

## American College of Radiology ACR Appropriateness Criteria®

### Primary Bone Tumors

**Variant 1: Suspect primary bone tumor. Initial imaging.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Radiography area of interest	Usually appropriate	Strong	Varies	Varies	9	9	0	1	0	0	0	0	0	0	13
		References		Study Quality											
		10 (9308471)		3											
		3 (5846856)		4											
		4 (7323290)		4											
		5 (7323291)		4											
		6 (7323292)		4											
		7 (16247641)		3											
		8 (27070373)		3											
		9 (26220916)		2											
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	11	1	1	1	0	0	0	0	0
CT area of interest without IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	12	0	1	0	1	0	0	0	0
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	12	0	2	0	0	0	0	0	0
MRI area of interest without IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	10	1	1	1	0	1	0	0	0

MRI area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	11	0	2	0	1	0	0	0	0
Bone scan whole body	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	11	0	2	0	0	0	0	1	0
FDG-PET/CT whole body	Usually not appropriate	Expert Consensus	⊗⊗⊗⊗ 10-30 mSv	⊗⊗⊗⊗ 3-10 mSv [ped]	1	1	11	1	1	0	0	0	1	0	0
US area of interest	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	0	0	0	0	0	0	0	1

**Variant 2: Suspect primary bone tumor. Radiographs negative or do not explain symptoms. Next imaging study.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
MRI area of interest without and with IV contrast	Usually appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	9	9	1	0	0	1	1	1	1	1	8
		References		Study Quality											
		12 (2120933)		2											
MRI area of interest without IV contrast	Usually appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	7	7	0	0	1	0	5	0	2	2	4
		References		Study Quality											
		12 (2120933)		2											
CT area of interest without IV contrast	May be appropriate	Limited	Varies	Varies	5	5	1	0	1	1	6	4	1	0	0
		References		Study Quality											
		11 (12886126)		3											
CT area of interest without and with IV contrast	May be appropriate	Limited	Varies	Varies	4	4	4	1	1	3	4	0	1	0	0
		References		Study Quality											
		11 (12886126)		3											

CT area of interest with IV contrast	Usually not appropriate	Limited	Varies	Varies	1	1	10	1	3	0	0	0	0	0	0
		References		Study Quality											
		11 (12886126)		3											
Bone scan whole body	Usually not appropriate	Limited	☹☹☹ 1-10 mSv	☹☹☹☹ 3-10 mSv [ped]	1	1	9	1	1	2	0	0	0	0	0
		References		Study Quality											
		12 (2120933)		2											
FDG-PET/CT whole body	Usually not appropriate	Expert Consensus	☹☹☹☹ 10-30 mSv	☹☹☹☹ 3-10 mSv [ped]	1	1	8	0	2	2	0	2	0	0	0
US area of interest	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	11	1	1	0	0	0	0	1	0

**Variant 3: Suspect primary bone tumor. Benign radiographic features. Not osteoid osteoma. Next imaging study.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
MRI area of interest without IV contrast	May be appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	5	5	0	0	0	5	8	1	0	0	0
		References		Study Quality											
		13 (-3145589)		4											
MRI area of interest without and with IV contrast	May be appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	5	5	0	0	0	3	7	3	1	0	0
		References		Study Quality											
		13 (-3145589)		4											
CT area of interest without IV contrast	May be appropriate	Expert Consensus	Varies	Varies	4	4	6	0	1	2	3	2	0	0	0
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	10	0	2	1	0	0	1	0	0

CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	9	1	1	1	1	0	1	0	0
Bone scan whole body	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	8	1	2	0	1	1	1	0	0
FDG-PET/CT whole body	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	10	1	2	0	0	1	0	0	0
US area of interest	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	12	0	1	0	0	0	0	1	0

**Variant 4: Suspect primary bone tumor. Radiographs or clinical presentation suggest osteoid osteoma. Next imaging study.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT area of interest without IV contrast	Usually appropriate	Limited	Varies	Varies	9	9	1	0	0	0	2	0	0	1	10
		References		Study Quality											
		14 (2119115)		4											
		15 (8134575)		3											
		16 (24631034)		4											
CT area of interest without and with IV contrast	May be appropriate (Disagreement)	Expert Opinion	Varies	Varies	5	5	0	4	1	2	5	0	2	0	0
		References		Study Quality											
		14 (2119115)		4											
		15 (8134575)		3											
		16 (24631034)		4											
MRI area of interest without IV contrast	May be appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	5	5	1	0	0	2	10	0	1	0	0
		References		Study Quality											
		17 (12324824)		4											

