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Bone Cancer Early Detection, Diagnosis, and Staging

Detection and Diagnosis

Finding cancer early -- while it's small and before it has spread -- often allows for more treatment options. Some early cancers may have signs and symptoms that can be noticed, but that's not always the case.

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

Stages and Outlook (Prognosis)

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

- [Bone Cancer Stages](#)
- [Survival Rates for Bone Cancer](#)

Questions to Ask About Bone Cancer

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

- [Questions to Ask About Bone Cancer](#)
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Can Bone Cancer Be Found Early?

There are tests that can be used to find some cancers early (such as breast, cervical, colorectal, and skin cancer), before they cause symptoms. At this time, no special tests are available to find bone cancers early. The best way to find these cancers early is to see a health care provider right away if you have [signs and symptoms](#) of this disease.

References

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

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Signs and Symptoms of Bone Cancer

Pain

Pain in the affected bone is the most common sign of bone cancer. At first, the pain is not constant. It may be worse at night or when the bone is used, for instance, leg pain when walking. As the cancer grows, the pain will be there all the time, and get worse with activity.

Swelling

Swelling in the area of the pain may not occur until weeks later. It might be possible to feel a lump or mass depending on where the tumor is.

Cancers in the bones of the neck can cause a lump in the back of the throat that can lead to trouble swallowing or make it hard to breathe.

Fractures

Bone cancer can weaken the bone it's in, but most of the time the bones do not fracture (break). People with a fracture next to or through a bone tumor usually describe sudden severe pain in a bone that had been sore for a few months.

Other symptoms

Cancer in the bones of the spine can press on nerves, causing numbness and tingling or even weakness.

Cancer can cause weight loss and fatigue. If the cancer spreads to internal organs it may cause other symptoms, too. For instance, if the cancer spreads to the lungs, it can cause trouble breathing.

These symptoms are more often due to conditions other than cancer, such as injuries or arthritis. Still, if these problems go on for a long time without a known reason, you should see your doctor.

References

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Tests for Bone Cancer

Symptoms, a physical exam, and the results of [imaging tests](#)¹, and [blood tests](#)² might suggest that a person has [bone cancer](#)³. But in most cases, doctors must confirm this by testing a tissue or cell sample and checking it with a microscope (a procedure known as a [biopsy](#)⁴).

Accurate diagnosis of a bone tumor often depends on combining information about what bone is affected and which part of the bone is involved, how it looks on x-rays, and what the cells look like under a microscope.

Other diseases, like bone infections, can cause symptoms and imaging results that might be confused with bone cancer.

[Bone metastasis](#)⁵ can also look like primary bone cancer. Bone tumors are more often caused by cancer that has spread to the bone from some other part of the body. This is a bone metastasis. A single bone metastasis can have the same signs and symptoms as a primary bone tumor, so many doctors require a biopsy to diagnose a patient's first bone metastasis. After that, new bone metastases can usually be diagnosed based on x-rays and other imaging tests.

Imaging tests

X-rays

Most bone cancers show up on [x-rays](#)⁶ of the bone. The bone at the site of the cancer may look "ragged" instead of solid. The cancer can also appear as a hole in the bone. Sometimes doctors can see a tumor around the defect in the bone that might extend into nearby tissues (such as muscle or fat). The radiologist (doctor who specializes in reading x-rays) can often tell if a tumor is malignant by the way it appears on the x-ray, but only a biopsy can tell for sure.

A chest x-ray is often done to see if bone cancer has spread to the lungs.

Computed tomography (CT) scans

[CT scans](#)⁷ are helpful in [staging cancer](#)⁸. They help show if the bone cancer has spread to your lungs, liver, or other organs. The scans show the [lymph nodes](#)⁹ and distant organs where there might be cancer spread.

CT scans can also be used to guide a biopsy needle into a tumor. This is called a CT-guided needle biopsy. For this test, you stay on the CT scanning table while a radiologist moves a biopsy needle toward the tumor. CT scans are repeated until the tip of the needle is within the mass. (See Needle biopsy below.)

Magnetic resonance imaging (MRI) scans

[MRI scans](#)¹⁰ are often the best test for outlining a bone tumor. They are very helpful for looking at the brain and spinal cord.

Radionuclide bone scans

[Bone scans](#)¹¹ can show if a cancer has spread to other bones. It can find smaller areas of metastasis than regular x-rays. Bone scans also can show how much damage the cancer has caused in the bone.

