

American College of Radiology ACR Appropriateness Criteria®

Acute Shoulder Pain

Variant 1: Adult. Acute shoulder pain. Any etiology. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Radiography shoulder	Usually appropriate	Strong	☼ <0.1 mSv		9	9	0	0	0	0	0	0	1	1	12
		References	Study Quality												
		9 (17692769)	3												
		7 (20206348)	4												
		11 (24124199)	3												
		10 (19166638)	3												
		12 (35813132)	2												
CT shoulder without IV contrast	Usually not appropriate	Limited	☼☼☼ 1-10 mSv		2	2	5	3	2	3	0	1	0	0	0
		References	Study Quality												
		9 (17692769)	3												
		6 (18029890)	2												
		7 (20206348)	4												
		8 (25231817)	3												
CT arthrography shoulder	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv		1	1	12	0	0	1	1	0	0	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	11	1	1	0	0	0	1	0	0

CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	11	2	0	0	0	0	1	0	0
MR arthrography shoulder	Usually not appropriate	Expert Consensus	○ ○ mSv	○ ○ mSv [ped]	1	1	11	2	0	0	0	1	0	0	0
MRI shoulder without IV contrast	Usually not appropriate	Expert Consensus	○ ○ mSv	○ ○ mSv [ped]	1	1	11	1	0	0	1	0	0	1	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ ○ mSv	○ ○ mSv [ped]	1	1	11	2	0	0	0	1	0	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	0	1	0	0	0	0	0	0
FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Expert Consensus	⊕⊕⊕⊕ 10-30 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	1	1	13	1	0	0	0	0	0	0	0
US shoulder	Usually not appropriate	Limited	○ ○ mSv	○ ○ mSv [ped]	1	1	9	0	1	0	2	1	1	0	0
			References	Study Quality											
			13 (20848574)	2											

Variant 2: Adult. Acute shoulder pain. Suspect occult fracture. 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
CT shoulder without IV contrast	Usually appropriate	Strong	⊕⊕⊕ 1-10 mSv		9	9	0	0	0	0	0	1	4	0	9
			References	Study Quality											
			16 (17325929)	2											
			15 (26295635)	4											
			14 (32656034)	2											
MRI shoulder without IV contrast	Usually appropriate	Strong	○ ○ mSv	○ ○ mSv [ped]	7	7	0	0	0	0	2	1	5	3	3

References	Study Quality
18 (24560469)	4
19 (21940587)	3
21 (24172671)	4
20 (19305272)	2
17 (34033918)	2

CT arthrography shoulder	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv		1	1	13	0	0	0	0	0	1	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	11	1	1	0	0	0	1	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	11	2	0	0	0	0	1	0	0
MR arthrography shoulder	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	12	0	0	1	0	1	0	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	10	2	0	1	0	0	1	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	12	1	0	0	0	1	0	0	0
FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	13	0	1	0	0	0	0	0	0
US shoulder	Usually not appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	1	1	9	0	2	1	0	1	1	0	0

References	Study Quality
17 (34033918)	2

Variant 3: Adult. Acute shoulder pain. Radiographs positive for proximal humerus, scapular, or clavicle fracture. Next imaging study.

[illegible]

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT shoulder without IV contrast	Usually appropriate	Strong	⊕⊕⊕ 1-10 mSv		9	9	0	0	0	0	1	1	3	1	8
		References	Study Quality												
		7 (20206348)	4												
		22 (19836976)	3												
		24 (19724000)	4												
		16 (17325929)	2												
		25 (16054146)	2												
		12 (35813132)	2												
		23 (17169583)	4												
MRI shoulder without IV contrast	May be appropriate	Limited	○ ○ mSv	○ ○ mSv [ped]	4	4	0	2	4	2	5	0	0	0	0
		References	Study Quality												
		19 (21940587)	3												
		26 (19685061)	4												
		15 (26295635)	4												
CT arthrography shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕⊕ 10-30 mSv		1	1	13	0	0	0	1	0	0	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	11	1	1	0	0	1	0	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	11	2	0	0	0	1	0	0	0
MR arthrography shoulder	Usually not appropriate	Expert Consensus	○ ○ mSv	○ ○ mSv [ped]	1	1	12	0	0	1	0	1	0	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ ○ mSv	○ ○ mSv [ped]	1	1	11	1	0	1	0	1	0	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	1	0	0	0	0	0	0	0

