American College of Radiology
ACR Appropriateness Criteria®

Suspected Primary Bone Tumors

Variant 1: Adult or child. Suspected 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	1	0	0	0	0	0	0	1	12

References	Study Quality
17 (9308471)	3
10 (5846856)	4
11 (7323290)	4
12 (7323291)	4
13 (7323292)	4
14 (16247641)	3
15 (27070373)	3
16 (26220916)	2

CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	2	2	7	2	3	0	1	1	0	0	0
CT area of interest without IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	2	2	6	2	3	0	2	1	0	0	0
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	2	2	7	3	2	1	0	1	0	0	0
MRI area of interest without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	6	2	2	2	0	2	0	0	0

MRI area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	6	2	2	2	0	1	1	0	0
Bone scan whole body	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	2	2	6	3	2	0	2	0	0	1	0
Bone scan whole body with SPECT or SPECT/CT area of interest	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	2	2	7	3	3	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	8	1	3	1	0	0	0	1	0
US area of interest	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	11	0	1	0	1	0	0	1	0

Variant 2: Adult or child. Suspected primary bone tumor. No lesions on radiographs. 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	Expert Consensus	O 0 mSv	O 0 mSv [ped]	9	9	0	0	0	0	0	0	3	4	7
MRI area of interest without IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	1	1	0	3	5	4

References	Study Quality
18 (2120933)	2

CT area of interest with IV contrast	May be appropriate (Disagreement)	Expert Opinion	Varies	Varies	5	5	3	2	1	5	0	3	0	0	0

References	Study Quality
8 (34601617)	2
7 (35147726)	2
4 (37606571)	4

CT area of interest without IV contrast	May be appropriate (Disagreement)	Expert Opinion	Varies	Varies	5	5	0	0	0	5	3	3	1	2	0

References	Study Quality
19 (12886126)	3
22 (27101076)	3
21 (29323547)	3
20 (32755207)	2

Bone scan whole body	May be appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	4	4	1	1	1	9	2	0	0	0	0

References	Study Quality
18 (2120933)	2

Bone scan whole body with SPECT or SPECT/CT area of interest	May be appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	4	4	3	0	0	9	2	0	0	0	0
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	3	3	4	2	5	2	0	1	0	0	0
FDG-PET/CT whole body	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	6	1	3	1	1	2	0	0	0
US area of interest	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	11	3	0	0	0	0	0	0	0

Variant 3: Adult or child. Suspected primary bone tumor. Lesion on radiographs. Benign appearance. 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	O 0 mSv	O 0 mSv [ped]	6	6	1	0	0	1	4	3	3	2	0

References	Study Quality
23 (-3145589)	4

MRI area of interest without and with IV contrast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	6	6	1	0	0	1	3	4	3	0	2

References	Study Quality
23 (-3145589)	4
25 (34436624)	2
24 (36745072)	2

CT area of interest without IV contrast	May be appropriate	Expert Consensus	Varies	Varies	5	5	0	0	0	3	8	2	0	1	0
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	2	2	7	2	4	1	0	0	0	0	0
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	2	2	6	2	1	2	1	1	0	1	0
Image-guided biopsy area of interest	Usually not appropriate	Expert Consensus	Varies	Varies	2	2	7	3	2	0	1	0	0	0	1
Bone scan whole body	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	8	0	2	1	2	0	0	0	1
Bone scan whole body with SPECT or SPECT/CT area of interest	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	13	1	0	0	0	0	0	0	0
FDG-PET/CT whole body	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	8	1	3	0	1	0	0	1	0
US area of interest	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	11	1	1	0	0	0	0	1	0

Variant 4: Adult or child. Suspected primary bone tumor. Osteoid osteoma suspected on radiographs or osteoid osteoma suspected based on clinical presentation with no lesions on radiographs. 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	Usually	Limited	Varies	Varies	8	8	1	0	0	0	0	0	2	5	6

