Bone Cancer Risk Factor Information

This document gives a general overview of risk factors. The document covers:

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- About Bone Cancer
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About Cancer and Risk Factors

Cancer is not just one disease.

Cancer is a group of over 100 different diseases. Cancer occurs when abnormal cells grow out of control and crowd out the normal cells. It can start anywhere in the body and can spread ("metastasize") to other parts of the body. Cancer types are named for the original location in the body and the type of cell or tissue. Different types of cancer have different causes and risk factors.

Cancer can take a long time to develop.

The cause of cancer is sometimes related to events that happened many years ago. Most cancer types are thought to take anywhere from 10 to over 50 years to develop. A few types, such as leukemia or lymphoma, are thought to take less than 10 years.

A risk factor is anything that increases your chance of getting cancer.

Some risk factors can be controlled while others cannot. Risk factors can include:

- Hereditary conditions (e.g., genes passed down from parents)
- Medical conditions or treatments (e.g., a previous cancer diagnosis)
- Infections (e.g., human papilloma virus)
- Lifestyle factors (e.g., smoking cigarettes)
- Environmental exposures (e.g., certain air pollutants)

Most risk factors do not directly cause cancer.

A risk factor influences the development of cancer but usually does not directly cause cancer. Instead, a combination of risk factors likely drives cancer development. For example, genetic factors can make individuals more likely to get cancer when they are exposed to a cancer-causing chemical.

Environmental risk factors depend on how, how much, and how long you are exposed.

Your risk from exposure to certain chemicals or radiation depends on the type, extent, and duration of exposure. For example, inhaling a certain chemical may increase your risk of getting cancer. However, touching the same chemical may not. In addition, some substances may increase your risk only if you are exposed to high amounts over a long time.

It is difficult to identify the exact causes of cancer.

- Many cancers can develop due to random chance.
- Multiple risk factors can act in combination.
- Risk factors can change over time.
- Cancer might not develop or get diagnosed for a long time after an initiating event (such as exposure or random cell mutation).

Knowing your risk factors can help you make more informed choices.

Discuss your risk factors with your health care provider to make more informed decisions on lifestyle and health care.

About Bone Cancer

Both primary and secondary tumors can develop in bone.

Primary bone tumors start in the bone. Secondary bone tumors start elsewhere in the body and then spread (metastasize) to the bone. Secondary tumors are named for the original cancer type. Only cancer that starts in the bone is called bone cancer. Bone tumors can be either cancerous (malignant) or non-cancerous (benign).[1]

Bone cancer is extremely rare.

Bone cancer accounts for less than 0.2% of all cancer diagnoses.[1, 5] The American Cancer Society estimates 3,910 people will be diagnosed with bone cancer in the U.S. in 2022.[2]

Types of Bone Cancer

There are many different types of bone cancer.

- Osteosarcoma (the most common type) affects the bones themselves.
- Chondrosarcoma (2nd most common) is a cancer of the cartilage cells.[1]
- Ewing tumor (3rd most common) usually starts in bones or nearby soft tissue.[1, 3]
- Malignant fibrous histiocytoma (MFH) usually starts in soft tissue.
- Fibrosarcoma develop in soft tissues more often than in the bones.
- Giant cell tumor of bone typically affects the legs or arms and is most commonly benign.
- Chordoma usually occurs in the base of the skull and bones of the spine.[1,8]

Some types are more common among men and among white individuals.

Chordoma is twice as common in men as in women.[1] Osteosarcoma is also more common among men than women.[4] Ewing tumors occur most often in white individuals and very rarely among black individuals; it seldom occurs in other racial groups.[3]

Different types are more common among different age groups.

Osteosarcoma mainly occurs among young people (ages 10-30) and older adults (over age 60). Ewing tumor occurs most often in children and teens (younger than 20 years). Chondrosarcoma, MFH, fibrosarcoma, giant cell tumor of bone, and chordoma usually occur in adults.[1]

About 4% of cancers in children and teens in Massachusetts are bone cancer.

In children and teens, osteosarcoma (58%) and Ewing tumors (36%) are much more common than chondrosarcoma (1.6%).[7] The risk of osteosarcoma is highest during the teenage "growth spurt". Children with osteosarcoma are usually tall for their age, suggesting a relationship between rapid bone growth and risk of tumor formation.[6]

Known Risk Factors

Medical Conditions

Multiple enchondromatosis:

Individuals with multiple enchondromatosis, a condition in which many benign cartilage tumors develop, are at increased risk for chondrosarcoma.[1]

Hereditary Conditions

Certain rare inherited syndromes:

Most bone cancers do not appear to have a hereditary basis. However, children with certain rare inherited syndromes, such as Li-Fraumeni syndrome, Rothmund-Thomson syndrome, and hereditary retinoblastoma (eye cancer) have an elevated risk of developing osteosarcoma. People with multiple exostoses (also known as multiple osteochondromas) syndrome have an elevated risk of chondrosarcoma. This inherited syndrome causes bumps on the bones.[1,8,4]

Environmental Exposures

Ionizing radiation:

Exposure to ionizing radiation (i.e., x-rays and gamma rays) increases the risk of certain types of bone cancer, such as osteosarcoma. For example, individuals who were treated with radiation therapy for a previous cancer have a higher risk of later developing bone cancer.[1, 5] Radiation treatment at a younger age and with higher doses increases the risk. A typical diagnostic x-ray of a bone poses little danger. Non-ionizing radiation from microwaves, cell phones, and household appliances does not increase the risk of bone cancer.[1]

Possible Risk Factors

Medical Conditions

Chemotherapy for a previous cancer:

Individuals treated with certain chemotherapy drugs (such as alkylating agents and anthracyclines) may have an increased risk of later developing bone cancer, usually osteosarcoma.[5]

Certain non-cancerous bone diseases:

About 1% of individuals with Paget disease of the bone develop bone cancer, usually osteosarcoma. Paget disease primarily affects people over the age of 50 and results in abnormal bone tissue.[1,8] Fibrous dysplasia may also increase the risk of osteosarcoma.[5]

Hereditary Conditions

Certain gene defects (mutations):

Chordomas may run in the family, but the responsible gene defects have not been identified yet. People with tuberous sclerosis (an inherited syndrome) may have a high risk of chordomas during childhood.[1]

Other Risk Factors That Have Been Investigated

Medical Conditions

Bone injuries?

Some people wonder if bone injury can cause cancer, but this has not been proven. Most doctors do not believe this is a significant risk factor. It is more likely that a cancer diagnosis prompts a patient to remember an injury or that an injury draws attention to a bone mass that already existed.[1]

References / More Information

This information sheet should not be considered exhaustive. For more information on other possible risk factors and health effects being researched, please see the resources below. Much of the information contained in this summary has been taken directly from these sources. This material is provided for informational purposes only and should not be considered as medical advice. Consult your physician if you have questions regarding a specific medical problem or condition.

American Cancer Society (ACS). http://www.cancer.org

1. ACS. 2020. Bone Cancer.
2. ACS. 2022. Cancer Facts & Figures 2022.
3. ACS. 2018. Ewing Family of Tumors.
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5. ASCO. 2020. Bone Cancer (Sarcoma of Bone).
6. ASCO. 2019. Osteosarcoma – Childhood and Adolescence.

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7. MCR. 2014. Childhood Cancer in Massachusetts 2000-2009. Available at: http://www.mass.gov/eohhs/docs/dph/cancer/registry-child-cancer-00-09.pdf

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8. NCI. 2018. Bone Cancer – Patient Version.

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