Areas of diseased bone will be seen on the bone scan as dense, gray to black areas, called “hot spots.” These areas suggest cancer is present, but arthritis, infection, or other bone diseases can also cause hot spots. Other imaging tests or a bone biopsy may be needed to know what's causing the change.

Positron emission tomography (PET or PET) scans

[PET scans](#)¹² use glucose (a form of sugar) that's attached to a radioactive atom. A special camera can detect the radioactivity. Cancer cells absorb a lot of the radioactive sugar because of their high rate of metabolism. PET scans are useful in looking for cancer throughout your entire body. It can sometimes help tell if a tumor is cancer or not cancer (benign). It's often combined with CT scans to better pinpoint some kinds of cancer.

Biopsy

A [biopsy](#)¹³ takes a piece of tissue from a tumor so that it can be looked at with a microscope and tested in the lab. This is the only way to know that the tumor is cancer and not another bone disease.

If it is cancer, the biopsy can tell the doctor if it's a primary bone cancer or cancer that started somewhere else and spread to the bone (metastasis). Many types of tissue and cell samples are used to diagnose bone cancer. It's very important that your biopsy be done by a surgeon with experience in diagnosing and treating bone tumors.

The type of biopsy done is based on whether the tumor looks benign (not cancer) or malignant (cancer) and exactly what type of tumor it most likely is (based on x-rays, the patient's age, and where the tumor is). Some kinds of bone tumors can be diagnosed from needle biopsy samples, but larger samples (from a surgical biopsy) are often needed to diagnose other types.

Whether the surgeon plans to remove the entire tumor during the biopsy will also impact the type of biopsy done. Sometimes the wrong kind of biopsy can make it hard for the surgeon to later remove all of the cancer without having to also remove all or part of the arm or leg containing the tumor. It also may cause the cancer to spread.

Needle biopsy

There are 2 types of needle biopsies: **fine (aspiration)** and **core**. For both types, a drug is first used to numb the area for the biopsy.

For **fine needle aspiration** (FNA), the doctor uses a very thin needle and a syringe to take out a small amount of fluid and some cells from the tumor. Sometimes, the doctor can aim the needle by feeling the tumor if it's near the surface of the body. If the tumor is too deep to feel, the doctor can guide the needle while looking at a CT scan. This is called a CT guided needle biopsy and it is often done by an x-ray specialist known as an interventional radiologist.

In a **core needle biopsy**, the doctor uses a larger needle to remove a small cylinder of tissue (about 1/16 inch in diameter and 1/2 inch long). Many experts feel that a core needle biopsy is better than FNA to diagnose a primary bone cancer.

Surgical bone biopsy

In this procedure, a surgeon needs to cut through the skin to reach the tumor to remove a small piece of tissue. This is also called an **incisional biopsy**. If the entire tumor is removed (not just a small piece), it's called an **excisional biopsy**.

These biopsies are often done with the patient under general anesthesia (drugs are used to put you into a deep asleep). They can also be done using a nerve block, which numbs a large area. If this type of biopsy is needed, it's important that the surgeon who will later remove the cancer also be the one to do the biopsy.

Hyperlinks

1. www.cancer.org/treatment/understanding-your-diagnosis/tests/imaging-radiology-tests-for-cancer.html
2. www.cancer.org/treatment/understanding-your-diagnosis/tests.html
3. www.cancer.org/cancer/bone-cancer/about/what-is-bone-cancer.html
4. www.cancer.org/treatment/understanding-your-diagnosis/tests/testing-biopsy-and-cytology-specimens-for-cancer.html
5. www.cancer.org/treatment/understanding-your-diagnosis/advanced-cancer.html
6. www.cancer.org/treatment/understanding-your-diagnosis/tests/x-rays-and-other-radiographic-tests.html
7. www.cancer.org/treatment/understanding-your-diagnosis/tests/ct-scan-for-cancer.html
8. www.cancer.org/treatment/understanding-your-diagnosis/staging.html
9. www.cancer.org/cancer/cancer-basics/lymph-nodes-and-cancer.html

10. www.cancer.org/treatment/understanding-your-diagnosis/tests/mri-for-cancer.html
11. www.cancer.org/treatment/understanding-your-diagnosis/tests/nuclear-medicine-scans-for-cancer.html
12. www.cancer.org/treatment/understanding-your-diagnosis/tests/nuclear-medicine-scans-for-cancer.html
13. www.cancer.org/treatment/understanding-your-diagnosis/tests/testing-biopsy-and-cytology-specimens-for-cancer.html

References

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

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Bone Cancer Stages

After someone is diagnosed with bone cancer, 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](#)¹. Doctors also use a cancer's stage when talking about survival statistics.