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
contrast	appropriate														
		References		Study Quality											
		29 (2119115)		4											
		30 (8134575)		3											
MRI area of interest without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	2	3	2	3	1	3
		References		Study Quality											
		33 (12773675)		2											
CT area of interest with IV contrast	May be appropriate	Expert Consensus	Varies	Varies	5	5	0	0	0	6	7	0	1	0	0
CT area of interest without and with IV contrast	May be appropriate	Limited	Varies	Varies	5	5	1	0	0	5	4	3	1	0	0
		References		Study Quality											
		28 (24631034)		4											
MRI area of interest without IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	5	5	1	0	0	2	5	2	3	1	0
		References		Study Quality											
		34 (12324824)		4											
		33 (12773675)		2											
		30 (8134575)		3											
Image-guided biopsy area of interest	Usually not appropriate	Limited	Varies	Varies	3	3	4	1	5	0	2	2	0	0	0
		References		Study Quality											
		32 (33563522)		Good											
		31 (34573895)		3											
Bone scan whole body with SPECT or SPECT/CT area of interest	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	5	1	2	1	4	1	0	0	0

		References		Study Quality											
		27 (24751704)		3											
Bone scan whole body	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	2	2	5	6	3	0	0	0	0	0	0
		References		Study Quality											
		27 (24751704)		3											
FDG-PET/CT whole body	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	2	2	7	2	5	0	0	0	0	0	0
US area of interest	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	12	0	1	0	0	0	0	1	0

Variant 5: Adult or child. Suspected primary bone tumor. Lesion on radiographs. Indeterminate or aggressive appearance for malignancy. 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	Strong	O 0 mSv	O 0 mSv [ped]	9	9	0	0	0	1	0	0	1	4	8
		References		Study Quality											
		56 (7529935)		2											
		55 (1853820)		4											
		60 (8058957)		3											
		54 (16436820)		2											
		57 (10671608)		3											
		59 (25656545)		4											
		58 (32429792)		4											
MRI area of interest without IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	1	1	1	5	3	3
		References		Study Quality											
		29 (2119115)		4											

FDG-PET/CT whole body	Usually appropriate	Strong	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	0	0	0	2	0	0	8	4	0

References	Study Quality
64 (3055041)	3
63 (1737596)	3
69 (20566784)	3
39 (14530882)	4
38 (19277645)	4
40 (14512511)	4
41 (8988217)	2
61 (12652336)	4
70 (26388466)	3
62 (24035342)	4
14 (16247641)	3
16 (26220916)	2
65 (26724650)	3
59 (25656545)	4
66 (26162578)	3
67 (26559290)	Good
68 (22210011)	Good
49 (15286325)	2
43 (11376267)	3
45 (8657920)	2
51 (15937711)	3
44 (18278491)	3
47 (18756363)	3
50 (18309481)	3
46 (26356700)	Good
48 (22072239)	Good
53 (30953476)	Good
52 (31887730)	Good

CT area of interest without IV contrast	May be appropriate	Strong	Varies	Varies	6	6	0	0	1	1	1	5	4	2	0

References	Study Quality
39 (14530882)	4
38 (19277645)	4
40 (14512511)	4
41 (8988217)	2
42 (26002126)	3
22 (27101076)	3
21 (29323547)	3
20 (32755207)	2

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	0	0	0	4	10	0	0	0	0

References	Study Quality
37 (22865157)	3

CT area of interest with IV contrast	May be appropriate	Expert Consensus	Varies	Varies	4	4	0	0	0	9	5	0	0	0	0
CT area of interest without and with IV contrast	May be appropriate	Expert Consensus	Varies	Varies	4	4	1	0	0	9	4	0	0	0	0
Image-guided biopsy area of interest	Usually not appropriate	Limited	Varies	Varies	3	3	3	1	4	2	3	0	1	0	0

References	Study Quality
31 (34573895)	3

Bone scan whole body	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	5	2	5	2	0	0	0	0	0
US area of interest	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	11	0	1	1	0	0	0	1	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.**