AAVBC

AMERICAN ACADEMY OF VALUE BASED CARE

Bone Cancers

Quick Reference Guide

2026

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1 CLINICAL SNAPSHOT

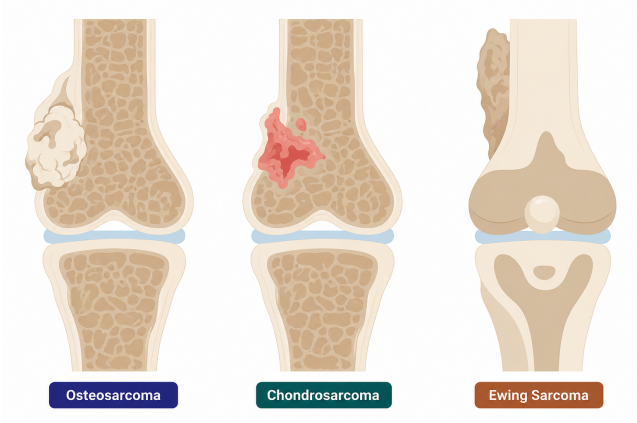
Definition: '**Bone cancer**' in clinical and coding practice encompasses **two fundamentally distinct disease categories**.[1,2] **Primary bone malignancies** originate in bone tissue itself and include **osteosarcoma** (bimodal age distribution with primary peak in adolescents/young adults and second peak in **adults 60+** frequently associated with Paget disease or prior radiation), **chondrosarcoma** (most common primary bone cancer in **adults >40**; largely chemoresistant with surgical resection as cornerstone; ivosidenib for IDH1 mutations), **Ewing sarcoma** (predominantly AYA; essentially absent in patients 65+), and **chordoma** (rare axial tumor of notochordal origin; median age at diagnosis approximately 60 years; incidence 0.08 per 100,000).[1–4] **Metastatic bone disease**, cancer spread from a primary site to bone, is **far more common in the Medicare population**, with lung, prostate, breast, and kidney as the dominant sources.[5]

ICD-10 Codes:

Primary bone cancer uses **C40.0x-C40.9x** (limbs; require bone group **AND** laterality digit **0**=unspecified/**1**=right/**2**=left) and **C41.0-C41.9** (axial/other; no laterality digit). Secondary bone cancer uses **C79.51** (bone metastases) and **C79.52** (bone marrow metastases), **always** paired with the primary site code (e.g., **C50.x** breast, **C61** prostate, **C34.x** lung, **C64** kidney).[6] **NOTE**: Multiple myeloma uses **C90.0x**, **NOT C79.51**, because **bone destruction** is inherent to myeloma rather than metastasis.[6,7] **Complications**: **M84.5xx** (pathologic fracture in neoplastic disease, frequently undercoded); **G95.20** (spinal cord compression, oncologic emergency code). Personal history **Z85.830** applies **only** after treatment is complete and there is **no active disease**.

Prevalence and Burden: The American Cancer Society projected approximately **3,770 new** primary bone and joint cancer cases and **2,190 deaths** in the United States in 2025, **less than 0.2% of all cancers**.[8] Primary bone cancer incidence is approximately 1 case per 100,000 persons per year.[4] **In the Medicare-age population**, however, metastatic bone disease **vastly outnumbers primary bone cancer** in clinical frequency, with approximately 400,000 new cases of bone metastases diagnosed annually in the US versus fewer than 4,000 primary bone cancers.[9,10] This disparity drives the **NCCN age-stratified workup rule**:[1] patients **age <40** with a suspicious bone lesion are **referred directly to orthopedic oncology**, while patients **age 40+** undergo a **metastatic workup first** (bone scan or FDG-PET/CT, SPEP, PSA, mammogram, CT chest/abdomen/pelvis). By subtype, 5-year relative survival is approximately **54% for osteosarcoma** (60% for age <30, 30% for age 50+), **75% for chondrosarcoma**, **51% for Ewing sarcoma**, and **68% for chordoma**.[11–13] The age-adjusted incidence of de novo bone metastases increased from **18.04 to 20.89 per 100,000** between 2010 and 2018 (APC 2.3%), reflecting a **growing burden of metastatic bone disease**.[14]

Primary Bone Cancer Subtypes



HCC/RAF V28 Mapping

ICD-10 CODE(S)[15]	HCC CATEGORY (V28)[16]	RAF (CNA)[17]	DOCUMENTATION REQUIREMENT
C40.0x–C40.9x (primary limb bone, bone group + laterality)	**HCC 19**: Myelodysplastic Syndromes/ Multiple Myeloma/ and **Other Cancers**	1.798	Active primary bone malignancy **confirmed by pathology/imaging**; document **bone group** (scapula/long upper, short upper, long lower, short lower) **AND laterality** (1=right, 2=left); **avoid 0=unspecified** when imaging specifies side
C41.0–C41.9 (primary axial/ other bone)	**HCC 19**: Myelodysplastic Syndromes/ Multiple Myeloma/ and **Other Cancers**	1.798	**Document specific axial site** (skull, mandible, vertebra, rib, pelvis); **C41.4** covers sacrococcygeal region (common chordoma site); **avoid C41.9** unspecified when site is documented
C79.51 (secondary bone mets)	**HCC 18**: Cancer Metastatic to Bone	2.341	**ALWAYS** pair with primary site code (C50.x breast, C61 prostate, C34.x lung, C64 kidney); document **each anatomic bone site involved**
C79.52 (secondary bone marrow mets)	**HCC 18**: Cancer Metastatic to Bone	2.341	Use when bone marrow specifically involved; **distinct from C79.51**; pair with primary site code; **NOT** for multiple myeloma marrow involvement (use **C90.0x**)
M84.5xx (pathologic fracture in neoplastic disease)[3]	**No HCC**	—	Specify bone, laterality, and **7th character** (**A**=initial, **D**=subsequent, **S**=sequela); frequently undercoded; represents a skeletal-related event
G95.20 (cord compression)[3]	**No HCC**	—	**Code alongside C79.51** + primary site code when metastatic spinal cord compression documented; document "metastatic spinal cord compression" **explicitly**
Z85.830 (avoid for active disease)	**No HCC**	—	**AVOID** for active disease: use only after treatment completion with no active disease and no active surveillance; ongoing chemotherapy or surveillance = **active cancer code**

ICD-10 CODE(S)[15]	HCC CATEGORY (V28)[16]	RAF (CNA)[17]	DOCUMENTATION REQUIREMENT

ABBREVIATIONS: ICD-10 = International Classification of Diseases, Tenth Revision; HCC = Hierarchical Condition Category; CMS-HCC V28 = Centers for Medicare & Medicaid Services Hierarchical Condition Category Model V28; RAF = Risk Adjustment Factor; CNA = Community Non-Dual Aged segment; mets = metastases

RAF values represent the Community Non-Dual Eligible Aged (CNA) coefficient from the 2026 CMS-HCC model; values vary across patient populations based on eligibility and care setting

Risk-Adjusted Care Resources per Patient/Year[16,17]

Risk-adjusted care resource allocation — MA base rate (~$10,402.34) × RAF coefficient

PRIMARY BONE CANCER	METASTATIC BONE CANCER
$18.7K	**~$24.3K+**
HCC 19 · RAF 1.798	HCC 18 · RAF 2.341

RAF values represent the Community Non-Dual Eligible Aged (CNA) coefficient from the 2026 CMS-HCC model; values vary across patient populations based on eligibility and care setting

AAVBC PERSPECTIVE

***From the AAVBC's perspective**, the primary care role in bone cancer centers on **timely imaging of suspicious lesions** and ensuring treatment decisions for older adults **reflect functional status**, not chronological age. Persistent bone pain lasting **more than 2 to 3 weeks warrants plain radiography** regardless of pattern or minor trauma history (ACR Appropriateness Criteria, **Grade A**).[1,4] Night pain is supportive but not required. A negative radiograph **does not exclude malignancy**: MRI is the recommended next study, or immediate referral to orthopedic oncology.[4] The NCCN Bone Cancer Guidelines apply an **age-stratified rule**:[1] patients <40 with an abnormal x-ray go directly to orthopedic oncology, while patients 40+ undergo metastatic workup first (bone scan or PET/CT, SPEP, PSA, mammogram, CT chest/abdomen/pelvis). Treatment selection for older adults should be guided by **Comprehensive Geriatric Assessment (CGA)** and competing comorbidity risks; ASCO guidelines recommend GA-guided management for all cancer patients 65+ receiving systemic therapy, and meta-analysis of 17 RCTs shows **CGA significantly reduces treatment toxicity** (RR 0.78, 95% CI 0.70 to 0.86).[18,19] Dose-modified regimens and functional-preservation approaches (CIRT, SBRT) extend treatment access to elderly patients who might otherwise be excluded.[20,21]*

2 RECOGNITION AND DIAGNOSIS

There are no population-wide screening initiatives for bone cancer; diagnosis is **symptom-driven**. Primary malignant bone tumors account for **<1%** of all cancers (~0.2% of all neoplasms), with an estimated incidence of 1 case per 100,000 persons per year in the United States (~5,000 new cases annually).[4,10] Benign bone tumors are estimated to be at least 1**00 times more common** but are frequently asymptomatic and **discovered incidentally**.[10] In contrast, metastatic bone disease is far more prevalent, with roughly **400,000 new cases diagnosed annually in the US**, making it the dominant diagnostic consideration in patients ≥40 presenting with a bone lesion.[1,10]

Diagnostic Tests Covered Under Medicare Part B (Older Adults, At-Risk Population)

TEST	FREQUENCY	CPT/ HCPCS	CLINICAL INDICATION[1,4,7]
Plain radiography (extremity, 2+ views)	**At symptom trigger** (persistent bone pain >2-3 weeks)	73060-73090 (site-dependent)	**First-line imaging** for persistent musculoskeletal pain, night pain, or pain after minor trauma; correctly categorizes tumor grade in 82.5% of cases[4]
MRI of extremity/ spine	When X-ray equivocal or negative with persistent clinical suspicion	73721-73723 (site-dependent)	Negative X-ray does **NOT** exclude malignancy: **19.7%** of bone sarcoma patients had negative initial radiographs[4]
FDG-PET/CT (staging)	**Once at staging** (40+ metastatic workup or confirmed primary)	78816	Required in metastatic workup for patients 40+ with suspicious bone lesion;[1] **staging of confirmed primary bone cancer**
Bone scan (whole body)	**Once at metastatic workup**	78306	Component of NCCN 40+ metastatic workup;[1] **identifies polyostotic disease**
Contrast CT chest/ abdomen/pelvis	**Once at staging**	74177	Part of 40+ metastatic workup;[1] **staging of confirmed bone cancer**
Bone biopsy (superficial/deep needle)†	Specialist-directed only	20220/ 20225	**MUST** be performed at the treating institution by an experienced sarcoma team;[1] biopsy in primary care can **compromise surgical options**