			18 (12773675)		2													
			15 (8134575)		3													
MRI area of interest without and with IV contrast	May be appropriate	Limited	0 0 mSv	0 0 mSv [ped]	5	5	0	0	0	1	10	2	1	0	0			
			References		Study Quality													
			17 (12324824)		4													
			18 (12773675)		2													
			15 (8134575)		3													
Bone scan whole body with SPECT or SPECT/CT area of interest	May be appropriate	Limited	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	5	5	1	0	1	4	8	0	0	0	0			
			References		Study Quality													
			19 (24751704)		3													
Bone scan whole body	Usually not appropriate	Limited	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	2	2	7	2	2	3	0	0	0	0	0			
			References		Study Quality													
			19 (24751704)		3													
CT area of interest with IV contrast	Usually not appropriate	Limited	Varies	Varies	1	1	10	1	0	3	0	0	0	0	0			
			References		Study Quality													
			14 (2119115)		4													
			15 (8134575)		3													
			16 (24631034)		4													
FDG-PET/CT whole body	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	9	3	0	1	0	0	1	0	0			
US area of interest	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	12	1	0	0	0	0	0	0	0	0	0	1

**Variant 5: Suspect primary bone tumor. Lesion on radiographs. Indeterminate or aggressive appearance for malignancy. Next imaging study.**



14 (2119115)	4
41 (7529935)	2
37 (3055041)	3
36 (1737596)	3
40 (1853820)	4
44 (8058957)	3
39 (16436820)	2
48 (20566784)	3
21 (14530882)	4
20 (19277645)	4
42 (10671608)	3
22 (14512511)	4
23 (8988217)	2
34 (12652336)	4
49 (26388466)	3
35 (24035342)	4
7 (16247641)	3
9 (26220916)	2
38 (26724650)	3
43 (25656545)	4
45 (26162578)	3
46 (26559290)	Good
47 (22210011)	Good

CT area of interest without IV contrast	May be appropriate	Moderate	Varies	Varies	5	5	0	0	0	1	10	2	1	0	0
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References	Study Quality
21 (14530882)	4
20 (19277645)	4
22 (14512511)	4
23 (8988217)	2
24 (26002126)	3





21 (14530882)	4
20 (19277645)	4
22 (14512511)	4
23 (8988217)	2
24 (26002126)	3

US area of interest	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	11	2	0	0	0	0	0	0	1
Radiography skeletal survey	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼ 0.3-3 mSv [ped]	1	1	9	1	0	0	3	1	0	0	0

**Variant 6: “Incidental” osseous lesion on MRI or CT scan for unrelated indication. Suspect primary bone tumor. Not clearly benign. Next imaging study.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Radiography area of interest	Usually appropriate	Limited	Varies	Varies	9	9	0	0	0	0	0	1	1	0	12

References	Study Quality
3 (5846856)	4
4 (7323290)	4
5 (7323291)	4
6 (7323292)	4
7 (16247641)	3
8 (27070373)	3

MRI area of interest without and with IV contrast	May be appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	6	6	0	0	0	0	6	2	1	3	2
CT area of interest without IV contrast	May be appropriate	Expert Consensus	Varies	Varies	5	5	0	1	0	2	11	0	0	0	0
CT area of interest without and with IV contrast	May be appropriate (Disagreement)	Expert Opinion	Varies	Varies	5	5	0	0	3	2	3	2	1	2	1

MRI area of interest without IV contrast	May be appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	5	5	0	0	0	0	12	2	0	0	0
Bone scan whole body	May be appropriate	Expert Consensus	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	4	4	4	2	1	5	2	0	0	0	0
FDG-PET/CT whole body	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv	☼☼☼☼ 3-10 mSv [ped]	2	2	6	2	3	2	0	0	1	0	0
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	10	0	1	3	0	0	0	0	0
US area of interest	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	13	0	0	0	1	0	0	0	0

## **Appendix Key**

A more complete discussion of the items presented below can be found by accessing the supporting documents at the designated hyperlinks.

**Appropriateness Category:** The panel's recommendation for a procedure based on the assessment of the risks and benefits of performing the procedure for the specified clinical scenario.

**SOE:** Strength of Evidence. The assessment of the amount and quality of evidence found in the peer reviewed medical literature for an appropriateness recommendation.

- **References:** The citation number and PMID for the reference(s) associated with the recommendation.
- **Study Quality:** The assessment of the quality of an individual reference based on the number of study quality elements described in the reference.

**RRL:** Relative Radiation Level. A population based assessment of the amount of radiation a typical patient may be exposed to during the specified procedure.

**Rating:** The final rating (1-9 scale) for the procedure as determined by the panel during rating rounds.

**Median:** The median rating (1-9 scale) for the procedure as determined by the panel during rating rounds.

**Final tabulations:** A histogram showing the number of panel members who rated the procedure as noted in the column heading (ie, 1, 2, 3, etc.).

Additional supporting documents about the AC methodology and processes can be found at [www.acr.org/ac](http://www.acr.org/ac).