CT arthrography shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕⊕ 10-30 mSv		1	1	7	1	2	2	1	0	0	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	10	1	0	0	2	1	0	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	11	1	1	1	0	0	0	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	11	1	0	0	1	0	1	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	0	1	0	0	0	0	0	0
FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Expert Consensus	⊕⊕⊕⊕ 10-30 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	1	1	13	0	1	0	0	0	0	0	0
US shoulder	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	11	1	0	0	1	1	0	0	0

Variant 5: Adult. Acute shoulder pain. Physical examination consistent with labral tear. 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
MR arthrography shoulder	Usually appropriate	Moderate	○ 0 mSv	○ 0 mSv [ped]	9	9	1	0	0	1	1	2	0	2	7

References	Study Quality
33 (19098184)	3
41 (24794570)	3
32 (16244267)	3
38 (17896393)	4
37 (21907516)	2
40 (20950767)	3
42 (22401678)	3

		39 (23801390)	3												
		43 (27826700)	Good												
		44 (29582141)	Good												
		45 (35122144)	Good												
MRI shoulder without IV contrast	Usually appropriate	Limited	0 0 mSv	0 0 mSv [ped]	9	9	0	0	0	0	0	0	4	3	7
		References	Study Quality												
		31 (24060014)	3												
		33 (19098184)	3												
		44 (29582141)	Good												
		46 (28604236)	Good												
		47 (26779556)	3												
CT arthrography shoulder	Usually appropriate	Strong	☹☹☹☹ 10-30 mSv		7	7	1	0	0	0	4	1	3	5	0
		References	Study Quality												
		29 (19556150)	2												
		36 (21074344)	2												
		34 (22358006)	2												
		35 (31541346)	2												
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	11	1	1	0	0	0	1	0	0
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	11	1	0	0	0	1	1	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	11	1	1	0	0	1	0	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	11	1	0	0	1	0	1	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	13	1	0	0	0	0	0	0	0

FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 3-10 mSv [ped]	1	1	13	0	1	0	0	0	0	0	0
US shoulder	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	11	1	1	0	1	0	0	0	0

Variant 6: Adult. Acute shoulder pain. Physical examination consistent with rotator cuff tear. 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 shoulder without IV contrast	Usually appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	9	9	1	0	0	0	0	0	2	1	10
		References		Study Quality											
		29 (19556150)		2											
		31 (24060014)		3											
		49 (25677796)		M											
US shoulder	Usually appropriate	Strong	○ 0 mSv	○ 0 mSv [ped]	8	8	0	0	0	0	0	0	5	6	3
		References		Study Quality											
		31 (24060014)		3											
		49 (25677796)		M											
		50 (18591598)		2											
		51 (18160242)		3											
		52 (18449121)		3											
		54 (17149764)		2											
		57 (15674840)		2											
		56 (18651142)		2											
		53 (19457838)		M											
		55 (30744304)		4											
MR arthrography shoulder	Usually not appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	2	2	5	2	2	3	0	0	0	0	1

References	Study Quality
31 (24060014)	3
49 (25677796)	M
48 (34939473)	Good

CT arthrography shoulder	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv		1	1	8	2	1	2	0	0	0	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	11	1	1	0	0	0	1	0	0
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	11	1	1	0	1	0	0	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	11	1	1	0	0	0	1	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	11	1	0	1	0	0	0	1	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	13	1	0	0	0	0	0	0	0
FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv	☼☼☼☼ 3-10 mSv [ped]	1	1	13	0	1	0	0	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.