

American College of Radiology
ACR Appropriateness Criteria®

Stress (Fatigue/Insufficiency) Fracture, Including Sacrum, Excluding Other Vertebrae

Variant 1: Adult. Suspect stress fracture, excluding vertebrae. 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	Limited	Varies	Varies	9	9	1	0	0	0	1	1	2	0	10
		References		Study Quality											
		31 (17317066)		4											
		43 (12143987)		4											
Bone scan whole body with SPECT or SPECT/CT area of interest	May be appropriate (Disagreement)	Expert Opinion	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	2	1	3	3	4	0	2	0	0
		References		Study Quality											
		19 (22341018)		4											
		21 (11981604)		4											
		20 (22583605)		4											
		17 (21285675)		2											
		18 (18806135)		3											
MRI area of interest without IV contrast	Usually not appropriate	Strong	0 0 mSv	0 0 mSv [ped]	3	3	6	1	4	1	2	0	0	1	0
		References		Study Quality											
		40 (21531099)		4											
		30 (16798139)		4											
		28 (19651835)		4											
		26 (22815414)		4											

27 (14736647)	4
25 (16235078)	4
29 (14576960)	3
31 (17317066)	4
32 (18382945)	4
23 (15858094)	3
33 (17387472)	2
34 (19700255)	4
35 (16294127)	4
22 (16247722)	4
36 (18492915)	4
37 (16324973)	4
38 (17015602)	3
39 (16466974)	3
41 (18084759)	4
42 (23825184)	3
15 (17099238)	4

CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	0	1	0	0	1	0	0
CT area of interest without IV contrast	Usually not appropriate	Limited	Varies	Varies	1	1	9	1	1	2	1	0	1	0	0

References	Study Quality
23 (15858094)	3
22 (16247722)	4
24 (25805712)	4

CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	0	1	0	1	0	0	0
MRI area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	13	0	0	1	0	0	1	0	0
US area of interest	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	11	2	2	0	0	0	0	0	0

References	Study Quality
46 (16769791)	4
45 (24643763)	4
44 (19567620)	2

Variant 2: Adult. Suspect stress fracture, excluding vertebrae. Radiographs negative or indeterminate. 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	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	9	9	1	0	0	0	0	0	2	0	12
		References	Study Quality												
		30 (16798139)	4												
		29 (14576960)	3												
		31 (17317066)	4												
		32 (18382945)	4												
		23 (15858094)	3												
		33 (17387472)	2												
		34 (19700255)	4												
		35 (16294127)	4												
		22 (16247722)	4												
		36 (18492915)	4												
		37 (16324973)	4												
		38 (17015602)	3												
		39 (16466974)	3												
		41 (18084759)	4												
		42 (23825184)	3												
		15 (17099238)	4												
Bone scan whole body with SPECT or SPECT/CT area of interest	May be appropriate	Limited	⊕⊕⊕ 1-10 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	6	6	0	0	0	1	2	5	5	2	0

		References		Study Quality											
		28 (19651835)		4											
		26 (22815414)		4											
		27 (14736647)		4											
		25 (16235078)		4											
		31 (17317066)		4											
Radiography area of interest repeat in 10-14 days	May be appropriate	Limited	Varies	Varies	6	6	0	0	1	1	1	7	4	0	1
		References		Study Quality											
		31 (17317066)		4											
		43 (12143987)		4											
CT area of interest without IV contrast	May be appropriate	Limited	Varies	Varies	4	4	2	1	2	3	5	1	1	0	0
		References		Study Quality											
		23 (15858094)		3											
		22 (16247722)		4											
US area of interest	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	2	2	5	5	5	0	0	0	0	0	0
		References		Study Quality											
		46 (16769791)		4											
		45 (24643763)		4											
		44 (19567620)		2											
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	0	1	0	0	1	0	0
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	1	0	0	1	0	0	0
MRI area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	11	1	2	0	1	0	0	0	0

Variant 3: Adult. Suspect pelvis or hip or sacrum stress fracture. Pregnant patient. Radiographs negative or indeterminate. 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	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	9	9	1	0	0	0	0	0	0	2	12
		References		Study Quality											
		28 (19651835)		4											
		26 (22815414)		4											
		27 (14736647)		4											
		25 (16235078)		4											
		57 (17560159)		4											
US area of interest	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	3	3	7	0	3	1	2	1	0	1	0
		References		Study Quality											
		45 (24643763)		4											
		44 (19567620)		2											
Radiography area of interest repeat in 10-14 days	Usually not appropriate	Limited	Varies	Varies	3	3	6	0	6	2	1	0	0	0	0
		References		Study Quality											
		43 (12143987)		4											
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	14	0	0	0	0	0	0	1	0
CT area of interest without IV contrast	Usually not appropriate	Limited	Varies	Varies	1	1	12	1	1	1	0	0	0	0	0
		References		Study Quality											
		62 (-3195179)		4											
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	14	0	0	0	0	0	1	0	0
MRI area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	0	0	1	0	1	0	0	0