TEST	FREQUENCY	CPT/ HCPCS	CLINICAL INDICATION[1,4,7]
SPEP/ immunofixation	**At metastatic workup**	84165/ 86334	Part of NCCN 40+ metastatic workup;[1] **rules out multiple myeloma** before **C79.51** coding
DEXA scan (bone density)	Every 24 months	77080	Relevant for **osteoporosis screening** and OMW measure intersection with **pathologic fracture differential**
Advance Care Planning (AWV)‡	Annually + when goals change	99497/ 99498	Document directives, surrogate, code status; particularly important when functional preservation outweighs maximum resection

ABBREVIATIONS: CPT = Current Procedural Terminology; HCPCS = Healthcare Common Procedure Coding System; MRI = magnetic resonance imaging; FDG-PET/CT = fluorodeoxyglucose positron emission tomography/computed tomography; NCCN = National Comprehensive Cancer Network; CT = computed tomography; SPEP = serum protein electrophoresis; DEXA = dual-energy X-ray absorptiometry; OMW = Osteoporosis Management in Women Who Had a Fracture; ACP = Advance Care Planning; AWV = Annual Wellness Visit
† Biopsy track placement is critical: poorly placed biopsies may necessitate wider resection or limb amputation; always defer to orthopedic oncology
‡ ACP is covered with no patient copay when performed during the AWV; 99497 covers the first 30 minutes, 99498 each additional 30 minutes

Subtle Early Signs in Older Adults (>65)

SIGN/SYMPTOM	CLINICAL SIGNIFICANCE
Persistent musculoskeletal pain >2-3 weeks, regardless of presumed cause	**Most important early signal**; activity-related, intermittent pain is the dominant early pattern, **not** constant night pain[22,23]
Pain after minor trauma that fails to resolve or recurs	**47%** of osteosarcoma and **26%** of Ewing sarcoma patients related onset to minor trauma;[22] trauma drew attention to bone already weakened by tumor; **Do NOT** treat temporal association as reassurance
Intermittent or waxing-and-waning bone pain with symptom-free intervals	Median doctor delay **14-19 weeks** (Ewing) vs **9 weeks** (osteosarcoma);[24] intermittent course misleads clinicians into thinking condition is self-limited
Buttock, hip, low-back, sciatica, or groin pain in a Medicare-age patient	Pelvic sarcomas misdiagnosed in **44%** of patients (mean 10 months to correct dx);[24] symptoms overlap entirely with degenerative joint disease
Bone pain in a patient with known breast/prostate/lung/ kidney cancer	Presume metastatic bone disease (**C79.51**) **until proven otherwise**;[1,2] image promptly and engage oncology

SIGN/SYMPTOM	CLINICAL SIGNIFICANCE
Bone pain worsening with recumbency (especially axial)	Metastatic pain typically worsens **lying flat**;[1] degenerative pain is typically relieved; useful distinction in **elderly with known cancer history**
Night pain (when present)	Present in **only 21%** of osteosarcoma and **35.2%** of bone sarcoma patients at initial presentation;[22] supportive but **NOT** required to trigger imaging
New, firm, fixed mass overlying bone	Palpable mass warrants expedited imaging and orthopedic oncology referral;[2,22] noted at first visit in **39%** of osteosarcoma and **34%** of Ewing sarcoma
Unexplained pathologic fracture (low-energy mechanism)	Fracture from minor force in patient with known cancer or risk factors **warrants metastatic workup**;[1] code **M84.5xx** alongside cancer code

ABBREVIATIONS: dx = diagnosis; mets = metastases

Geriatric Risk Factors

FACTOR	RISK SIGNAL	NOTES
Known primary cancer (breast/prostate/lung/kidney)	**Most common cause** of 'bone cancer' presentation in Medicare population = metastatic bone disease, **not** primary[1]	**C79.51** paired with primary site code; **never** C40–C41[1]
Paget disease of bone	Most well-established **risk factor for osteosarcoma** in the elderly[4]	Absolute risk of malignant transformation **<1%** but relative risk substantially elevated;[4] Paget-associated osteosarcoma carries **poor prognosis**
Prior radiation therapy (5–20 years)	**Radiation-induced osteosarcoma** typically 5–20 years post-exposure[4,25]	Relevant for patients with prior pelvic, breast, or other radiation fields; **document remote radiation history**[4,25]
Age ≥60	Bimodal osteosarcoma peak in adults ≥60 (**~10%** of cases);[26] systematic review confirms older age as an independent prognostic factor[12]	Axial skeleton involvement more common (spine, pelvis); distant metastases at presentation 26% vs. 17% younger; 5-year DSS 40% vs. 70%[27]
Chondrosarcoma in adults >40	Most common primary bone cancer in adults; **peaks in elderly**[28]	Largely chemoresistant; surgery is the cornerstone[1]

FACTOR	RISK SIGNAL	NOTES
Genetic predisposition (TP53/Li-Fraumeni, RB1)	Linked to osteosarcoma pathogenesis; more relevant in **younger patients**[4]	Consider in **family history assessment**; refer for genetic counseling when indicated
Female sex (axial/ pelvic chondrosarcoma context)	Independent risk factor for prolonged diagnostic intervals (**SURVSARC**)[29]	Female sex independently associated with **very long diagnostic interval** (3+ months) in **SURVSARC** (n=1,099)[29]
Race/ethnicity (Black, Hispanic patients)	Higher rates of **prolonged PCP wait-time**, imaging wait-time >5 weeks (p=0.02 Hispanic; p=0.05 Black)[22,23]	aOR 1.74 (Black) and 1.31 (Hispanic) for **treatment delay >1 month** in osteosarcoma <40; document referral and imaging timelines[22,23]
Estrogen exposure (chondrosarcoma)	SEER age-period-cohort analysis: **~50% rise** in female chondrosarcoma incidence across OCP/HT-exposed cohorts (1976–2005)[30]	Ecological association; not actionable individually but relevant for **risk-factor literacy**

ABBREVIATIONS: DSS = disease-specific survival; SURVSARC = Survivors of Sarcoma; aOR = adjusted odds ratio; SEER = Surveillance, Epidemiology, and End Results; OCP = oral contraceptive; HT = hormone therapy

Diagnostic Thresholds

Bone cancer evaluation follows a **two-phase sequence**: initial imaging with **plain radiography** when symptoms trigger clinical concern, followed by **diagnostic escalation** (Medicare Part B Covered, refer to **Diagnostic Tests covered above**) **with MRI**, **CT**, **biopsy**, and **staging studies** when radiographs are abnormal or clinical suspicion persists despite negative films.

The critical branch point is **age**: the NCCN Bone Cancer algorithm directs patients <40 with an abnormal radiograph directly to orthopedic oncology, while patients 40+ undergo a metastatic workup first (bone scan or FDG-PET/CT, SPEP, CBC, CMP with calcium, PSA, mammogram, CT chest/ abdomen/pelvis), reflecting the far higher prevalence of metastatic bone disease in the older adult population.[1] **Biopsy must be performed at the treating institution by an experienced sarcoma team**; primary care biopsy can compromise surgical options.

Initial Imaging: ACR Bone-RADS Risk Stratification

BONE-RADS SCORE	RISK ASSESSMENT	MANAGEMENT
0 (Incompletely characterized)	Risk cannot be adequately predicted (e.g., lucent lesions of axial skeleton)	Additional radiographic views or cross-sectional imaging
1 (Very low risk)	Pathognomonic benign lesion; classic "**do not touch**" (e.g., nonossifying fibroma)	If asymptomatic, **consider workup complete** vs annual surveillance

BONE-RADS SCORE	RISK ASSESSMENT	MANAGEMENT
2 (Low risk)	Asymptomatic geographic lytic lesion **without suspicious features** (e.g., giant cell tumor, aneurysmal bone cyst)	Short-interval (3-6 month) surveillance; **consider advanced imaging** and orthopedic oncology referral
3 (Intermediate risk)	**Geographic lytic lesion in patient with known malignancy elsewhere**; geographic but ill-defined lytic lesion	**Orthopedic oncology referral** for probable biopsy; advanced imaging (CT, MRI, bone scan)
4 (High risk)	**Malignant until proven otherwise**; aggressive periosteal reaction or soft tissue mass; nongeographic osteolytic lesion	**Orthopedic oncology referral** for biopsy and treatment planning; staging imaging

ABBREVIATIONS: CT = computed tomography; MRI = magnetic resonance imaging
Adapted From: Caracciolo J, Ali S, Chang C, *et al.* Bone Tumor Risk Stratification and Management System: A Consensus Guideline from the ACR Bone Reporting and Data System Committee. *J Am Coll Radiol.* 2023;**20**:1044-1058.

Staging Systems

AJCC 8th Edition TNM (2017) is the standard pathologic bone cancer staging system, with site-specific T classifications for three anatomic regions: **appendicular skeleton/trunk/skull** (T1 ≤8 cm, T2 >8 cm, T3 skip metastases), **spine** (T1-T4 based on vertebral segments and canal/vascular invasion), and **pelvis** (T1-T4 based on pelvic segments and extraosseous extension).[31] Histologic grade uses a 3-tier system (G1 low, G2-G3 high). Prognostic stage groups exist **only for the appendicular skeleton** (Stage IA through IVB); **no prognostic groupings exist for spine or pelvis**.[31] M1a denotes lung metastases; M1b denotes bone or other distant sites.

AJCC 8th Edition Prognostic Stage Groups- Appendicular Skeleton/Trunk/Skull

STAGE	T	N	M	GRADE
IA	T1	N0	M0	G1, GX
IB	T2 or T3	N0	M0	G1, GX
IIA	T1	N0	M0	G2, G3
IIB	T2	N0	M0	G2, G3
III	T3 (skip mets)	N0	M0	G2, G3
IVA	Any T	N0	M1a (lung)	Any G
IVB	Any T	N1 or M1b	Any M/N	Any G

Site-Specific T Definitions

SITE	T1	T2	T3	T4
Appendicular/ trunk/skull	≤8 cm	>8 cm	**Skip metastases** (discontinuous tumors in primary bone)	—
Spine	1–2 adjacent vertebral segments	3 adjacent segments	≥4 adjacent **or** nonadjacent segments	**T4a**: spinal canal extension **T4b**: great vessel invasion
Pelvis	1 segment, no extraosseous extension (**a**: ≤8 cm; **b**: >8 cm)	1 segment + extraosseous extension **or** 2 segments without (**a**: ≤8 cm; **b**: >8 cm)	2 segments + extraosseous extension (**a**: ≤8 cm; **b**: >8 cm)	≥3 segments **or** crosses sacroiliac joint (**a**: medial to sacral neuroforamen; **b**: vessel encasement)

Adapted from: Amin MB, Edge SB, Greene FL, et al., eds. AJCC Cancer Staging Manual. 8th ed. New York: Springer; 2017.

