

**American College of Radiology  
ACR Appropriateness Criteria®**

**Chronic Shoulder Pain**

**Variant 1: Chronic 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	Strong	✖ <0.1 mSv			9	9	0	0	0	0	0	0	0	0	0	15	
Radiography shoulder	References							Study Quality										
	10 (18599231)							4										
	14 (31201467)							3										
	11 (32298371)							3										
	1 (28537759)							4										
	13 (29504320)							2										
	12 (30423642)							2										
US shoulder	May be appropriate	Strong	0 0 mSv		0 0 mSv [ped]	5	5	2	1	0	2	9	1	0	0	0	0	0
US shoulder	References							Study Quality										
	10 (18599231)							4										
	14 (31201467)							3										
	11 (32298371)							3										
	1 (28537759)							4										
	13 (29504320)							2										
	12 (30423642)							2										
CT arthrography shoulder	Usually not appropriate	Expert Consensus	✖✖✖ 10-30 mSv			1	1	12	1	0	1	1	0	0	0	0	0	0

CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	1	1	0	0	0	0	0
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	12	0	2	0	1	0	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	1	1	0	0	0	0	0
MR arthrography shoulder	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	12	0	0	2	0	1	0	0
MRI shoulder without IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	10	1	1	0	2	1	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	0 0 mSv	0 0 mSv [ped]	1	1	12	1	0	1	0	1	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	1	1	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	1	0	0	0	0
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	12	0	0	0	1	1	0	0

**Variant 2: Chronic shoulder pain. Suspect rotator cuff disorders or subacromial subdeltoid bursitis (no prior surgery). 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	2	2	11
	References				Study Quality										
	42 (8865483)				4										
	38 (15069134)				2										

37 (3496760)	3
39 (2740508)	3
28 (32241656)	4
40 (28273425)	3
29 (32195972)	Good
27 (31831029)	Good
41 (32077302)	3

US shoulder	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	0	0	4	4	7
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References		Study Quality	
38 (15069134)		2	
45 (19052931)		2	
51 (8633460)		4	
24 (19457838)		M	
46 (32609088)		1	
50 (29075914)		3	
48 (32117542)		2	
47 (32190853)		Good	
49 (27755645)		2	

MR arthrography shoulder	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	1	0	0	1	4	0	3	1	5
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References		Study Quality	
25 (1489363)		3	
32 (12147844)		3	
33 (10227520)		3	
26 (19098184)		3	
24 (19457838)		M	
30 (31773187)		3	
28 (32241656)		4	
29 (32195972)		Good	
27 (31831029)		Good	

		31 (20563802)		3																	
CT arthrography shoulder		May be appropriate	Strong	⊕⊕⊕ 10-30 mSv		5	5		0	0	1	3	5	5	1	0	0				
		References			Study Quality																
		15 (15911667)			3																
		18 (18400443)			4																
		17 (22919041)			2																
		16 (19556150)			2																
		May be appropriate	Strong	Varies		Varies	5	5		0	0	1	2	8	2	2	0	0			
		References			Study Quality																
		21 (31743987)			1																
		20 (32160504)			1																
		23 (31209618)			3																
		22 (27468666)			4																
		Usually not appropriate	Strong	0.0 mSv		0.0 mSv [ped]	3	3		2	4	5	1	2	0	0	0	1			
		References			Study Quality																
		34 (12942203)			4																
		36 (24938663)			2																
		35 (26260536)			2																
		Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1		12	0	1	1	1	1	0	0	0	0			
CT shoulder with IV contrast	Usually not appropriate	Limited	⊕⊕⊕ 1-10 mSv		1	1		9	4	1	1	0	0	0	0	0	0				
		References			Study Quality																
		19 (29573902)			3																
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1		12	0	2	1	0	0	0	0	0	0				

**Variant 3: Chronic shoulder pain. Radiographs demonstrate calcific tendinopathy or calcific bursitis. Next imaging study.**

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	Usually appropriate	Strong	Varies	Varies	9	9	0	0	1	0	1	0	2	2	9
References	References			Study Quality											
	55 (20414859)			2											
	59 (19959377)			2											
	65 (33719606)			2											
	54 (27554465)			Good											
	63 (28613120)			1											
	64 (30975645)			1											
	58 (30204923)			2											
	57 (32114063)			1											
	56 (32451885)			2											
	60 (31124934)			Good											
	66 (33040221)			4											
	67 (27909786)			2											



