

Primary Bone Cancer

Note: For Medicare members/enrollees, to ensure consistency with the Medicare National Coverage Determinations (NCD) and Local Coverage Determinations (LCD), all applicable NCDs, LCDs, and Medicare Coverage Articles should be reviewed prior to applying the criteria set forth in this clinical policy. Please refer to the CMS website at <http://www.cms.gov> for additional information.

Note: For Medicaid/members/enrollees, circumstances when state Medicaid coverage provisions conflict with the coverage provisions within this clinical policy, state Medicaid coverage provisions take precedence. Please refer to the state Medicaid manual for any coverage provisions pertaining to this clinical policy.

DISCUSSION

Cancer that starts in a bone is uncommon. There are three types of bone cancer^{1,2}:

- *Osteosarcoma* - occurs most often between ages 10 and 19. It is more common in the knee and upper arm.
- *Chondrosarcoma* - starts in cartilage, usually after age 40.
- *Ewing's Sarcoma* - occurs most often in children and teens under 19. It is more common in boys than girls.

These three cancers account for less than 1% of diagnosed cancers each year and are associated with significant morbidity and mortality. Timely diagnosis is challenging because of late patient presentation, nonspecific symptoms that mimic common musculoskeletal injuries, and low suspicion by physicians. Radiographic suspicion of a bone malignancy should prompt quick referral to a cancer center for multidisciplinary care.³

Prognosis for osteosarcoma and Ewing sarcoma depends on the presence of metastasis, which lowers the five-year survival rate to 20% to 30%.³ Bone cancer can begin in any bone in the body, but it most commonly affects the pelvis or the long bones in the arms and legs.¹

Radiation therapy is used either following surgery or as definitive therapy. Techniques including intensity-modulated radiation, particle beam radiation with protons, or radiosurgery can be considered clinically indicated to deliver high doses of radiation. Primary radiation therapy is to be utilized in patients with borderline resectable and unresectable chondrosarcoma or chordoma. Proton beam radiation has been associated with excellent local tumor control in tumors of the spine.⁴

DEFINITIONS

- **Adjuvant radiation therapy** - Additional radiation therapy given after the primary treatment to lower the risk of cancer recurrence.
- **Brachytherapy** - Brachytherapy is a procedure that involves placing radioactive material inside your body. Brachytherapy is sometimes called internal radiation.
- **Definitive radiation treatment** – radiation therapy used with curative intent.
- **External beam radiation therapy (EBRT)** - External radiation (or external beam radiation) is the most common type of radiation therapy used for cancer treatment. A machine is used to aim high-energy rays (or beams) from outside the body into the tumor.
- **Fractions** - A way of dividing a total dose of radiation into separate doses to be administered over a period of time.
- **Gray (Gy)** - One of the two units used to measure the amount of radiation absorbed by an object or person, known as the absorbed dose. One gray (Gy) is the international system of units (SI) equivalent of 100 rads, which is equal to an absorbed dose of 1 Joule/kilogram.

- **Image-guided radiation therapy (IGRT)** - Image-guided radiation therapy (IGRT) is the use of imaging during radiation therapy to improve the precision and accuracy of treatment delivery. IGRT is used to treat tumors in areas of the body that move, such as the lungs. Radiation therapy machines are equipped with imaging technology to allow your doctor to image the tumor before and during treatment. By comparing these images to the reference images taken during simulation, the patient's position and/or the radiation beams may be adjusted to more precisely target the radiation dose to the tumor. To help align and target the radiation equipment, some IGRT procedures may use fiducial markers, ultrasound, MRI, X-ray images of bone structure, CT scan, 3D body surface mapping, electromagnetic transponders, or colored ink tattoos on the skin.
- **Intensity-modulated radiotherapy (IMRT)** - Intensity-modulated radiation therapy (IMRT) is an advanced mode of high-precision radiotherapy that uses computer-controlled linear accelerators to deliver precise radiation doses to a malignant tumor or specific areas within the tumor. IMRT allows the radiation dose to conform more precisely to the three-dimensional shape of the tumor by controlling the intensity of the radiation beam in multiple small volumes. IMRT also allows higher radiation doses to be focused to regions within the tumor while minimizing the dose to surrounding normal critical structures.
- **National Comprehensive Cancer Network® (NCCN)** - An alliance of 32 leading cancer centers devoted to patient care, research, and education. The NCCN guidelines are utilized for Radiation Therapy and Medical Oncology standards. NCCN consensus clinical standards are periodically updated and NantHealth, Inc. reviews these and updates its policies within a timely manner.
- **Stereotactic body radiotherapy (SBRT)** - Stereotactic body radiotherapy (SBRT) radiation that is given in several smaller treatments to deliver the same or slightly higher dose.
- **Stereotactic radiosurgery (SRS)** - Stereotactic radiosurgery (SRS) allows the delivery of a large dose of radiation to a small tumor area, usually in one session. After imaging tests 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.
- **Three dimensional conformal radiation therapy (3D-CRT)** - A procedure that uses a computer to create a three dimensional picture of the tumor. This allows doctors to give the highest possible dose of radiation to the tumor, while sparing the normal tissue as much as possible.