Other Relevant Staging and Classification Systems

SYSTEM	BASIS	STAGES	PRIMARY USE	KEY DISTINCTION FROM AJCC
MSTS/ Enneking (1980)[32]	Grade (low/high), compartment status (**A=**intracompartmental **B=**extracompartmental metastases	**I** (low grade) **II** (high grade) **III** (metastatic) each subdivided **A/ B**	**Surgical planning**: guides margin selection (intralesional, marginal, wide, radical)	Uses **compartment status** rather than tumor size; designed **pre-CT/MRI era**
WHO Classification (5th ed, 2020)[33]	Histologic type and molecular markers	**Not a staging system**; classifies tumor type and biologic behavior (benign, intermediate, malignant)	**Pathologic diagnosis**; incorporates novel gene alterations (e.g., **IDH1/2** in chondrosarcoma)	**Complements staging**; determines histologic grade input for both AJCC and MSTS

SYSTEM	BASIS	STAGES	PRIMARY USE	KEY DISTINCTION FROM AJCC
Weinstein-Boriani- Biagini (WBB)[34]	Anatomic zones and layers of vertebral involvement	12 radiating zones + 5 concentric layers **per vertebra**	Surgical planning for **primary spine tumors specifically**	**Spine-specific anatomic detail** not captured by AJCC or MSTS

ABBREVIATIONS: MSTS = Musculoskeletal Tumor Society; CT = computed tomography; MRI = magnetic resonance imaging; WHO = World Health Organization; IDH = isocitrate dehydrogenase; WBB = Weinstein-Boriani-Biagini; AJCC = American Joint Committee on Cancer

Clues to Dig Deeper

CLINICAL CLUE	WHY IT MATTERS	NEXT DIAGNOSTIC STEP
Activity-related bone pain attributed to strain or tendinitis	**85%** of osteosarcoma and **64%** of Ewing sarcoma patients had **pain attributed to strain** at first visit; misdiagnosed as **tendinitis** in 31%/21%[22]	Plain radiograph for **any** musculoskeletal pain persistent **>2–3 weeks** regardless of presumed cause[1,35]
Buttock, hip, sciatica, or low-back pain in patient ≥50	Pelvic sarcomas initially misdiagnosed in **44%** (mean 10 months to correct dx); symptoms overlap entirely with degenerative disease[2]	**Plain radiograph of pelvis**; if abnormal in patient ≥40 → **metastatic workup**; if normal and suspicion persists → **MRI**[1,4]
Pain after minor trauma that fails to resolve or recurs	Trauma may draw attention to bone **already weakened by tumor**; do not treat temporal association as reassurance[22]	**Plain radiograph**; if abnormal or symptoms persist beyond expected healing → **MRI**/ **specialist referral**[1]
Patient with known breast/prostate/lung/ kidney cancer + new bone pain	**Presume metastatic bone disease** until proven otherwise; not a new primary[1,35]	**Targeted imaging of painful site**; engage oncology; code **C79.51** + primary site code when confirmed[1,35]
Bone-RADS 3 (intermediate) or 4 (high-risk) on radiology report	**Standardized risk stratification**: scores **3–4** are "**malignant until proven otherwise**"[4]	Immediate orthopedic oncology referral; do **NOT** biopsy in primary care[1,4]
New neurological symptoms in patient with known bone metastases	**Possible spinal cord compression**: oncologic emergency requiring same-day workup[1,36]	**Emergent MRI**;[36] neurosurgery/ radiation oncology consult within hours[1]

CLINICAL CLUE	WHY IT MATTERS	NEXT DIAGNOSTIC STEP
Unexplained elevated alkaline phosphatase or LDH with bone pain	Particularly concerning in patients with known cancer history[1,35]	**Plain radiograph** of symptomatic site; if patient ≥40 with known primary → **metastatic workup**[1]
Sacrococcygeal axial pain in older adult	**Chordoma** frequently presents at this site in adults[1]	**MRI of sacrococcygeal region**; referral to high-volume center[1]
Negative initial X-ray with persistent clinical suspicion	**19.7%** of bone sarcomas had negative initial radiographs; **diagnosis delayed** 54 ± 134 days vs. 20 days for positive films (p=0.018)[4]	MRI or orthopedic oncology referral; do **NOT** reassure on the negative film alone[4]

ABBREVIATIONS: dx = diagnosis; MRI = magnetic resonance imaging; LDH = lactate dehydrogenase

Common Oversights

OVERSIGHT/SHORTCUT	WHY IT MATTERS — WHAT TO DO INSTEAD
Treating persistent bone pain as musculoskeletal strain without imaging	Persistent bone pain >2–3 weeks **warrants plain radiography regardless of presumed cause**;[1,4,22] repeated presentations with unresolved pain are themselves a diagnostic signal
Treating a negative initial radiograph as reassurance	**19.7%** of bone sarcomas had negative initial X-rays (54 ± 134 day delay);[4,23] persistent suspicion → MRI or specialist referral, **not watchful waiting**
Skipping metastatic workup in patients ≥40 with abnormal radiograph	**NCCN requires:** bone scan or PET/CT, SPEP, PSA, mammogram, and CT C/A/P **before** considering primary bone cancer in patients ≥40;[1] reflects prevalence of **metastatic disease**
Performing biopsy in primary care	Biopsy must be performed at the treating institution by an experienced sarcoma team;[1,4,37] primary care biopsy can **compromise limb salvage**
Using chronologic age as the determinant of treatment suitability	A fit 72-year-old may tolerate cisplatin/doxorubicin; **a frail 65-year-old may not**; use geriatric assessment tools (CGA, CARG, Fried Frailty), **not age alone**[18,21,38]

ABBREVIATIONS: MRI = magnetic resonance imaging; NCCN = National Comprehensive Cancer Network; SPEP = serum protein electrophoresis; PSA = prostate-specific antigen; CT C/A/P = computed tomography of chest/abdomen/pelvis; PET/CT = positron emission tomography/computed tomography; CGA = comprehensive geriatric assessment; CARG = Cancer and Aging Research Group

Key Differentials in Elderly

PRESENTATION	DIFFERENTIAL	KEY TESTS
Persistent bone pain in a patient ≥50	**Bone metastasis** (most common);[1,2] **primary bone tumor**; degenerative joint disease; osteoporotic fracture; osteomyelitis; myeloma	**Plain radiograph**; if abnormal in patient ≥40 → **metastatic workup** (bone scan/PET-CT, SPEP, PSA, mammogram, CT C/A/P)
Pelvic/buttock/sciatica pain	**Pelvic bone sarcoma** (44% initially misdiagnosed);[4] lumbar disc herniation; hip osteoarthritis; sacroiliitis; bursitis	**Plain radiograph of pelvis**;[4] MRI pelvis/lumbar spine if X-ray negative but suspicion persists
Unexplained pathologic fracture	**Metastatic bone disease**; **primary bone cancer**; severe osteoporosis; Paget disease; myeloma[1,39]	Imaging of fracture site; **metastatic workup if patient ≥40**[1,39]
Spinal pain with neurologic symptoms	**Metastatic spinal cord compression** (oncologic emergency);[36,40] spinal stenosis; primary axial sarcoma; epidural abscess	**Emergent MRI of spine**;[36,40] neurosurgery/radiation oncology consult within hours
Lytic bone lesion on imaging	**Multiple myeloma**;[7] metastatic bone disease; primary bone cancer; benign lytic lesion	**SPEP/immunofixation to rule out myeloma**;[7] metastatic workup if patient ≥40;[1] orthopedic oncology referral
Sacrococcygeal mass or midline pain	**Chordoma**; **sacrococcygeal metastasis**; pilonidal disease; sacral osteomyelitis	**MRI of sacrococcygeal region**;[1] referral to high-volume center

ABBREVIATIONS: CT = computed tomography; MRI = magnetic resonance imaging; PET-CT = positron emission tomography/computed tomography; SPEP = serum protein electrophoresis; PSA = prostate-specific antigen; C/A/P = chest/abdomen/pelvis; NCCN = National Comprehensive Cancer Network; LDH = lactate dehydrogenase

Comorbidity Screening

CONDITION	CLINICAL SIGNIFICANCE*	SCREENING APPROACH
Chronic kidney disease (N18.x)	**Constrains chemotherapy** (cisplatin, high-dose methotrexate) and bone-modifying agent selection[1]	**CrCl trending**; zoledronic acid contraindicated CrCl <30;*** denosumab hypocalcemia risk** with CKD;[41] coordinate oncology/nephrology
Cardiovascular disease (I25.x/I50.x)	**Doxorubicin cardiotoxicity** (cumulative dose ≤450–550 mg/m^2)[42]	**Baseline echocardiogram before anthracycline**;[42,43] coordinate cardio-oncology

CONDITION	CLINICAL SIGNIFICANCE*	SCREENING APPROACH
Osteoporosis (M81.0)	Treatment-induced bone fragility compounds age-related loss[44]	**DEXA screening**; antiresorptive therapy (denosumab 60 mg SC q6mo or ZA 5 mg IV annually)
Frailty (R54)	Independently predicts chemotherapy toxicity, surgical complications, mortality[18,21,38]	**G-8 Questionnaire**; CARG Toxicity Calculator; Fried Frailty Criteria[18,21,38]
Hypercalcemia of malignancy (E83.52)	**Calcium >14 mg/dL or symptomatic** = emergent[36,41]	**Calcium with each visit on bone-modifying agents**; IV hydration, calcitonin, **bisphosphonate/denosumab** if symptomatic[41]
Pain: chronic/ breakthrough	Mechanical (fracture risk) vs. inflammatory (tumor);[45,46] **both common**	Document pain trajectory; **palliative care for refractory pain**;[45,46] radiation oncology for painful bone mets
Depression (F32.x/ F33.x)	Common with chronic pain and metastatic disease;[42,47] **affects adherence**	PHQ-2/PHQ-9 **every visit**;[42,47] coordinate behavioral health
Polypharmacy	DDI risk with chemotherapy (methotrexate–NSAID, methotrexate–PPI)[18,21]	Medication reconciliation **every visit**; pharmacist review for high-risk regimens[18,21]
Cognitive impairment (F03.x/ G30.x)	Affects oral chemotherapy compliance and shared decision-making[18,21]	Cognitive screening per geriatric assessment;[18,21] coordinate with caregivers

ABBREVIATIONS: CrCl = creatinine clearance; CKD = chronic kidney disease; DEXA = dual-energy X-ray absorptiometry; SC = subcutaneous; IV = intravenous; ZA = zoledronic acid; G-8 = Geriatric 8 screening; CARG = Cancer and Aging Research Group; mets = metastases; PHQ-2 = Patient Health Questionnaire-2; PHQ-9 = Patient Health Questionnaire-9; DDI = drug–drug interaction; NSAID = nonsteroidal anti-inflammatory drug; PPI = proton pump inhibitor
***Consult FDA labels for the most up-to-date dosage information, contraindications, and drug-drug interactions**

⚠ RED FLAG — EMERGENCY/ACTIVATE CRISIS RESPONSE

These emergency conditions require **same-day ED transfer or emergent special consultation:**