Bone cancers are staged I (1) through IV (4). As a rule, the lower the number, the less the cancer has spread. A higher number, such as stage IV, means cancer has spread more. And within a stage, an earlier letter means a lower stage. Although each person's cancer experience is unique, cancers with similar stages tend to have a similar outlook and are often treated in much the same way.

How is the stage determined?

The staging system most often used for bone cancer is the American Joint Committee on Cancer (AJCC) **TNM** system, which is based on 4 key pieces of information:

- The extent (size) of the **tumor (T)**: How large is the cancer? Is it in more than one spot in the bone?
- The spread to nearby lymph **nodes (N)**: Has the cancer spread to nearby lymph nodes?
- The spread (**metastasis**) to distant sites (**M**): Has the cancer spread to the lungs only or to distant sites such as other bones or the liver?
- The **grade** of the cancer (**G**): How abnormal do the cells look when seen under a microscope?

The scale used for grading bone cancer is from 1 to 3. Low-grade cancers (G1) tend to grow and spread more slowly than high-grade (G2 or G3) cancers.

- Grade 1 (G1) means the cancer looks much like normal bone tissue.
- Grade 3 (G3) means the cancer looks very abnormal.
- Grade 2 (G2) falls somewhere in between.

The staging system described below is the most recent AJCC system effective January 2018 and applies to bone cancers of the appendicular skeleton (such as bones in the arms and legs), trunk, skull, and facial bones. Bone cancers of the pelvis and spine use different T categories and it is best to speak with your doctor about your stage for these specific cancers.

Numbers or letters after T, N, and M provide more details about each of these factors. Higher numbers mean the cancer is more advanced. Once a person's T, N, and M categories have been determined, this information is combined in a process called **stage grouping** to assign an overall stage. For more information see [Cancer Staging](#)².

The staging system in the table below uses the **pathologic stage** (also called the surgical stage). It is determined by examining tissue removed during [an operation](#)³. Sometimes, if surgery is not possible right away or at all, the cancer will be given a **clinical stage** instead. This is based on the results of a [physical exam, biopsy, and imaging tests](#). The clinical stage will be used to help plan treatment. Sometimes, though, the cancer has spread further than the clinical stage estimates, and may not predict the patient's outlook as accurately as a pathologic stage.

Cancer staging can be complex, so ask your doctor to explain it to you in a way you understand.

AJCC stage	Stage grouping	Stage description*
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IA	T1 N0 M0 G1 or GX	The cancer is 8 centimeters (cm) across (about 3 inches) or smaller(T1). It has not spread to nearby lymph nodes (N0) or to distant sites (M0). The cancer is low grade (G1) or the grade cannot be determined (GX).
	T2 N0 M0 G1 or GX	The cancer is larger than 8 cm (3 inches) across (T2). It has not spread to nearby lymph nodes (N0) or to distant sites (M0). The cancer is low grade (G1) or the grade cannot be determined (GX).
IB	OR	
	T3 N0 M0 G1 or GX	The cancer is in more than one place on the same bone (T3). It has not spread to nearby lymph nodes (N0) or to distant sites (M0). The cancer is low grade (G1) or the grade cannot be determined (GX).
IIA	T1 N0 M0 G2 or G3	The cancer is 8 centimeters (cm) across (about 3 inches) or less (T1). It has not spread to nearby lymph nodes (N0) or to distant sites (M0). The cancer is high grade (G2 or G3).
IIB	T2 N0 M0 G2 or G3	The cancer is larger than 8 cm (3 inches) across (T2). It has not spread to nearby lymph nodes (N0) or to distant sites (M0). The cancer is high grade (G2 or G3).
III	T3 N0 M0	The cancer is in more than one place on the same bone (T3). It has not spread to nearby lymph nodes (N0) or to distant sites (M0). The cancer is high grade (G2 or G3).

