

American College of Radiology ACR Appropriateness Criteria®

Shoulder Pain-Atraumatic

Variant 1: Atraumatic shoulder pain. 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	Limited	☼ <0.1 mSv		9	9	0	0	0	0	0	0	0	0	0	16
		References		Study Quality												
		2 (18599231)		4												
CT arthrography shoulder	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv		1	1	15	0	1	0	0	0	0	0	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	15	0	1	0	0	0	0	0	0	0
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	13	1	1	1	0	0	0	0	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	16	0	0	0	0	0	0	0	0	0
X-ray arthrography shoulder	Usually not appropriate	Expert Consensus	☼ <0.1 mSv		1	1	16	0	0	0	0	0	0	0	0	0
MR arthrography shoulder	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	0	1	0	1	0	0	0	0	0
MRI shoulder without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	12	0	0	1	1	2	0	0	0	0

MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	14	0	1	1	0	0	0	0	0
US shoulder	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	12	1	1	1	0	1	0	0	0

References	Study Quality
7 (-3110180)	2

Variant 2: Atraumatic shoulder pain. Suspect rotator cuff disorders (tendinosis, tear, calcific tendinitis). Initial radiographs normal or inconclusive. 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	Strong	0 0 mSv	0 0 mSv [ped]	9	9	0	0	0	0	0	0	0	3	13

References	Study Quality
5 (1985990)	3
13 (19931132)	4
23 (2740508)	3
24 (3496760)	3
25 (15069134)	2
26 (-3101660)	4
27 (8249731)	3
28 (1489363)	3
29 (14500211)	4

US shoulder	Usually appropriate	Strong	0 0 mSv	0 0 mSv [ped]	8	8	1	0	0	0	2	0	3	4	6
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References	Study Quality
25 (15069134)	2
33 (23401583)	4
34 (19052931)	2
35 (20414859)	2

		36 (19959377)		2												
MR arthrography shoulder	May be appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	6	6	0	0	2	0	6	5	2	0	1	
CT arthrography shoulder	May be appropriate	Strong	☼☼☼☼ 10-30 mSv		5	5	0	0	0	2	12	2	0	0	0	

References	Study Quality
18 (15911667)	3
19 (19556150)	2
20 (22919041)	2
21 (18400443)	4
22 (16969638)	3

Radiography shoulder additional views	Usually not appropriate	Strong	☼ <0.1 mSv		2	2	7	5	0	0	3	0	0	0	1
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References	Study Quality
2 (18599231)	4
8 (6766616)	3
9 (6766615)	3
10 (2773735)	4
11 (15671396)	3
12 (13721957)	2
13 (19931132)	4
14 (18562731)	2
15 (-3101631)	4

CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	15	1	0	0	0	0	0	0	0
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CT shoulder without IV contrast	Usually not appropriate	Limited	☼☼☼ 1-10 mSv		1	1	10	1	1	0	2	1	1	0	0
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References	Study Quality
13 (19931132)	4
16 (15100546)	4
17 (8724130)	4

CT shoulder without and with IV contrast	Usually not appropriate	Limited	☼☼☼ 1-10 mSv		1	1	16	0	0	0	0	0	0	0	0
		References					Study Quality								
		13 (19931132)					4								
		16 (15100546)					4								
		17 (8724130)					4								
X-ray arthrography shoulder	Usually not appropriate	Expert Consensus	☼ <0.1 mSv		1	1	9	1	0	4	1	0	1	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	0	1	0	1	0	0	0	0

Variant 3: Atraumatic shoulder pain. Suspect labral tear and instability. Initial radiographs normal or inconclusive. 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	Strong	○ 0 mSv	○ 0 mSv [ped]	9	9	0	0	0	0	0	0	1	3	12
		References					Study Quality								
		27 (8249731)					3								
		49 (8115604)					2								
		50 (7480762)					2								
		51 (16244267)					3								
		52 (26295662)					4								
		53 (9275908)					2								
		54 (8058959)					4								
		55 (24623367)					3								
MRI shoulder without IV contrast	Usually appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	8	8	1	0	0	0	2	1	4	4	4
		References					Study Quality								
		40 (22469405)					4								

			46 (15385288)			4												
			47 (7726053)			3												
			48 (21512082)			2												
CT arthrography shoulder	May be appropriate	Limited	☼☼☼☼ 10-30 mSv		6	6	0	0	0	0	7	8	1	0	0			
			References		Study Quality													
			21 (18400443)		4													
			37 (24155283)		4													
			45 (22358006)		2													
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼☼ 1-10 mSv		1	1	15	1	0	0	0	0	0	0	0	0	0	
CT shoulder without IV contrast	Usually not appropriate	Limited	☼☼☼☼ 1-10 mSv		1	1	14	0	1	0	0	0	0	1	0	0	0	
			References		Study Quality													
			37 (24155283)		4													
			38 (19887292)		4													
			39 (21603873)		3													
			40 (22469405)		4													
			41 (10462730)		4													
			42 (21808996)		4													
			43 (15827355)		4													
			44 (12728039)		4													
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼☼ 1-10 mSv		1	1	15	1	0	0	0	0	0	0	0	0	0	
X-ray arthrography shoulder	Usually not appropriate	Expert Consensus	☼ <0.1 mSv		1	1	14	1	0	0	0	0	1	0	0	0	0	
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	0	2	0	0	0	0	0	0	0	0	
US shoulder	Usually not appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	1	1	10	1	1	2	2	0	0	0	0	0	0	