- **Spinal cord compression** (new bilateral leg weakness, saddle anesthesia, urinary retention, rapidly progressive deficit)[35,36,40]
  - → **Emergent MRI entire spine**;[39] dexamethasone IV bolus (**do not wait** for imaging); neurosurgery/radiation oncology consult within hours
  - × Deficits present >48 hours are **frequently irreversible**
- **Pathologic fracture of weight-bearing bone** (acute inability to bear weight, deformity at known or suspected tumor site)[4,9]
  - → **Emergent orthopedic evaluation and stabilization**; do not attempt closed reduction without oncologic guidance
  - × Fracture through tumor risks soft tissue contamination and **may compromise limb salvage**
- **Hypercalcemia of malignancy** (calcium >14 mg/dL or symptomatic with altered mental status, arrhythmia, or renal failure)[41]
  - → Aggressive IV saline hydration (200–300 mL/h); calcitonin for rapid effect; IV zoledronic acid; **denosumab if bisphosphonate-refractory**
  - × Untreated severe hypercalcemia can progress to **coma and cardiac arrest**

⚠ RED FLAG — URGENT (24-72 HOURS)

Expedited workup required = **do not** refer to routine follow-up:

- **Radiograph showing aggressive bone lesion** (permeative/moth-eaten osteolysis, sunburst or Codman triangle periosteal reaction, soft tissue mass); **Bone-RADS 4** = "malignant until proven otherwise"[9]
  - → Immediate orthopedic oncology referral for biopsy and staging; do **NOT** biopsy in primary care[1]
  - × Primary care biopsy can **compromise surgical planes and prevent limb salvage**
- **Bone-RADS 3 (indeterminate) on radiology report**[9]
  - → **Orthopedic oncology referral for probable biopsy**;[1] advanced imaging (CT/MRI/bone scan) for further characterization
  - × **18–30% malignancy rate** in Bone-RADS 3 lesions[48]
- **New neurologic symptoms in known bone metastases** (progressive radiculopathy, motor weakness, gait instability)
  - → **Urgent MRI within 24–72 hours**; dexamethasone if cord compression suspected;[36] radiation oncology consultation
  - × Early detection preserves neurologic function; **delays worsen outcomes**
- **Impending pathologic fracture** (cortical destruction >50% on imaging, persistent weight-bearing pain at metastatic site)[9]
  - → **Orthopedic oncology referral for prophylactic stabilization**; restrict weight-bearing pending evaluation
  - × **Mirels score ≥8** indicates high fracture risk warranting prophylactic fixation

3 MEAT DOCUMENTATION ESSENTIALS

Bone cancer documentation translates clinical complexity into a record that supports **continuity**, **quality measurement**, and **care planning**. **The most common gaps are** primary-vs.-secondary misclassification, omission of pathologic fracture codes, misuse of "history of" codes during active disease, and absent geriatric assessment documentation in older adults.

73-year-old, 14-year history of breast cancer (s/p lumpectomy + radiation, on letrozole), presenting with 5 weeks of progressive right hip/buttock pain worse at night and with recumbency. Exam: antalgic gait, focal tenderness over right hemipelvis, BMI 27 (down from 31). Labs: Hgb 10.1 g/dL; alkaline phosphatase mildly elevated.

MONITOR: "Pain trajectory: 5 weeks progressive hip/buttock pain; recumbency-worsening pattern. Weight: 4 kg loss over 4 months. Functional status: ambulating with antalgic gait; G-8 score pending. Anemia: Hgb 10.1, down from 12.0 one year prior; iron studies ordered."

EVALUATE: "Plain radiograph of pelvis ordered per persistent bone pain >2–3 weeks in patient **≥50 with known primary**. Staging workup initiated given breast cancer history: bone scan, CT C/A/P. SPEP/immunofixation ordered **to rule out myeloma**. CMP with calcium to screen for hypercalcemia. Coordination with breast oncology for biomarker and treatment review."

ASSESS: "Pelvic radiograph: lytic lesion right iliac wing with cortical disruption = **Bone-RADS 4**. PET/CT: FDG-avid right iliac lesion plus T8 and L3 vertebral lesions; no other distant disease. **SPEP negative**. **Diagnoses**: metastatic bone disease from breast cancer, Right iliac wing and thoracolumbar vertebrae (**C79.51** + **C50.x** with laterality); impending pathologic fracture risk: right iliac wing, cortical destruction approaching 50% (**M84.5xx**); iron deficiency anemia (**D50.0**). **G-8 score 13** → referred to geriatric oncology for comprehensive geriatric assessment."

TREAT: "Multidisciplinary tumor board review (medical, radiation, orthopedic oncology; geriatric oncology consult). **Bone-modifying agent**: denosumab 120 mg SC q4 weeks with calcium/vitamin D supplementation and baseline dental evaluation. Palliative RT to painful iliac lesion. Orthopedic consultation for prophylactic stabilization of right iliac wing given cortical destruction. Continue adjuvant breast cancer therapy per oncology. PCP co-manages CV monitoring, fall prevention, calcium homeostasis, and advance care planning."

Clinical Documentation Elements

- **Document the primary-vs.-secondary determination explicitly**: 'metastatic bone disease **from breast cancer** (**C79.51** + **C50.x**)' OR 'primary osteosarcoma, left proximal femur (**C40.22**)'. Never use C40–C41 when the cancer originated outside the bone
- **Document the specific bone and laterality for C40 codes** (bone group + 0 unspecified/ 1 right/2 left). Document the specific **axial site for C41 codes**. Defaulting to C40.90 or C41.9 when documentation supports a specific site = **coding deficiency**
- **Code each metastatic bone site separately** (e.g., right iliac wing, T8, L3) and pair every **C79.51 with the primary site code**. Documentation must support each anatomic site from imaging or pathology
- **Document complications when present**: **M84.5xx** (pathologic fracture in neoplastic disease — specify bone, laterality, 7th character); **G95.20** (cord compression — oncologic emergency); **E83.52** (hypercalcemia of malignancy)
- **Document histology specificity per pathology**: osteosarcoma, chondrosarcoma (specify IDH1 status), Ewing sarcoma, chordoma, dedifferentiated subtypes. Histology drives separate NCCN treatment algorithms[1]
- **Document the comorbidity burden**: chronic kidney disease (**N18.x**), cardiovascular disease (I25.x/I50.x), osteoporosis (**M81.0**), frailty (**R54**), depression (**F32.x/F33.x**), polypharmacy, and cognitive status
- **Document the geriatric assessment outcome**: G-8 score, CGA summary, CARG/CRASH scores when used, treatment modifications based on the assessment, and the patient's preferences regarding aggressive vs. functional-preservation approaches

Reframing Common Documentation Shortcuts

INSTEAD OF…	DOCUMENT…
'Bone cancer'	'**Metastatic bone disease** from breast cancer, right iliac wing and thoracolumbar vertebrae (**C79.51** each site + **C50.x**)' **OR** '**Primary** osteosarcoma, left proximal femur (**C40.22**), cT2N0M0, high grade'
'Bone cancer of leg'	'Osteosarcoma, left proximal femur (**C40.22**)' = bone group + laterality + specific bone per imaging/pathology
'Metastatic bone cancer'	'Metastatic bone disease from prostate cancer (**C79.51**), right iliac wing, L3 vertebra; primary: C61' = **pair every C79.51 with primary site code**
'Multiple myeloma with bone lesions, coded as bone mets'	'Multiple myeloma (**C90.0x**) with lytic bone lesions'; bone destruction inherent to **myeloma**; **never C79.51**
'On chemo'	'**Cisplatin/doxorubicin cycle 2 day 1**; CTCAE grade 1 peripheral neuropathy; cumulative doxorubicin 240 mg/m^2; baseline LVEF 58%'
'Pathologic fracture'	'Pathological fracture in neoplastic disease, right femoral neck (**M84.552A**), initial encounter = secondary to metastatic breast cancer (**C79.51** + **C50.x**)'
'History of bone cancer' (while on active treatment)	Active cancer code (**C40–C41** or **C79.51**); **Z85.830 ONLY AFTER** treatment complete, no active disease
'Spinal cord compression'	'Metastatic spinal cord compression (**G95.20**) at T8, secondary to vertebral metastasis from breast cancer (**C79.51** + **C50.x**); emergent MRI and radiation oncology consult'
'On bisphosphonates'	'Denosumab 120 mg SC q4wk for SRE prevention; calcium/vitamin D supplementation; baseline dental eval completed; serial calcium monitoring'

ABBREVIATIONS: CTCAE = Common Terminology Criteria for Adverse Events; LVEF = left ventricular ejection fraction; MRI = magnetic resonance imaging; SC = subcutaneous; SRE = skeletal-related event

4 TREATMENT AND REFERRAL QUICK GUIDE

Bone cancer treatment is highly specialized and should **never be initiated in primary care**.[1] The **PCP role** is recognition, referral, and co-management, not treatment selection. Treatment is driven by **histology** (osteosarcoma, chondrosarcoma, Ewing sarcoma, chordoma, metastatic disease), **stage** (AJCC 8th Edition, where applicable), **biomarker status** (IDH1 for chondrosarcoma),[3] and **functional/geriatric** (not chronological age alone).[1,4,9] A fit 72-year-old with osteosarcoma **may tolerate cisplatin/doxorubicin**; **a frail 65-year-old may not**. The PCP's highest-value contributions are recognizing persistent bone pain >2–3 weeks as a radiography trigger, correctly

distinguishing primary from secondary bone cancer for coding, referring to high-volume sarcoma centers for biopsy and treatment, co-managing bone-modifying agents and SRE prevention, **integrating palliative care conversations** (**NOT** framed as end-of-life care) at diagnosis, and proactively managing the comorbidity burden that determines treatment tolerability.

