve after the drug is stopped. 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 use the immune system, see [Immunotherapy](#)⁷.

Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/targeted-therapy.html
2. www.cancer.org/cancer/cancer-causes/genetics/genes-and-cancer.html
3. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html
4. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy/monoclonal-antibodies.html
5. www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html
6. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/targeted-therapy.html

7. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy.html

References

See all references for Bone Cancer (www.cancer.org/cancer/bone-cancer/references.html)

Amgen Inc. Xgeva® (denosumab), Highlights of Prescribing Information, 6/2015. Accessed at www.accessdata.fda.gov/drugsatfda_docs/label/2016/125320Orig1s1771bl.pdf on December 5, 2017.

Benjamin RS, Wagner MJ, Livingston JA, Ravi V, Patel SR. Chemotherapy for Bone Sarcomas in Adults: The MD Anderson Experience. *Am Soc Clin Oncol Educ Book*. 2015:e656-660.

Colia V, Stacchiotti S. Medical treatment of advanced chordomas. *Eur J of Ca*. 2017;83:220-228.

Mavrogenis AF, Igoumenou VG, Megaloikonomos PD, et al. Giant cell tumor of bone revisited. *SICOT J*. 2017;3:54.

Merck & Co., Inc. Product Information INTRON® A, Interferon alfa-2b, Recombinant For Injection, 2/2016. Accessed at www.merck.com/product/usa/pi_circulars/i/intron_a/intron_a_pi.pdf on December 5, 2017.

Novartis Pharmaceuticals Corporation. Gleevec® (imatinib mesylate), Highlights of Prescribing Information, 9/2017. Accessed at www.accessdata.fda.gov/drugsatfda_docs/label/2017/021588s0521bl.pdf on December 5, 2017.

Polychronidou G, Karavasilis V, Pollack SM, et al. Novel therapeutic approaches in chondrosarcoma. *Future Oncol*. 2017;13(7):637-648.

Last Medical Review: November 28, 2017 Last Revised: January 3, 2019

Treating Specific Bone Cancers

Information on treating [Ewing sarcoma](#)¹ and [osteosarcoma](#)² is not covered here. Please see the American Cancer Society information on those cancers to learn more.

Chondrosarcomas

After a [biopsy](#)³ confirms the diagnosis, [surgery](#) is done to remove the tumor. Again, it's important that the biopsy be done by the same surgeon who will remove the tumor.

For a low-grade chondrosarcoma in an arm or leg, [curettage with cryotherapy](#) is an option.

If the tumor is high-grade, [limb-sparing surgery](#) will be done if possible. Sometimes [amputation](#) is needed to completely remove the cancer. If the chondrosarcoma has spread to the lungs and there are only a few tumors, they may be removed surgically.

Chondrosarcomas in the skull are hard to treat. Complete surgical removal is difficult, and might cause serious side effects. Some low-grade tumors are treated with curettage and cryosurgery.

Sometimes the patient is treated with [radiation therapy](#) before and/or after surgery. Radiation can also be used if surgery can't be done. Since chondrosarcomas are resistant to radiation, high doses are required. [Proton-beam radiation](#) works best for these tumors.

[Chemotherapy](#) (chemo) is not often used to treat chondrosarcoma, because it doesn't work. Most types of chondrosarcoma are resistant to chemo. Still, chemo can be used to treat some special types of chondrosarcoma. For example, dedifferentiated chondrosarcoma is often treated like [osteosarcoma](#)⁴, with chemo followed by surgery and then more chemo. Patients with mesenchymal chondrosarcomas also get chemo before surgery. These tumors are treated the same as [Ewing tumors](#)⁵ or [soft tissue sarcomas](#)⁶.

Malignant fibrous histiocyomas (MFH)

MFH is treated the same way [osteosarcoma is treated](#)⁷.

Often the patient is treated first with [chemotherapy](#) to shrink the tumor. Then the tumor and some surrounding normal tissue is removed (wide-excision). After surgery, the

bone may be reconstructed with a bone graft or a prosthesis (metallic rod). Amputation is rarely needed.

In some cases, chemotherapy is also given after [surgery](#).

Fibrosarcomas

[Surgery](#) is the main treatment for this kind of cancer. The goal is take out the tumor and a margin of surrounding normal bone.

This tumor tends to come back in the same place it started, so [radiation](#) may be given after surgery to help keep this from happening. Radiation is also used if the doctor suspects that some cancer has been left behind.

Radiation is sometimes used instead of surgery if the tumor cannot be removed completely. It also can be used if a fibrosarcoma returns after surgery.

Chemotherapy may be tried, but this has not been studied well, and it's not clear that it helps.

Giant cell tumors of bone

These are treated mainly with [surgery](#). Different operations are used, depending on the size and location of the tumor. Overall, treatment is much like the [treatment⁸for osteosarcoma⁹](#).