CT arthrography shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕⊕ 10-30 mSv		1	1	12	0	1	2	0	0	1	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	15	1	0	0	0	0	0	0	0
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	15	1	0	0	0	0	0	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	15	1	0	0	0	0	0	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	1	1	13	1	1	0	1	0	0	0	0
			References	Study Quality											
			66 (9437603)	4											

Variant 6: Atraumatic shoulder pain. Suspect biceps tendinitis, bursitis, dislocation or tear. Initial radiographs normal or inconclusive. 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]	8	8	1	0	0	0	2	0	5	1	7
			References	Study Quality											
			72 (12591665)	3											
			73 (24891814)	3											
			74 (15111894)	2											
US shoulder	Usually appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	8	8	0	1	0	0	0	0	5	3	7
MR arthrography shoulder	May be appropriate (Disagreement)	Expert Opinion	○ 0 mSv	○ 0 mSv [ped]	5	5	1	0	1	0	3	3	4	3	1
			References	Study Quality											
			75 (9609174)	2											

CT arthrography shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕⊕ 10-30 mSv		1	1	12	0	1	2	1	0	0	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	15	1	0	0	0	0	0	0	0
CT shoulder without IV contrast	Usually not appropriate	Limited	⊕⊕⊕ 1-10 mSv		1	1	12	0	2	1	0	0	1	0	0

References	Study Quality
69 (21367551)	2
70 (2027968)	4
71 (10543593)	4

CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	16	0	0	0	0	0	0	0	0
X-ray arthrography shoulder	Usually not appropriate	Expert Consensus	⊕ <0.1 mSv		1	1	13	2	1	0	0	0	0	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	13	1	2	0	0	0	0	0	0

Variant 7: Pain after rotator cuff repair. Initial radiographs normal or inconclusive. 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	Limited	○ 0 mSv	○ 0 mSv [ped]	9	9	0	0	0	1	1	1	1	4	8

References	Study Quality
77 (22469406)	4
78 (23345200)	4
79 (14730038)	4
80 (10580942)	4
81 (23351978)	1

MRI shoulder without IV contrast	Usually appropriate	Limited	0 0 mSv	0 0 mSv [ped]	8	8	0	0	0	0	0	0	1	2	6	7	
		References	Study Quality														
		77 (22469406)	4														
		78 (23345200)	4														
		79 (14730038)	4														
		80 (10580942)	4														
		81 (23351978)	1														
US shoulder	Usually appropriate	Strong	0 0 mSv	0 0 mSv [ped]	8	8	0	0	0	0	0	0	0	2	12	2	
		References	Study Quality														
		82 (21719313)	2														
		83 (21719319)	2														
CT arthrography shoulder	May be appropriate	Expert Consensus	☹☹☹☹ 10-30 mSv		6	6	0	0	0	0	8	7	1	0	0		
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	15	1	0	0	0	0	0	0	0		
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	13	1	2	0	0	0	0	0	0		
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	15	1	0	0	0	0	0	0	0		
X-ray arthrography shoulder	Usually not appropriate	Expert Consensus	☹ <0.1 mSv		1	1	13	0	2	1	0	0	0	0	0		
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	10	2	0	1	2	1	0	0	0		

Variant 8: Atraumatic shoulder pain. Neurogenic pain (excluding plexopathy). Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9

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 0 mSv	0 0 mSv [ped]	9	9	0	0	0	0	0	0	1	1	14
		References		Study Quality											
		85 (25714290)		4											
		87 (10550533)		4											
		88 (23125929)		4											
		89 (21415181)		4											
		90 (21536461)		4											
		91 (21862800)		4											
US shoulder	May be appropriate	Limited	0 0 mSv	0 0 mSv [ped]	5	5	0	0	0	0	12	4	0	0	0
		References		Study Quality											
		92 (10447077)		2											
		93 (7933041)		4											
		94 (12640155)		4											
CT shoulder without IV contrast	Usually not appropriate	Limited	☹☹☹ 1-10 mSv		2	2	8	1	1	1	3	2	0	0	0
		References		Study Quality											
		86 (20926731)		4											
Radiography shoulder	Usually not appropriate	Limited	☹ <0.1 mSv		2	2	8	0	2	1	3	1	1	0	0
		References		Study Quality											
		86 (20926731)		4											
CT arthrography shoulder	Usually not appropriate	Expert Consensus	☹☹☹☹ 10-30 mSv		1	1	14	0	1	1	0	0	0	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	15	0	0	1	0	0	0	0	0

CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	15	0	1	0	0	0	0	0	0
X-ray arthrography shoulder	Usually not appropriate	Expert Consensus	☼ <0.1 mSv		1	1	15	1	0	0	0	0	0	0	0
MR arthrography shoulder	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	0	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	16	0	0	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.