Therapy Escalation Criteria

TRIGGER	ACTION*
Persistent bone pain >2–3 weeks regardless of presumed cause	**Plain radiograph of symptomatic site**;[1,4] do **NOT** substitute MRI or escalate analgesics empirically
Negative initial X-ray with persistent suspicion	MRI or orthopedic oncology referral;[4] do **NOT** reassure on negative film alone
Abnormal radiograph (Bone-RADS 3–4) in patient 40	**Immediate orthopedic oncology referral**; do **NO**T biopsy in primary care
Abnormal radiograph in patient ≥40	**Metastatic workup FIRST**:[1,9] bone scan or PET/CT, SPEP, CBC, CMP, PSA, mammogram, CT C/A/P; orthopedic oncology if workup negative
Bone pain in patient with known breast/prostate/lung/kidney cancer	**Targeted imaging of painful site**;[5,49] engage oncology; presume metastatic disease **until proven otherwise**
Confirmed osteosarcoma: fit patient 40	**MAP** (methotrexate/doxorubicin/cisplatin);[1] wide excision; limb salvage **achievable in 90–95%** at specialty centers[26]
Confirmed osteosarcoma: patient >40 or renal impairment	**Cisplatin/doxorubicin doublet** (high-dose methotrexate poorly tolerated >40);[1] dactinomycin substitution **if cardiac-compromised**
Confirmed conventional chondrosarcoma	Surgical resection = **chemoresistant**;[1] ivosidenib for susceptible **IDH1 mutations**[50]
Confirmed Ewing sarcoma	**VDC-IE** (vincristine/doxorubicin/cyclophosphamide alternating with ifosfamide/etoposide);[1,51] treatment data **essentially absent in patients ≥65**
Confirmed chordoma	**En bloc resection**;[1] proton beam or carbon ion RT preferred for unresectable/residual disease[52]
Confirmed metastatic bone disease	**Bone-modifying agent**: denosumab 120 mg SC q4wk or zoledronic acid 4 mg IV q12wk;[53] **palliative RT for painful mets**;[1] SBRT for selected axial mets
G-8 ≤14 or established frailty	**CGA** with CARG/CRASH toxicity scoring;[18,38] consider dose reduction, hypofractionated RT, or supportive care alone

TRIGGER	ACTION*
Metastatic spinal cord compression	**Emergent MRI**;[35,36,40] radiation oncology + neurosurgery consult within hours
Impending pathologic fracture (cortical destruction >50%)	Orthopedic referral for **prophylactic stabilization**;[1] palliative RT;[46] bone-modifying agent intensification

ABBREVIATIONS: MRI = magnetic resonance imaging; PET/CT = positron emission tomography/computed tomography; SPEP = serum protein electrophoresis; CBC = complete blood count; CMP = comprehensive metabolic panel; PSA = prostate-specific antigen; CT = computed tomography; C/A/P = chest/abdomen/pelvis; MAP = methotrexate + adriamycin (doxorubicin) + cisplatin; IDH1 = isocitrate dehydrogenase 1; VDC-IE = vincristine + doxorubicin + cyclophosphamide / ifosfamide + etoposide; RT = radiotherapy; SC = subcutaneous; IV = intravenous; SBRT = stereotactic body radiotherapy; mets = metastases; G-8 = Geriatric 8 screening; CGA = comprehensive geriatric assessment; CARG = Cancer and Aging Research Group; CRASH = Chemotherapy Risk Assessment Scale for High-Age Patients
***Consult FDA labels for the most up-to-date dosage information, contraindications, and drug-drug interactions**

NCCN-Aligned Treatment by Histology, Stage, and Patient Profile

Treatment is specialist-directed.[1] The PCP role is recognition, referral, and co-management, **not treatment selection**. All regimens below are per **NCCN Bone Cancer Guidelines v2.2026**.

HISTOLOGY/SETTING[1]	PREFERRED REGIMEN*[1]	KEY PCP NOTES*[1]
Osteosarcoma: localized, fit patient 40	**MAP** (methotrexate/doxorubicin/cisplatin) = **category 1**	Limb salvage in **~90%** at specialty centers;[26] baseline echo before anthracycline
Osteosarcoma: patient >40 or renal impairment	Cisplatin/doxorubicin doublet = **category 1**	High-dose methotrexate poorly tolerated >40; dactinomycin substitution if cardiac risk
Osteosarcoma: relapsed/refractory	Regorafenib (**category 1**), sorafenib, high-dose ifosfamide, cabozantinib	**Specialist-directed**; monitor HTN, hand-foot syndrome, hepatotoxicity with regorafenib
Conventional chondrosarcoma	Wide surgical excision = **chemoresistant**	Ivosidenib for susceptible IDH1 mutations (off-label, NCCN-listed; phase III CHONQUER trial enrolling)
Dedifferentiated chondrosarcoma	May treat as osteosarcoma (**category 2B**)	Specialist-directed histology-driven escalation
Ewing sarcoma	**VDC-IE** = category 1	Treatment data essentially **absent in patients ≥65**; comorbidities (not age) define outcome
Chordoma (sacrococcygeal/skull base)	**En bloc resection ± adjuvant RT**; definitive RT if unresectable	**Proton beam or carbon ion RT preferred**; >70 Gy with specialized techniques for unresectable

HISTOLOGY/SETTING[1]	PREFERRED REGIMEN*[1]	KEY PCP NOTES*[1]
Metastatic bone disease: SRE prevention	**Denosumab 120 mg SC q4wk** (superior SRE prevention vs. ZA; HR 0.85) OR zoledronic acid 4 mg IV q12wk[53]	Mandatory calcium + vitamin D; baseline dental eval for **ONJ risk**; **denosumab**: monitor calcium (severe hypocalcemia risk with CKD); [53] **ZA**: contraindicated CrCl <30
Painful bone metastases	**Palliative RT**:[46] 8 Gy single fraction or 30 Gy/10 fx	**SBRT** for selected axial mets; functional-preservation oriented
Elderly/frail (G-8 ≤14)	**Dose-reduced regimens**, hypofractionated RT, or supportive care alone	**CGA** with CARG/CRASH toxicity scoring; GA-guided care **reduces toxicity**[38]

ABBREVIATIONS: MAP = methotrexate + adriamycin (doxorubicin) + cisplatin; IDH1 = isocitrate dehydrogenase 1; VDC-IE = vincristine + doxorubicin + cyclophosphamide / ifosfamide + etoposide; RT = radiotherapy; SC = subcutaneous; SRE = skeletal-related event; ZA = zoledronic acid; HR = hazard ratio; IV = intravenous; ONJ = osteonecrosis of the jaw; CKD = chronic kidney disease; CrCl = creatinine clearance; SBRT = stereotactic body radiotherapy; mets = metastases; G-8 = Geriatric 8 screening; CGA = comprehensive geriatric assessment; CARG = Cancer and Aging Research Group; CRASH = Chemotherapy Risk Assessment Scale for High-Age Patients; GA = geriatric assessment; HTN = hypertension.
***Consult FDA labels for the most up-to-date dosage information, contraindications, and drug-drug interactions**

CLINICAL PEARL: CIRT/SBRT FOR ELDERLY PATIENTS WITH AXIAL TUMORS

When elderly patients present with **axial tumors** (spine, skull base, pelvis), major surgery often carries disproportionate morbidity. **Carbon Ion Radiation Therapy** (**CIRT**) and **Stereotactic Body Radiotherapy** (**SBRT**) are evidence-supported alternatives that should be part of the referral conversation, **not reserved as last resorts**.[1,21,54]

CIRT delivers highly precise, biologically potent radiation ideal for skull base chordomas, pelvic sarcomas, and spinal tumors where conventional resection would require significant functional sacrifice.[1] Treatment courses are **shorter than conventional radiotherapy**, reducing burden on frail patients.

SBRT (1–5 sessions) serves dual roles: **palliative treatment** for painful bone metastases and **definitive therapy** for select primary axial tumors.[1,21,54] By avoiding prolonged hospitalization and surgical complications, SBRT reduces the **institutionalization risk** that disproportionately affects elderly patients.

When to consider referral to radiation oncology:[1,21,54] Elderly patients with axial tumors, especially those with surgical risk factors (frailty, comorbidities, functional dependence), benefit from multidisciplinary evaluation that includes these modalities. Early referral ensures the **full range of options is discussed** before defaulting to surgery.

Non-Pharmacologic Care and Supportive Interventions

INTERVENTION	TARGET/RECOMMENDATION	NOTES
Fall prevention + home safety	Structured **low-impact PT**;[21] home safety evaluation; assistive device assessment	**Pathologic fracture risk reduction** is a core PCP responsibility post-referral
Nutritional support	**Dietitian referral** for cachexia, malnutrition, or weight loss during treatment[21]	Compounds chemotherapy toxicity in elderly;[21,55] document **E44.x** severity when applicable
Geriatric assessment	**G-8 ≤14 triggers full CGA**;[18] **CARG + CRASH** for chemotherapy toxicity risk	GA-guided care **reduces toxicity** and improves treatment completion[18]
Early palliative care	**Not end-of-life only** = across all stages[46]	Symptom management, goals-of-care, advance care planning; reduces hospitalizations and ED visits
Cognitive screening	**Mini-Cog** or equivalent as part of CGA[18,21]	**Affects**: oral chemotherapy compliance, shared decision-making capacity, fall risk
Advance care planning	Annual + when goals change[46]	Document directives, surrogate, code status;[46] CPT 99497/99498 billable during AWV with no copay

ABBREVIATIONS: PT = physical therapy; PCP = primary care provider; CGA = comprehensive geriatric assessment; G-8 = Geriatric 8 screening; CARG = Cancer and Aging Research Group; CRASH = Chemotherapy Risk Assessment Scale for High-Age Patients; GA = geriatric assessment; ED = emergency department; AWV = Annual Wellness Visit; CPT = Current Procedural Terminology

Medication Safety and Key Interactions

DRUG/CLASS	INTERACTION/TOXICITY*	CLINICAL ACTION*
Doxorubicin/ anthracyclines	Dose-dependent cardiotoxicity; cumulative limit ≤450 mg/m^2 [56]	Baseline echocardiogram; **serial LVEF monitoring**;[56] dactinomycin substitution for cardiac-compromised patients
High-dose methotrexate (MAP)	**Severe renal toxicity**; mucositis; cytopenias; NSAID/PPI interactions*	MAP preferred in patients <40;[1] **poorly tolerated in elderly**;*[26] monitor CrCl and MTX levels closely
Cisplatin	Nephrotoxicity, ototoxicity, peripheral neuropathy*	**Aggressive hydration**;[1] CrCl monitoring; no standard oxaliplatin substitution in osteosarcoma

DRUG/CLASS	INTERACTION/TOXICITY*	CLINICAL ACTION*
Cyclophosphamide/ ifosfamide (VDC-IE)	**Hemorrhagic cystitis**; cytopenias; ifosfamide encephalopathy	**MESNA prophylaxis**;[1] CBC monitoring; baseline cognitive assessment for ifosfamide
Denosumab (120 mg SC q4wk)	**Severe hypocalcemia** (especially CKD);* ONJ; rebound vertebral fractures on discontinuation	Calcium + vitamin D supplementation **mandatory**; baseline dental evaluation; calcium monitoring; no renal dose adjustment needed
Zoledronic acid (4 mg IV q12wk)	**Nephrotoxicity**; hypocalcemia; ONJ; acute-phase reaction	Contraindicated CrCl <30;* dose reduce CrCl 30–60; baseline dental evaluation; calcium/ vitamin D supplementation
Regorafenib (relapsed osteosarcoma, category 1)	**Hepatotoxicity**;* hypertension; hand-foot syndrome	**LFTs q2wk × 2 months** then monthly;[1] BP weekly × 6 weeks then every cycle; coordinate dose adjustments with oncology
Ivosidenib (IDH1+ chondrosarcoma)	QTc prolongation (mean increase ~17 ms);* avoid CYP3A4 inhibitors	Baseline and serial **ECG**; electrolyte monitoring; avoid concomitant QT-prolonging medications
Opioids (bone pain)	**Constipation**;[45] sedation; respiratory depression	**Prophylactic bowel regimen at initiation** (stimulant laxative ± osmotic);[18,45] **palliative care referral** for refractory pain; consider RT for painful bone lesions
Corticosteroids (antiemetic/cord compression)	**Hyperglycemia**; osteoporosis exacerbation; immunosuppression	Coordinate diabetes adjustments; bone density monitoring on prolonged courses; coordinate steroid use with oncology team