POLICY

The following table outlines the criteria that must be met for the number of fractions and dosing relative to primary bone cancer radiation treatments. This dosing table represents evidence-based doses and fractions for the designated type of cancer treatment. Variations outside of the ranges may indicate a deviation from standard treatment.

Primary Bone Cancer			
Chondrosarcoma/Chordoma			
	Number of Fractions	Total Dose	Technique
Definitive (may require specialized technique)	35 or more	Greater than 70 Gy	3D, IMRT, IGRT
Neoadjuvant	10-28	19.8-50.4 Gy	3D, IMRT, IGRT, Proton
Adjuvant	35-43	70-78 Gy	3D, IMRT, IGRT, Proton
Ewing Sarcoma Definitive	27-34	54-61.2 Gy (total dose including all cone downs)	3D, IMRT, IGRT
Ewing Sarcoma Neoadjuvant	18-25	36-45 Gy	3D, IMRT, IGRT
Ewing Sarcoma Adjuvant	22-31	45-55.8 Gy	3D, IMRT, IGRT
Giant Cell Tumor	25-33	50-60 Gy	3D, IMRT, IGRT
Osteosarcoma Unresectable	30-39	60-70.2 Gy	3D, IMRT, IGRT
Osteosarcoma Adjuvant	27-30 4-7	55 Gy 9-13 Gy boost	3D, IMRT, IGRT

REFERENCES

1. What is bone cancer. American Cancer Society. <https://www.cancer.org/cancer/bone-cancer/about/what-is-bone-cancer.html>. Accessed May 14, 2022.
2. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Bone Cancer. (Version 2.2022). Available at https://www.nccn.org/professionals/physician_gls/pdf/bone.pdf. ©National Comprehensive Cancer Network, 2022.
3. Ferguson JL, Turner SP. Bone Cancer: Diagnosis and Treatment Principles. *Am Fam Physician*. 2018;98(4):205-213.
4. Radiation therapy for bone cancer. American Cancer Society. <https://www.cancer.org/cancer/bone-cancer/treating/radiation.html>. Accessed May 14, 2022.
5. Bone cancer. Medline Plus. <https://medlineplus.gov/bonecancer.html>. Accessed May 14, 2022.

Please see all related radiation therapy treatment policies for additional information on the treatment modalities. (3D-CRT, EBRT, IGRT, IMRT and PBT)

CODING [ICD-10, HCPCS]*

*Procedure codes appearing in medical policy documents are only included as a general reference. This list may not be all-inclusive and is subject to updates. In addition, codes listed are not a guarantee of payment. CPT codes are available through the AMA.

Code	Description
0C00-D49	Neoplasms
C40-C41	Malignant neoplasm of bone and articular cartilage
C79	Secondary malignant neoplasm of other and unspecified sites
C79.5	Secondary malignant neoplasm of bone and bone marrow
G6015	Intensity-modulated treatment delivery, single or multiple fields/arcs, via narrow spatially and temporally modulated beams, binary, dynamic MLC, per treatment session
G6016	Compensator-based beam modulation treatment delivery of inverse planned treatment using 3 or more high resolution (milled or cast) compensator, convergent beam modulated fields, per treatment session

REVISION AND REVIEW HISTORY

No.	Description	Metadata
1	Original Effective Date:	5/2022
2	Policy Review Dates:	5/16/2022, 5/17/2022, 5/25/2022, 6/2/2022, 7/20/2022
3	Policy Revision Dates:	5/16/2022, 5/17/2022, 5/25/2022, 6/2/2022, 7/20/2022
4	Department Owner:	Medical Affairs
5	NH Advisory Committee Approval Dates:	5/17/2022, 5/25/2022. 6/2/22
6	Revision Changes:	