	G2 or G3	
IVA	Any T N0 M1a Any G	The cancer can be any size and may be in more than one place in the bone (Any T) AND has not spread to nearby lymph nodes (N0). It has spread only to the lungs (M1a). The cancer can be any grade (Any G).
	Any T N1 Any M Any G	The cancer can be any size and may be in more than one place in the bone (Any T) AND it has spread to nearby lymph nodes (N1). It may or may not have spread to distant organs like the lungs or other bones (Any M). The cancer can be any grade (Any G).
IVB	OR	
	Any T Any N M1b Any G	The cancer can be any size and may be in more than one place in the bone (Any T) and it might or might not have spread to nearby lymph nodes (Any N). It has spread to distant sites like other bones, the liver or brain (M1b). The cancer can be any grade (Any G).

* The following additional categories are not listed on the table above:

- **TX:** Main tumor cannot be assessed due to lack of information.
- **T0:** No evidence of a primary tumor.
- **NX:** Regional lymph nodes cannot be assessed due to lack of information.

Hyperlinks

1. www.cancer.org/cancer/bone-cancer/treating.html
2. www.cancer.org/treatment/understanding-your-diagnosis/staging.html
3. www.cancer.org/cancer/bone-cancer/treating/surgery.html

References

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

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Survival Rates for Bone Cancer

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 you will live, but they may help give you a better understanding of how likely it is that your 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, 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 often stage) of cancer to people in the overall population. For example, if the **5-year relative survival rate** for a specific type and stage of bone cancer is 80%, it means that people who have that cancer are, on average, about 80% 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 different types of bone cancer in the United States, based on how far the cancer has spread. The SEER database, however, does not group cancers by [AJCC 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 grown outside the bone and into nearby bones or other structures, or it has reached nearby 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 bone cancer

These numbers are based on people diagnosed with certain types of bone cancer between 2009 and 2015. For rates for some of the other more common types of bone cancer, see [Survival Rates for Osteosarcoma](#)¹ or [Survival Rates for Ewing Tumors](#)².

Chondrosarcoma

SEER stage	5-year relative survival rate
Localized	91%
Regional	75%
Distant	22%
All SEER stages combined	78%

Chordoma

SEER stage	5-year relative survival rate
Localized	87%
Regional	83%
Distant	55%
All SEER stages combined	82%

Some types of bone cancers are so rare that survival rates are only available for all stages combined, instead of for individual SEER stages. For example, the 5-year relative survival rate for **giant cell tumor of bone** for all stages combined is 79%.

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 your age and overall health, the type and location of the cancer, and how well the cancer responds to treatment, can also affect your outlook.
- **People now being diagnosed with bone cancer 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.

*SEER = Surveillance, Epidemiology, and End Results

Hyperlinks

1. www.cancer.org/cancer/osteosarcoma/detection-diagnosis-staging/survival-rates.html
2. www.cancer.org/cancer/ewing-tumor/detection-diagnosis-staging/survival-rates.html

References

Howlader N, Noone AM, Krapcho M, et al (eds). SEER Cancer Statistics Review, 1975-2016, National Cancer Institute, Bethesda, MD, https://seer.cancer.gov/csr/1975_2016/, based on November 2018 SEER data submission, posted to the SEER website, April 2019.

References

Howlader N, Noone AM, Krapcho M, et al (eds). SEER Cancer Statistics Review, 1975-2016, National Cancer Institute, Bethesda, MD, https://seer.cancer.gov/csr/1975_2016/, based on November 2018 SEER data submission, posted to the SEER website, April 2019.

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Questions to Ask About Bone Cancer

As you cope with cancer and cancer treatment, you need to have honest, open discussions with your doctor. You should be able to ask any question no matter how small it might seem. Nurses, social workers, and other members of the treatment team may also be able to answer many of your questions.

- What [kind](#)¹ of bone cancer do I have?
- Has my cancer spread?
- What is the [stage](#) of my cancer and what does that mean?
- What are my [treatment](#)² choices?
- What do you recommend and why?
- What risks or side effects are there to the treatments you suggest?
- What are the chances of my cancer coming back with these treatment plans?
- What should I do to be ready for treatment?
- Based on what you've learned about my cancer, how long do you think I'll survive?

In addition to these sample questions, be sure to write down some of your own. For instance, you might want more information about recovery times so that you can plan your work schedule. Or you might want to ask about second opinions or about clinical trials. You can find more information about communicating with your health care team in [The Doctor-Patient Relationship](#)³.

Hyperlinks

1. www.cancer.org/cancer/bone-cancer/about/what-is-bone-cancer.html
2. www.cancer.org/cancer/bone-cancer/treating.html
3. www.cancer.org/treatment/finding-and-paying-for-treatment/choosing-your-treatment-team/the-doctor-patient-relationship.html

References

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

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