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# Bone Cancer Causes, Risk Factors, and Prevention

Learn about the risk factors for bone cancer and if there are things you might be able to do to help lower your risk.

## 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 bone cancer.

- [Risk Factors for Bone Cancer](#)
- [What Causes Bone Cancer?](#)

## Prevention

At this time there is no way to prevent this cancer.

- [Can Bone Cancer Be Prevented?](#)

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# Risk Factors for Bone Cancer

- [Chondrosarcoma risk factors](#)
- [Chordoma risk factors](#)
- [Other risk factors for bone cancer](#)

*The information here focuses on primary bone cancers (cancers that start in bones) that most often are seen in adults. Information on [Osteosarcoma](#)<sup>1</sup>, [Ewing Tumors \(Ewing sarcomas\)](#)<sup>2</sup>, and [Bone Metastases](#)<sup>3</sup> is covered separately.*

A risk factor is anything that raises your chances of getting a disease such as cancer. Different cancers have different risk factors. Some risk factors, like smoking, can be changed. Others, like a person's age or family history, can't be changed.

But having a risk factor, or even several risk factors, does not mean that you will get the disease. Many people with one or more risk factors never get cancer, while others who get cancer may have had few or no known risk factors.

There are different [types of primary bone cancers](#)<sup>4</sup> (cancers that start in the bones), and while they might have some things in common, these different cancers do not all have the same risk factors.

Many bone cancers are not linked with any known risk factors and have no obvious cause. But there are a few factors that can raise the risk of some types of bone cancers.

The main risk factors for [osteosarcoma](#)<sup>5</sup> and [Ewing tumors](#)<sup>6</sup> are discussed elsewhere.

## Chondrosarcoma risk factors

**Older age:** Most chondrosarcomas occur in older adults, although they can develop in younger people as well.

**Benign bone tumors:** Having certain types of benign (non-cancerous) bone tumors can increase a person's risk of chondrosarcoma.

For example, an **enchondroma** is a benign cartilage tumor that can develop in the middle of a bone. These tumors rarely transform into chondrosarcomas, but people with many of these tumors (a condition called **multiple enchondromatosis**) have an increased risk of chondrosarcoma. Sometimes this condition is linked with inherited changes in the *IDH1* or *IDH2* genes.

**Multiple exostoses** (also known as **multiple osteochondromas**) is an inherited condition in which a person has many benign bone tumors called **osteochondromas**, which are made mostly of cartilage. These tumors can sometimes be painful and can lead to deformed or fractured bones. Each tumor also has a small chance of transforming into a chondrosarcoma. This disorder is most often caused by inherited

changes (mutations) in either the *EXT1* or *EXT2* gene.

## Chordoma risk factors

Most chordomas do not have a known cause. But a small number of chordomas seem to run in families (known as **familial chordoma**). This is often linked to a mutation (change) in the *TBXT* gene that a person inherits from a parent.

Patients with **tuberous sclerosis**, an inherited syndrome caused by a defect (mutation) in either the *TSC1* or *TSC2* gene, seem to have a high risk of chordoma during childhood, although this seems to be rare overall.

## Other risk factors for bone cancer

There are few known risk factors for other, less common types of bone cancer, although there are some factors that increase the risk for several types of bone cancer.

**Paget disease of bone:** This is a benign condition that occurs mostly in older people, in which an area (or areas) of bone becomes more active than normal. This can result in abnormal bone that is more likely to fracture (break). People with this condition have a small chance of developing bone tumors in these areas. Most often this is an osteosarcoma, but it can also be a less common type of bone tumor, such as a giant cell tumor of bone.

**Previous radiation therapy:** People who have received radiation therapy (usually to treat another type of cancer) have a slightly increased risk of developing bone cancer in the area that was treated. This risk is higher in people who were treated when they were younger (especially as children) and those who were treated with higher doses of radiation.

These cancers tend to develop many years (often decades) after the radiation therapy was given. Most often these are osteosarcomas, but they also can be less common types of bone cancer, such as fibrosarcoma of bone or undifferentiated pleomorphic sarcoma (UPS) of bone.