One option is wide-excision. This often means removing the part of the bone that has the tumor, and replacing it with a bone graft or prosthesis (such as a metal rod). If this operation can be done without seriously affecting the ability of the limb to move or without causing serious damage to nearby tissues, this approach has a good likelihood of success.

Another option is curettage followed by cryosurgery. The defect (hole) in the bone can then be filled in with bone cement or a bone graft.

Amputation is rarely needed to treat a giant cell tumor.

[Radiation](#) therapy may sometimes be used for giant cell tumors in bones where surgery may be hard to do without damaging nearby sensitive tissues such as tumors in the skull or spine. Radiation is not often used to treat giant cell tumors because if the non-cancerous tumor is not completely destroyed, it might increase the chance that it comes

back as cancer.

If a giant cell bone tumor spreads to other organs, the lungs are most commonly affected. If there are only a few tumors in the lungs, it might be possible to remove them surgically.

Because these tumors are benign, chemotherapy isn't used.

Both primary tumors and metastases that can't be removed can be treated with radiation with or without the [targeted therapy](#) drug denosumab (Xgeva).

Chordomas

This rare primary tumor of bone most often occurs in the base of the skull or the lower bones of the spine. The best treatment is a [wide excision](#) to remove all of the tumor with some nearby normal tissue. This is not always possible because the spinal cord and nearby nerves may be involved. Still, as much of the tumor will be removed as possible

[Radiation](#) may be given after surgery to lower the chance that the tumor will grow back. Proton-beam radiation, either alone or with intensity-modulated radiation therapy, is best. Radiation may also be used if the tumor cannot be taken out with surgery.

Imatinib (Gleevec) is a [targeted therapy](#) drug that may be used for a chordoma that has spread widely. It rarely shrinks the tumors, but it can slow down tumor growth and help ease symptoms.

So far, [chemo](#) hasn't been found to work by itself. Still, it may be used to treat high-grade/dedifferentiated types of chordoma.

Chordomas can come back, even 10 or more years after treatment, so long-term follow-up is important.

Hyperlinks

1. www.cancer.org/cancer/ewing-tumor.html
2. www.cancer.org/cancer/osteosarcoma.html
3. www.cancer.org/cancer/bone-cancer/detection-diagnosis-staging/how-diagnosed.html
4. www.cancer.org/cancer/osteosarcoma.html

5. www.cancer.org/cancer/ewing-tumor.html
6. www.cancer.org/cancer/soft-tissue-sarcoma.html
7. www.cancer.org/cancer/osteosarcoma/treating.html
8. www.cancer.org/cancer/osteosarcoma/treating.html
9. www.cancer.org/cancer/osteosarcoma/treating.html

References

See all references for Bone Cancer (www.cancer.org/cancer/bone-cancer/references.html)

Benjamin RS, Wagner MJ, Livingston JA, Ravi V, Patel SR. Chemotherapy for Bone Sarcomas in Adults: The MD Anderson Experience. *Am Soc Clin Oncol Educ Book*. 2015:e656-660.

Colia V, Stacchiotti S. Medical treatment of advanced chordomas. *Eur J Cancer*. 2017;83:220-228.

Giridhar P, Mallick S, Haresh KP, et al. Intracranial fibrosarcoma treated with adjuvant radiation and temozolomide: Report of a case and review of all published cases. *J Egypt Natl Canc Inst*. 2016;28(2):111-116.

Mavrogenis AF, Igoumenou VG, Megaloikonomos PD, et al. Giant cell tumor of bone revisited. *SICOT J*. 2017;3:54.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology. Bone Cancer. Version 1.2018 -- August 29, 2017.

Özkurt B, Baarr K, Yldz YH, Kalem M, Salk Y. Primary malignant fibrous histiocytoma of long bones: long-term follow-up. *Ekleml Hastalik Cerrahisi*. 2016;27(2):94-99.

Polychronidou G, Karavasilis V, Pollack SM, et al. Novel therapeutic approaches in chondrosarcoma. *Future Oncol*. 2017;13(7):637-648.

Van Gompel JJ, Janus JR. Chordoma and chondrosarcoma. *Otolaryngol Clin North Am*. 2015;48(3):501-514.

Zheng K, Yu X, Hu Y, et al. Surgical treatment for pelvic giant cell tumor: a multi-center study. *World J Surg Onc*. 2016;14:104

Last Medical Review: November 28, 2017 Last Revised: February 5, 2018

Written by

The American Cancer Society medical and editorial content team
(www.cancer.org/cancer/acs-medical-content-and-news-staff.html)

Our team is made up of doctors and oncology certified nurses with deep knowledge of cancer care as well as journalists, editors, and translators with extensive experience in medical writing.

cancer.org | 1.800.227.2345