Bone scan whole body with SPECT or SPECT/CT area of interest	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢☢ 3-10 mSv [ped]	1	1	12	0	1	0	1	0	1	0	0
		References	Study Quality												
		31 (17317066)	4												
		62 (-3195179)	4												

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	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	9	9	1	0	0	0	0	0	0	1	13	
		References		Study Quality												
		28 (19651835)		4												
		26 (22815414)		4												
		27 (14736647)		4												
		25 (16235078)		4												
CT area of interest without IV contrast	May be appropriate	Limited	Varies		Varies	5	5	0	0	0	0	12	1	1	1	0
		References		Study Quality												
		23 (15858094)		3												
		22 (16247722)		4												
		24 (25805712)		4												
Bone scan whole body with SPECT or SPECT/CT area of interest	May be appropriate (Disagreement)	Expert Opinion	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	5	5	0	0	3	2	6	1	2	1	0	
		References		Study Quality												
		66 (12777887)		4												
		31 (17317066)		4												
		67 (15722819)		4												

US area of interest	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	3	3	7	0	3	3	1	0	1	0	0
		References	Study Quality												
		45 (24643763)	4												
		44 (19567620)	2												
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	1	0	0	0	0	1	0
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	0	0	1	1	0	0	0
MRI area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	0	0	1	0	1	0	0	0
Radiography area of interest repeat in 10-14 days	Usually not appropriate	Limited	Varies	Varies	1	1	8	1	3	1	1	1	0	0	0
		References	Study Quality												
		43 (12143987)	4												

Variant 5: Adult. Suspect subchondral stress fracture at an extremity joint. Radiographs negative or indeterminate. 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	Usually appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	9	9	1	0	0	0	0	0	1	0	13
CT area of interest without IV contrast	May be appropriate	Limited	Varies	Varies	4	4	2	0	4	2	6	0	1	0	0
		References	Study Quality												
		23 (15858094)	3												
		22 (16247722)	4												
Bone scan whole body with SPECT or SPECT/CT area of interest	May be appropriate	Limited	☼☼☼ 1-10 mSv	☼☼☼☼ 3-10 mSv [ped]	4	4	2	1	2	5	3	1	1	0	0

		References		Study Quality												
		66 (12777887)		4												
		31 (17317066)		4												
		68 (22117809)		4												
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	0	1	0	1	0	0	0	
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	0	1	1	0	0	0	0	
MRI area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	11	0	0	3	0	0	1	0	0	
US area of interest	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	13	0	1	0	0	0	0	1	0	
		References		Study Quality												
		43 (12143987)		4												
Radiography area of interest repeat in 10-14 days	Usually not appropriate	Limited	Varies	Varies	1	1	11	1	1	1	0	1	0	0	0	
		References		Study Quality												
		43 (12143987)		4												

Variant 6: Adult. Positive stress fracture on radiographs, excluding vertebrae. Need for determining extent (ie, for surgical planning, return to activity) or associated complication (ie, osteonecrosis or delayed healing). 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	Usually appropriate	Limited	0 0 mSv	0 0 mSv [ped]	9	9	1	0	0	0	0	0	3	0	11
		References		Study Quality											
		42 (23825184)		3											
		13 (14623664)		4											
		72 (22623695)		3											

73 (9442205)	3
71 (7573660)	4
74 (22451555)	3

CT area of interest without IV contrast	Usually appropriate	Expert Consensus	Varies	Varies	7	7	0	0	0	0	3	3	8	1	0
Radiography area of interest repeat in 10-14 days	May be appropriate	Expert Consensus	Varies	Varies	4	4	1	1	0	6	5	1	1	0	0
MRI area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	2	2	5	3	3	4	0	0	0	0	0
CT area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	0	1	0	0	1	0	0
CT area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	13	0	0	0	0	0	2	0	0
US area of interest	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	13	0	1	0	0	1	0	0	0

References	Study Quality
46 (16769791)	4
45 (24643763)	4
44 (19567620)	2

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.