## Hyperlinks

1. [www.cancer.org/cancer/types/osteosarcoma.html](http://www.cancer.org/cancer/types/osteosarcoma.html)
2. [www.cancer.org/cancer/types/ewing-tumor.html](http://www.cancer.org/cancer/types/ewing-tumor.html)
3. [www.cancer.org/cancer/managing-cancer/advanced-cancer/bone-metastases.html](http://www.cancer.org/cancer/managing-cancer/advanced-cancer/bone-metastases.html)
4. [www.cancer.org/cancer/types/bone-cancer/about/what-is-bone-cancer.html](http://www.cancer.org/cancer/types/bone-cancer/about/what-is-bone-cancer.html)
5. [www.cancer.org/cancer/types/osteosarcoma/causes-risks-prevention/risk-factors.html](http://www.cancer.org/cancer/types/osteosarcoma/causes-risks-prevention/risk-factors.html)
6. [www.cancer.org/cancer/types/ewing-tumor/causes-risks-prevention/risk-factors.html](http://www.cancer.org/cancer/types/ewing-tumor/causes-risks-prevention/risk-factors.html)

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Anderson ME, Dubois SG, Gebhart MC. Chapter 89: Sarcomas of bone. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, Pa: Elsevier; 2020.

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# What Causes Bone Cancer?

*The information here focuses on primary bone cancers (cancers that start in bones) that most often are seen in adults. Information on [Osteosarcoma](#)<sup>1</sup>, [Ewing Tumors \(Ewing sarcomas\)](#)<sup>2</sup>, and [Bone Metastases](#)<sup>3</sup> is covered separately.*

There are different [types of primary bone cancers](#)<sup>4</sup> (cancers that start in the bones), and while they might have some things in common, these different cancers most likely do not all have the same causes.

Researchers have found some [risk factors for bone cancer](#), but often it's not clear exactly how these factors might affect how cells in the bones become cancer cells. Research is underway to learn more about the causes of these cancers.

Scientists have learned how certain changes in the **DNA** in bone cells can cause them to become cancerous. DNA is the chemical in 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.

- Genes that normally help cells grow, divide, or stay alive can sometimes change to become **oncogenes**.
- Genes that help keep cell division under control, repair mistakes in DNA, or make cells die at the right time are called **tumor suppressor genes**.

Cancers can be caused by gene mutations (defects) that create oncogenes, or that turn off tumor suppressor genes.

Some people inherit gene mutations (changes) from a parent that increase their risk of bone cancer. (See [Risk Factors for Bone Cancer](#).) Some of these mutations are now known, and [genetic testing](#)<sup>5</sup> can look for them.

**But the gene changes leading to bone cancer are usually acquired during life rather than inherited from a parent.** These changes sometimes result from factors such as exposure to radiation, but most of these changes are probably just random events that sometimes happen inside a cell, without having an outside cause. These mutations are present only in the cancer cells, so they cannot be passed on to the person's children.

Scientists are making progress in understanding these genetic changes and how they

happen, but there are still many things that are not completely understood at this time. As more is learned about these changes, it might help doctors find better ways to prevent, diagnose, and treat these cancers.

## Hyperlinks

1. [www.cancer.org/cancer/types/osteosarcoma.html](http://www.cancer.org/cancer/types/osteosarcoma.html)
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3. [www.cancer.org/cancer/managing-cancer/advanced-cancer/bone-metastases.html](http://www.cancer.org/cancer/managing-cancer/advanced-cancer/bone-metastases.html)
4. [www.cancer.org/cancer/types/bone-cancer/about/what-is-bone-cancer.html](http://www.cancer.org/cancer/types/bone-cancer/about/what-is-bone-cancer.html)
5. [www.cancer.org/cancer/risk-prevention/genetics.html](http://www.cancer.org/cancer/risk-prevention/genetics.html)

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Anderson ME, Dubois SG, Gebhart MC. Chapter 89: Sarcomas of bone. In: Niederhuber JE, Armitage JO, Doroshow JH, Kastan MB, Tepper JE, eds. *Abeloff's Clinical Oncology*. 6th ed. Philadelphia, Pa: Elsevier; 2020.

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# Can Bone Cancer Be Prevented?

*The information here focuses on primary bone cancers (cancers that start in bones) that most often are seen in adults. Information on [Osteosarcoma](#)<sup>1</sup>, [Ewing Tumors \(Ewing sarcomas\)](#)<sup>2</sup>, and [Bone Metastases](#)<sup>3</sup> is covered separately.*

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

## Hyperlinks

1. [www.cancer.org/cancer/types/osteosarcoma.html](http://www.cancer.org/cancer/types/osteosarcoma.html)
2. [www.cancer.org/cancer/types/ewing-tumor.html](http://www.cancer.org/cancer/types/ewing-tumor.html)
3. [www.cancer.org/cancer/managing-cancer/advanced-cancer/bone-metastases.html](http://www.cancer.org/cancer/managing-cancer/advanced-cancer/bone-metastases.html)

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