ABBREVIATIONS: LVEF = left ventricular ejection fraction; MAP = methotrexate + adriamycin (doxorubicin) + cisplatin; NSAID = nonsteroidal anti-inflammatory drug; PPI = proton pump inhibitor; CrCl = creatinine clearance; MTX = methotrexate; VDC-IE = vincristine + doxorubicin + cyclophosphamide/ifosfamide + etoposide; CBC = complete blood count; SC = subcutaneous; CKD = chronic kidney disease; ONJ = osteonecrosis of the jaw; IV = intravenous; LFT = liver function test; BP = blood pressure; IDH1 = isocitrate dehydrogenase 1; ECG = electrocardiogram; RT = radiotherapy
***Consult FDA labels for the most up-to-date dosage information, contraindications, and drug-drug interactions**

When to Refer

CRITERION	SPECIALIST[1,36]	URGENCY[1,36]
Spinal cord compression; pathologic fracture of weight-bearing bone; hypercalcemia of malignancy	Emergency department/neurosurgery/ radiation oncology/orthopedic surgery	**Emergent**

CRITERION	SPECIALIST[1,36]	URGENCY[1,36]
Bone-RADS 4 (high-risk) lesion on radiograph	Orthopedic oncology at high-volume sarcoma center	**Urgent** (within days; do **NOT** biopsy in primary care)
Persistent bone pain in patient ≥40 with abnormal radiograph	**Complete metastatic workup first** (bone scan/PET-CT, SPEP, PSA, mammogram, CT C/A/P); then orthopedic oncology if workup negative	**Urgent** (within 1–2 weeks)
Bone-RADS 3 (indeterminate) lesion	Orthopedic oncology for probable biopsy	**Urgent** (within days)
Confirmed primary bone cancer on biopsy	Multidisciplinary tumor board at high-volume sarcoma center	**Urgent** (within 1–2 weeks of pathology)
G-8 ≤14 or significant frailty/ multimorbidity	Geriatric oncology/comprehensive geriatric assessment	**Urgent** (before any treatment cycle 1)
Suspected hereditary syndrome (Li-Fraumeni, hereditary retinoblastoma)	Cancer genetics/genetic counseling	**Routine** (within 4–6 weeks)
Bone-modifying agent initiation (denosumab or zoledronic acid)	Dental evaluation; oncology/ endocrinology for calcium homeostasis support	**Routine** (before initiation)
Persistent or refractory bone pain on standard analgesics	Palliative care; radiation oncology for palliative RT	**Within days**
End-of-life trajectory; hospice eligible	Hospice (Medicare Hospice Benefit)	When goals align

ABBREVIATIONS: RT = radiotherapy; PET-CT = positron emission tomography/computed tomography; SPEP = serum protein electrophoresis; PSA = prostate-specific antigen; CT = computed tomography; C/A/P = chest/abdomen/pelvis; G-8 = Geriatric 8 screening; CGA = comprehensive geriatric assessment

Follow-Up Timing

STAGE/CATEGORY	FREQUENCY	LABS/MONITORING[1,2]
Osteosarcoma: neoadjuvant/adjuvant chemotherapy	**Every 2–3 weeks** during chemotherapy cycles	CBC, CMP with calcium, LFTs; symptom and CTCAE toxicity grading; LVEF every 3 months on anthracycline
Ewing sarcoma: VDC-IE	**Every 2–3 weeks** during alternating cycles	CBC, CMP, LFTs; ifosfamide-related cognitive screening; MESNA hydration documentation

STAGE/CATEGORY	FREQUENCY	LABS/MONITORING[1,2]
Chondrosarcoma: post-resection surveillance	**Every 3–6 months** for first 2 years; **every 6–12 months** thereafter	Imaging per oncology plan; symptom review; functional status
Metastatic bone disease — on bone-modifying agent[14,19]	**Every 4 weeks** (denosumab q4w) or **12 weeks** (denosumab/ZA q12w)	Calcium with each dose; CrCl on zoledronic acid; ONJ surveillance; CMP
Post-resection surveillance: primary bone cancer	**Every 3 months** × 2 years; every 6 months years 3–5; annual thereafter	Imaging per oncology plan; symptom review; weight; CBC, CMP, LFTs
Off active treatment: surveillance	Per oncology plan; **PCP every 3–6 months**	Weight; pain trajectory; functional status; comorbidity management; depression and ACP review
Post-radiation surveillance	Per radiation oncology plan; **PCP monitors late effects**	Late radiation-induced cardiotoxicity; second-malignancy surveillance long-term

ABBREVIATIONS: CBC = complete blood count; CMP = comprehensive metabolic panel; LFT = liver function test; CTCAE = Common Terminology Criteria for Adverse Events; LVEF = left ventricular ejection fraction; VDC-IE = vincristine + doxorubicin + cyclophosphamide / ifosfamide + etoposide; MESNA = 2-mercaptoethane sulfonate sodium; CrCl = creatinine clearance; ZA = zoledronic acid; ONJ = osteonecrosis of the jaw; PCP = primary care provider; ACP = advance care planning

Comorbidity Management — Primary Care Role

COMORBIDITY	APPROACH	CAUTION*[1]
Chronic kidney disease (N18.x)	**CrCl trending**; coordinate dose adjustments with oncology; nephrology for **CKD stage ≥3**	**ZA contraindicated CrCl <35 mL/min**; cisplatin/high-dose MTX nephrotoxic; denosumab severe **hypocalcemia risk in CKD**[53,57]
Cardiovascular disease (I25.x, I50.x)	**Baseline echocardiogram and serial LVEF** on anthracycline; standard secondary CV prevention	Cumulative doxorubicin dose ≥250 mg/m^2 = **high cardiotoxicity risk**;[42] consider dexrazoxane
Osteoporosis (M81.0)	**DEXA screening**; antiresorptive at osteoporosis dose distinct from SRE-prevention dose	**Denosumab 60 mg SC q6mo** (osteoporosis) vs. 120 mg q4w (SRE);[53] ZA 5 mg IV annually (osteoporosis) vs. 4 mg q12w (SRE)
Frailty (R54)	**G8 → CGA**; physical therapy; medication review	Drives treatment intensity decisions[21]

COMORBIDITY	APPROACH	CAUTION*[1]
Cognitive impairment	**Mini-Cog** or equivalent as part of CGA; coordinate with caregivers	Affects compliance, side-effect reporting, decision-making capacity, fall risk[21]
Polypharmacy	Medication reconciliation **every visit**; pharmacist review for high-risk regimens	MTX–NSAID and MTX–PPI interactions; DDIs with bone-modifying agents
Fall risk/fragility	Home safety assessment; **low-impact PT**;[21] assistive devices	Compounded by osteoporosis + tumor-weakened bone; pathologic fracture risk
Depression (F32.x/ F33.x)	**PHQ-2/PHQ-9** at baseline and during treatment;[21] behavioral health referral	Common in chronic pain and metastatic cancer;[21] **affects treatment adherence and QoL**
Diabetes (E11.x)	**HbA1c trending**; coordinate glycemic management during steroid courses[21]	Corticosteroid antiemetics **worsen hyperglycemia**
Hypercalcemia of malignancy (E83.52)	Calcium with each visit on bone-modifying agents[58]	**Corrected Ca >13 mg/dL or symptomatic** → emergent IV hydration, calcitonin, bisphosphonate/denosumab[36]

ABBREVIATIONS: CrCl = creatinine clearance; CKD = chronic kidney disease; ZA = zoledronic acid; MTX = methotrexate; LVEF = left ventricular ejection fraction; CV = cardiovascular; DEXA = dual-energy X-ray absorptiometry; SRE = skeletal-related event; SC = subcutaneous; IV = intravenous; G-8 = Geriatric 8 screening; CGA = comprehensive geriatric assessment; PT = physical therapy; NSAID = nonsteroidal anti-inflammatory drug; PPI = proton pump inhibitor; DDI = drug–drug interaction; PHQ-9 = Patient Health Questionnaire-9; QoL = quality of life; HbA1c = hemoglobin A1c
***Consult FDA labels for the most up-to-date dosage information, contraindications, and drug-drug interactions**

Cost-Smart Options

BRAND (EST. COST)	GENERIC/ ALTERNATIVE (EST. COST)[59–61]	EST. SAVINGS[59–61]	COST-SMART TIP[59–61]
Xgeva (denosumab 120 mg q4w) (~$2,000– $3,000/mo)	Generic ZA 4 mg IV q12w(**~$50–$150/ infusion**); **biosimilars** Wyost, Osenvelt now available	**~$1,500–$2,500/mo**	**ZA q12w is 9x less costly** than monthly denosumab with similar QALYs;[44] **biosimilars** may lower denosumab cost
Branded chemotherapy components	**Generic** doxorubicin, cisplatin, ifosfamide, methotrexate, vincristine, 5-FU	Significant	**All standard bone sarcoma regimen components available as generics**; document by component for continuity

BRAND (EST. COST)	GENERIC/ ALTERNATIVE (EST. COST)[59–61]	EST. SAVINGS[59–61]	COST-SMART TIP[59–61]
Major surgery for axial tumor in elderly (~$50,000–$150,000+)	**CIRT** or **SBRT** for selected unresectable axial tumors	Variable	Functional-preservation alternative; fewer sessions; **avoids surgery-associated institutionalization in frail patients**; CIRT limited to specialized centers
Conventional fractionated RT (10–25 fx; ~$8,000–$20,000/course)	Single-fraction 8 Gy (**~$2,000– $4,000**) or SBRT 1–5 fx (**~$7,000– $14,000**) for painful bone mets	**~$4,000–$14,000/course**	8 Gy × 1 provides **equivalent pain relief per ASTRO**;[54] SBRT conditionally recommended for **ECOG 0–2**; fewer visits
NK1 RA combos: Akynzeo (~$600–$800/dose)	Generic ondansetron + dexamethasone ± olanzapine (**~$2–$10/dose**)	**~$300–$700/cycle**	Reserve NK1 RA for **high emetogenic risk** (cisplatin); ondansetron + dex sufficient for moderate risk
Inpatient open bone biopsy (CPT 20245; ~$5,000– $15,000+)	Outpatient image-guided needle biopsy (CPT 20225; **~$1,500–$3,000**) at treating institution	**~$3,000–$12,000**	Biopsy **MUST** occur at treating sarcoma center; primary care biopsy can **compromise limb salvage**

ABBREVIATIONS: ZA = zoledronic acid; IV = intravenous; QALYs = quality-adjusted life years; 5-FU = 5-fluorouracil; CIRT = carbon ion radiotherapy; SBRT = stereotactic body radiotherapy; RT = radiotherapy; fx = fractions; mets = metastases; ASTRO = American Society for Radiation Oncology; ECOG = Eastern Cooperative Oncology Group; NK1 RA = neurokinin-1 receptor antagonist; SRE = skeletal-related event; CrCl = creatinine clearance
***Costs are approximate US estimates and vary by institution, payer, and region. Consult FDA labels for the most up-to-date dosage information, contraindications, and drug-drug interactions**

Patient Education and Adherence

What makes bone cancer patient education unique is the rarity of primary bone tumors, the complexity of multimodal treatment (surgery, chemotherapy, radiation), and bone-modifying agents with **distinct toxicity profiles** including osteonecrosis of the jaw and hypocalcemia requiring preventive dental care and supplementation. The patient population spans adolescents/young adults to older adults with frailty and multimorbidity, compounding fall risk on tumor-weakened bone, cognitive barriers to treatment compliance, and caregiver dependence. **Education should emphasize:** what symptoms to report urgently (new neurologic deficits, worsening pain, fever), how palliative care complements oncology from diagnosis onward, and what long-term surveillance involves after treatment.

DOCUMENTATION — PATIENT EDUCATION

*Document the following education topics, the patient and caregiver(s) present, materials provided, and patient understanding (**teach-back method**):*

- ***Primary vs. metastatic determination:*** *Document that the patient understands why a full metastatic workup (bone scan/PET-CT, labs, cross-sectional imaging) must precede biopsy in patients ≥40; document workup status*
- ***Biopsy safety:*** *Document counseling that biopsy must occur only at the treating sarcoma center; an outside biopsy can compromise limb salvage options*
- ***Treatment plan overview:*** *Document modalities discussed (surgery, chemotherapy, radiation), expected timeline, and patient questions*
- ***Bone-modifying agent counseling:*** *Document dental evaluation referral (pre-treatment), calcium/vitamin D supplementation plan, ONJ risk discussion, and hypocalcemia warning signs (numbness, tingling, muscle cramps)*
- ***Fall prevention and home safety:*** *Document home safety assessment, PT referral, assistive device needs; critical given osteoporosis + tumor-weakened bone*
- ***What to report between visits:*** *New neurologic symptoms (weakness, numbness, bowel/bladder changes → emergent); new or worsening pain; fever during chemotherapy; signs of pathologic fracture*
- ***Palliative care role:*** *Document that palliative care was introduced as complementary to oncology from diagnosis onward, not limited to end of life*
- ***Surveillance after treatment:*** *Document discussion of long-term follow-up schedule, imaging intervals, and late effects monitoring*
- ***Advance care planning:*** *Surrogate designation, code status, goals of care; CPT 99497/99498 billable during AWV with no patient copay*
- ***Caregiver assessment:*** *Document caregiver present, their understanding of care responsibilities, and burden screening; refer to social work if strain identified*

Quality Metrics Tie-In

No bone cancer-specific HEDIS or MIPS measures are currently active in MY2026, but bone cancer intersects **multiple quality measurement domains**: pain assessment, depression screening (PHQ-9), functional status and fall risk (limb-salvage rehabilitation, prosthetic mobility, amputation recovery), care transitions (post-surgical and post-chemotherapy hospitalizations), medication reconciliation (high-dose methotrexate, doxorubicin, cisplatin, opioids, antiemetics), and goals-of-care documentation. The disease's combination of **complex multimodal therapy** (neoadjuvant chemotherapy, limb-salvage surgery or amputation, rehabilitation), **high symptom burden** (pain, functional impairment, body image distress), and young-adult predominance in osteosarcoma/Ewing sarcoma means that cross-cutting national measures apply across the care trajectory and can anchor quality reporting for any PCP managing a bone cancer patient in a value-based program. **Accurate ICD-10 coding** (**C40.x/C41.x** with anatomic subsite + laterality, or **C49.x** for soft tissue sarcomas involving bone) **is the prerequisite** for mapping bone cancer patients into the correct measure denominators.[15]

MEASURE	STANDARD	APPLICABILITY TO BONE CANCER
HEDIS COA: Care for Older Adults-Medication Review	**Denominator**: MA enrollees ≥66, continuously enrolled **Numerator**: 4 sub-measures documented annually: (1) functional status assessment, (2) medication review, (3) pain assessment, (4) advance care planning **Exclusions**: hospice, ESRD	**Bone cancer polypharmacy includes**: chemotherapy agents (high-dose methotrexate, doxorubicin, cisplatin/ifosfamide), opioid analgesics, antiemetics, bisphosphonates/denosumab, and late-effects medications; medication review should reconcile nephrotoxic agents, cardiotoxicity monitoring (doxorubicin cumulative dose), and opioid safety
HEDIS COA: Care for Older Adults-Functional Status Assessment	**Denominator**: enrollees ≥66 **Numerator**: functional status assessment documented annually; **Exclusions**: hospice, ESRD	**ECOG/Karnofsky performance status and MSTS** (Musculoskeletal Tumor Society) **functional score** satisfy this sub-measure; document at **every visit** to track mobility trajectory post–limb-salvage surgery or amputation and guide rehabilitation intensity
HEDIS TRC: Transitions of Care Patient	**Denominator:** enrollees ≥18 with inpatient discharge **Numerator:** 4 sub-measures within 30 days: (**1**) notification of inpatient admission, (**2**) receipt of discharge information, (**3**) patient engagement after discharge, (**4**) medication reconciliation post-discharge; **Exclusions:** hospice	Bone cancer patients have frequent hospitalizations for surgical procedures (limb-salvage, amputation, hardware revision), chemotherapy cycles requiring inpatient administration (high-dose methotrexate with leucovorin rescue), and complications (wound infection, febrile neutropenia); **post-discharge medication reconciliation is critical**
HEDIS DMS-E: Utilization of the PHQ-9 to Monitor Depression Symptoms for Adolescents and Adults	**Denominator:** enrollees ≥12 with diagnosis of major depression or dysthymia AND elevated PHQ-9 ≥10 **Numerator:** follow-up PHQ-9 documented within 4–8 months of index elevated score **Exclusions:** hospice	Depression and anxiety rates in bone sarcoma patients **range 20–37%**;[62] body image distress after amputation or limb-salvage, chronic pain, functional loss, and young age at diagnosis are independent risk factors → **PHQ-9 at every visit** with follow-up plan if positive
HEDIS ACP: Advance Care Planning	**Denominator:** enrollees ≥66 **Numerator:** advance care plan or surrogate decision-maker documented, **OR** documentation that ACP was discussed but patient declined **Exclusions:** hospice	Metastatic/recurrent osteosarcoma and Ewing sarcoma carry poor prognosis (5-year OS 20–30% for metastatic disease); **ACP should be initiated early**, especially for relapsed disease; billable as CPT 99497/99498 during AWV with no copay

MEASURE	STANDARD	APPLICABILITY TO BONE CANCER
HEDIS PCR: Plan All-Cause Readmission	**Denominator:** enrollees ≥18 with acute inpatient discharge **Numerator:** unplanned readmission within 30 days (lower is better) **Exclusions:** planned readmissions (maintenance chemotherapy, transplant), hospice, psychiatric	**Bone cancer readmission drivers include**: surgical wound complications, prosthetic infection, febrile neutropenia, methotrexate toxicity (mucositis, renal injury), and uncontrolled pain; **PCP post-discharge follow-up within 7 days** reduces readmission risk
Annual Wellness Visit (AWV)	CPT G0438 (initial)/G0439 (subsequent); documents functional/cognitive screen, fall risk, ACP, depression screen	**Platform for**: PHQ-9/GAD-7, medication reconciliation (chemotherapy + opioids + bone-targeting agents), functional status (ECOG/MSTS score), fall risk (amputation, limb-salvage hardware, deconditioning), ACP update, survivorship care plan review, and SDoH screening; **no patient copay**

ABBREVIATIONS: MA = Medicare Advantage; ESRD = end-stage renal disease; ECOG = Eastern Cooperative Oncology Group; MSTS = Musculoskeletal Tumor Society; PHQ-9 = Patient Health Questionnaire-9; OS = overall survival; ACP = advance care planning; AWV = Annual Wellness Visit; PCP = primary care provider; GAD-7 = Generalized Anxiety Disorder-7; SDoH = social determinants of health; HEDIS = Healthcare Effectiveness Data and Information Set; COA = Care for Older Adults; TRC = Transitions of Care; DMS-E = Depression Monitoring and Follow-Up; PCR = Plan All-Cause Readmissions

5 CODING REMINDERS AND CASE EXAMPLES

Coding Specificity

- **Primary vs. Secondary:** Always document whether cancer originated in bone **OR** metastasized to bone.[1] **Primary → C40/C41**; Secondary → **C79.51 or C79.52** paired with primary site code (e.g., C50.x breast, C61 prostate, C34.x lung, C64 kidney). Misclassification in either direction distorts both **the clinical record and HCC mapping**[16,17]
- **C40 Family Requires Bone Group + Laterality:** Every imaging and pathology report specifies the bone and side = **transcribe into the encounter note**. Specify bone group (scapula/long upper, short upper, long lower, short lower) **AND** laterality (0=unspecified, 1=right, 2=left). **C40.90** (unspecified) is the **highest audit-risk code** in primary bone cancer because supporting documentation almost always contains the specific information
- **C41 Family Requires Specific Axial Site:** Specify the axial site (skull/face, mandible, vertebral column, ribs/sternum/clavicle, pelvis/sacrum/coccyx); **no laterality digit**. Document specific bone/structure from imaging or pathology: e.g., "sacrum" supports **C41.4**

- **C79.51 Always Paired:** Pair **every C79.51 or C79.52** with the primary site code. Pairing is required for **clinical completeness**; an unpaired C79.51/C79.52 leaves the clinical record incomplete and the treatment rationale unauditable
- **Multiple Myeloma = C90.0x, Not C79.51**: Bone destruction is inherent to **multiple myeloma**.[7,63] Use **C90.0x**; **never code myeloma bone lesions as C79.51**
- **Histology:** Document subtype (osteosarcoma, chondrosarcoma, Ewing sarcoma, chordoma, dedifferentiated subtypes); **histology drives separate NCCN treatment algorithms** and clinical trial eligibility[1]
- **Stage (AJCC 8th Edition)**: Document T, N, M with specific substage for appendicular skeleton tumors (staging system exists for appendicular only). Stage drives treatment algorithm selection[1]
- **Active vs. Personal History**: Use **C40/C41** or **C79.51** while disease is active, under treatment, or under active surveillance. Z85.830 applies **ONLY** after complete treatment with no active disease. Premature switch to Z85.830 **eliminates HCC mapping entirely**[17]
- **Functional Status (ECOG + G-8)**:[18,64] Document ECOG performance status **at every encounter**. For patients ≥65, document G-8 screening score; **G-8 ≤14** triggers comprehensive geriatric assessment. **Frailty** (not chronologic age) predicts treatment tolerance;[38] functional scores drive regimen intensity decisions and geriatric oncology referral[1]
- **Complications = Code Alongside Cancer**: **M84.5xx** (pathologic fracture in neoplastic disease)→ specify bone, laterality, 7th character (A=initial, D=subsequent, S=sequela); code **alongside C40/C41** or **C79.51/C79.52**. **G95.20** (cord compression) → code alongside **C79.51/C79.52** + primary site code when metastatic spinal cord compression is documented. **E83.52** (hypercalcemia of malignancy) → document and code when present
- **Concurrent Comorbidities**: CKD (**N18.x** = constrains cisplatin, methotrexate, zoledronic acid), cardiovascular disease (**I25.x/I50.x** = constrains doxorubicin), osteoporosis (**M81.0**), frailty (**R54**), depression (**F32.x/F33.x**), polypharmacy = each carries independent clinical significance, affects treatment decisions, and **supports distinct HCC categories**. Code and document MEAT **for each at every encounter**
- **Chronicity**: Diagnosis date, current treatment regimen with cycle number and date of last administration, duration in remission or progression status. Update at every encounter during the reporting year to **maintain HCC continuity**

Annual Clinical Review and Confirmation

- **Annual review:** Active bone cancer (primary or secondary) must be **reassessed annually** with **MEAT documented**; in patients on active treatment or surveillance, the diagnosis is current and requires ongoing documentation each year

- **Visit modality:** Face-to-face **or** synchronous audio-video telehealth qualifies when it supports meaningful clinical evaluation; **chart updates without an encounter do not satisfy MEAT**
- **Clinical context:** Under CMS-HCC V28,[16,17] primary bone cancer maps to **HCC 19**; metastatic bone disease maps to **HCC 18** (CNA RAF **2.341**) and requires pairing with the primary site code
- **Avoid rollover: Do not** copy forward last year's note **without updating**: treatment status, current line of therapy and cycle, current stage/biomarker status, metastatic site listing, performance and geriatric status, and the comorbidity burden

Good Documentation — EHR Tips

- **[EHR TIP — Smartphrase]** Build a **.boneca dot phrase** that auto-populates ICD-10 with **primary vs. metastatic** distinction + **site/laterality** (primary: **C40.0–C41.9**; metastatic: **C79.51** + source cancer code), **histology** (osteosarcoma/chondrosarcoma/Ewing/chordoma or metastatic primary type), AJCC 8th edition stage, grade, molecular profile (MDM2/CDK4, EWSR1-FLI1, IDH1/2 as applicable), **ECOG or G8** with trend, current regimen/cycle/day, bone-modifying agent status (agent, dose, start date), and **active comorbidities** (osteoporosis, renal insufficiency, dental status) = sourced from pathology, radiology, oncology notes, and problem list. Eliminates unspecified "bone cancer" coding and supports MEAT documentation in a single paste
- **[EHR TIP — Alert]** Filter "**Bone Cancer Active**" = patients with **C40.x**, **C41.x**, or **C79.51** on the problem list, or **Z51.11** chemotherapy encounter in the last 12 months plus bone malignancy, **without** oncology or PCP visit in the past 12 months. Filter "**Bone-Modifying Agent Monitoring Due**" = active denosumab or zoledronic acid without calcium, CrCl, or dental evaluation in the past 6 months
- **[EHR TIP — Best Practice] Problem list hygiene**: maintain entries as **specific** (e.g., "Osteosarcoma, left proximal femur, C40.22, cT2N0M0, high grade" or "Metastatic bone disease from breast cancer: right iliac wing, C79.51 + C50.x"), **not** "bone cancer." Update site/laterality from **every** imaging and pathology report. Code each metastatic site and comorbidity **individually** (osteoporosis M81.0, pathologic fracture M84.5x, renal insufficiency N18.x). Maintain bone-modifying agent status and molecular profile on the active list
- **[EHR TIP — Workflow] Fire BPA** when active bone cancer code (**C40.x**, **C41.x**, **C79.51**) has no MEAT-documented encounter **in 12 months** = supports HCC mapping and RAF continuity. Flag unspecified bone malignancy codes persisting >30 days for **specificity upgrade**. Flag bone-modifying agent orders **without monitoring labs** (calcium, CrCl, phosphate) at 6-month intervals
- **[EHR TIP — Order Set]** "**Bone Lesion Workup**": radiograph with Bone-RADS → MRI + staging CT/PET → biopsy with molecular panel; auto-attaches **metastatic workup** for age

≥40. "**Bone Cancer Surveillance**": imaging at 3-month intervals × 2 years, 6-month years 3–5, annual thereafter. "**Bone-Modifying Agent Initiation**": agent selection + baseline labs (calcium, CrCl, vitamin D, phosphate) + calcium/vitamin D supplementation + **dental referral** + ONJ counseling template. **New-diagnosis bundle** adds tumor board referral, geriatric assessment (G-8/CGA if ≥65), palliative care consult, and advance care planning

Brief Case Examples

SUCCESS: COMPREHENSIVE DOCUMENTATION

SCENARIO

A 73-year-old patient with 14-year history of breast cancer (s/p lumpectomy + radiation, on letrozole) presents with 5 weeks of progressive right hip/buttock pain worse at night and with recumbency; antalgic gait; hemoglobin 10.1 g/dL; mild alkaline phosphatase elevation. PCP recognized the **red-flag pattern** (persistent bone pain >2–3 weeks in patient ≥50 with known primary cancer), ordered **plain radiograph of pelvis** (CPT 73060–73090). Bone-RADS 4 lesion of right iliac wing identified. Staging workup completed with **bone scan**/**PET-CT**, **CT** C/A/P, SPEP (negative; **myeloma excluded**).

Documentation: "Metastatic bone disease from breast cancer: right iliac wing and thoracolumbar vertebrae (T8, L3), **C79.51** coded at each site + **C50.x** (right breast, with laterality) = confirmed by **CT-guided biopsy** [date], consistent with ER+/PR+/HER2− breast primary. **Concurrent**: osteopenia (**M85.80**), CKD stage 2 (**N18.2**), vitamin D insufficiency (**E55.9**). **G-8 score 13** → comprehensive geriatric assessment placed per ASCO 2023; CARG chemotherapy **toxicity risk calculated**. Multidisciplinary tumor board review completed [date]; **palliative radiation** (single fraction 8 Gy) for painful right iliac lesion; **SBRT consideration** for vertebral metastases (T8, L3) per radiation oncology. Denosumab 120 mg SC q4 weeks initiated (HR 0.83 vs. zoledronic acid for SRE prevention) with calcium 1200 mg + vitamin D 1000 IU daily; **baseline dental evaluation completed** [date]; ONJ risk counseled, patient confirms understanding. Orthopedic consultation for prophylactic stabilization of right iliac wing (cortical destruction approaching 50%). CPT 99497 **advance care planning completed**, patient confirms goals focused on function and pain control. Assessment: Metastatic breast cancer to bone = denosumab + palliative radiation per tumor board; letrozole continued per oncology (Dr. [Name], last seen [date]); CKD stable; fall prevention plan in place. PCP continues to co-manage CV monitoring, calcium homeostasis, fall prevention, and ACP. Return 4 weeks or sooner for new fracture symptoms, worsening pain, or signs of hypocalcemia."

Outcome: HCC 18 (metastatic malignancy) supported with anatomic specificity (**C79.51** at each site + **C50.x** with laterality); primary-vs.-secondary distinction **correctly documented** = the single most important coding decision in bone cancer; bone-modifying agent selection **rationale auditable** (denosumab over zoledronic acid with HR cited); **G-8-triggered CGA** supports geriatric-tailored dosing; palliative care and ACP **integrated early** in metastatic trajectory per ASCO/NCCN; orthopedic referral for prophylactic stabilization documented **with structural rationale**. Every MEAT element present: pathology with primary confirmation, imaging with Bone-RADS and staging findings, treatment plan with radiation and bone-modifying agent rationale, functional assessment with G-8 score, coded diagnoses at each metastatic site, follow-up interval with symptom-based return criteria.

PITFALL: INSUFFICIENT DOCUMENTATION

Documentation as written: "71-year-old man with metastatic prostate cancer to bone (**C41.4**; pelvic bone cancer) **on standard ADT** and zoledronic acid. Coded as personal history of cancer

(**Z85.830**). Plan: continue current management; outpatient follow-up in 3 months." Patient is on active ADT (enzalutamide + degarelix) and zoledronic acid 4 mg IV q12 weeks for known metastatic disease to pelvis, ribs, and lumbar spine. Bone scan from 3 months ago documents all three sites. CKD stage 3a on most recent labs. **No dental evaluation** documented since bone-modifying agent initiation 14 months ago.

Consequence: Two distinct coding errors undermine this record. (**1**) Bone metastases from prostate cancer is **C79.51** paired with **C61**, **NOT C41.4** (primary pelvic bone cancer); this is the single most common bone cancer coding error and **misclassifies secondary disease** as a primary bone malignancy. (**2**) **Z85.830** ("personal history") **does not** map to any HCC and is incorrect while the patient is on active bone-modifying agent therapy and active ADT: the disease is active, **not historical**. "On standard ADT" without agent names, doses, or cycle dates **fails MEAT**. Three known metastatic sites on bone scan but only one referenced. CKD stage 3a is not on active problem list despite zoledronic acid **requiring CrCl monitoring**. No ONJ surveillance documentation despite >12 months on bone-modifying agent. The record **understates the clinical complexity** the team is actually managing and **impairs continuity** between PCP and oncology.

RAF Impact: C41.4 → HCC 19 (RAF 1.798); correct code **C79.51 → HCC 18** (RAF 2.341); the 0.543 RAF difference **understates clinical complexity**. Adding Z85.830 instead of the active cancer code zeroes out the HCC entirely = both clinically and financially **incorrect while disease is active**. Missing CKD documentation further understates true clinical complexity.

Fix: Update problem list and assessment: "Metastatic prostate cancer to bone: right pelvis, bilateral ribs (4th, 7th), lumbar spine (L2, L4), **C79.51** coded at each site + **C61** (prostate primary) = confirmed by bone scan [date]. **Remove Z85.830**; patient has active disease on active therapy. Currently on enzalutamide 160 mg daily + degarelix 240 mg SC q28d (ADT initiated [date]) per oncology (Dr. [Name], last seen [date]). Zoledronic acid 4 mg IV q12 weeks (cycle [X], last infusion [date]); calcium 1000 mg + vitamin D 800 IU daily; **CrCl 48 mL/min** (CKD stage 3a, N18.3) → renal dose monitoring required. Dental evaluation overdue: **referral placed for ONJ** surveillance per 12-month protocol. PSA trend: [value/date]. ECOG 2. **Advance care plan reviewed**, patient confirms current goals. Assessment: Metastatic prostate cancer to bone on active ADT + bone-modifying agent = continue per oncology; CKD stage 3a stable, monitor CrCl **before** each zoledronic acid infusion; ONJ surveillance dental referral placed. Return 4 weeks or sooner for new bone pain, signs of hypocalcemia, or urinary symptoms." Coding after fix: **C79.51** at each site + **C61** (→ HCC **18**) + **N18.3** (CKD stage 3a) + **M81.0** (osteoporosis if documented) = **real clinical picture** preserved.

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