			52 (31650966)		4											
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	12	2	0	0	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	10	1	1	1	1	1	0	0	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	1	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	1	0	0	0	0	0	0	0
Radiography shoulder additional views	Usually not appropriate	Expert Consensus	⊕ <0.1 mSv		1	1	11	0	3	0	1	0	0	0	0	0

**Variant 4: Chronic shoulder pain. Suspect labral pathology or shoulder instability. Initial radiographs normal or inconclusive. Next imaging study...**



		87 (28756510)	1															
		82 (32712787)	2															
MRI shoulder without and with IV contrast	Usually not appropriate	Moderate	0.0 mSv	0.0 mSv [ped]	3	3	4	2	4	4	1	0	0	0	0	0	0	
		References		Study Quality														
		89 (28604236)		Good														
		34 (12942203)		4														
US shoulder	Usually not appropriate	Limited	0.0 mSv	0.0 mSv [ped]	2	2	7	2	3	0	2	1	0	0	0	0	0	
		References		Study Quality														
		101 (31912757)		3														
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	0	1	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	13	0	1	1	0	0	0	0	0	0	0	
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	14	1	0	0	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	14	0	1	0	0	0	0	0	0	0	0	
Radiography shoulder additional views	Usually not appropriate	Limited	⊕ <0.1 mSv		1	1	9	3	3	0	0	0	0	0	0	0	0	
		References		Study Quality														
		1 (28537759)		4														
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	Usually not appropriate	Limited	Varies	Varies	1	1	12	0	2	0	0	0	0	1	0	0	0	
		References		Study Quality														
		23 (31209618)		3														

**Variant 5: Chronic shoulder pain. Suspect adhesive capsulitis. 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	Moderate	0 0 mSv	0 0 mSv [ped]	8	8	1	0	0	0	1	2	1	4	6
	References				Study Quality										
	113 (23082152)				4										
	114 (28410478)				2										
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	Usually appropriate	Strong	Varies	Varies	8	8	0	0	1	0	2	0	2	4	6
	References				Study Quality										
	106 (33517741)				1										
	107 (27566475)				1										
	105 (28619380)				2										
	108 (28687319)				3										
	23 (31209618)				3										
MR arthrography shoulder	May be appropriate	Limited	0 0 mSv	0 0 mSv [ped]	5	5	1	0	0	3	7	2	2	0	0
	References				Study Quality										
	109 (15358849)				3										
US shoulder	May be appropriate (Disagreement)	Expert Opinion	0 0 mSv	0 0 mSv [ped]	5	5	1	2	1	3	4	1	1	0	2
	References				Study Quality										
	116 (29770850)				3										
	117 (31782541)				3										
	108 (28687319)				3										
	115 (28900523)				1										
MRI shoulder without and with IV contrast	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	2	2	4	5	5	0	1	0	0	0	0
	References				Study Quality										

			111 (32591886)		2											
			112 (26611904)		3											
			110 (28729060)		4											
CT arthrography shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕⊕ 10-30 mSv		1	1	12	0	2	0	1	0	0	0	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	1	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	0	0	0	0	0	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	1	1	0	0	0	0	0	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	14	0	1	0	0	0	0	0	0	0
FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Strong	⊕⊕⊕⊕ 10-30 mSv	⊕⊕⊕⊕ 3-10 mSv [ped]	1	1	12	0	2	0	0	0	1	0	0	0

	References		Study Quality			
	103 (28161721)		2			
	102 (32170356)		2			
	104 (28168397)		3			

**Variant 6: Chronic shoulder pain. Suspect biceps tendon abnormality. Initial radiographs normal or inconclusive. Next imaging study.**



CT arthrography shoulder	May be appropriate	Limited	⊕⊕⊕ 10-30 mSv		4	4	2	1	2	4	4	1	1	0	0
			References		Study Quality										
			119 (28842745)		3										
			118 (30853414)		2										
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	1	1	0	0	0	0	0	0
CT shoulder without IV contrast	Usually not appropriate	Limited	⊕⊕⊕ 1-10 mSv		1	1	11	2	1	1	0	0	0	0	0
		References		Study Quality											
		120 (21367551)		2											
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	1	1	0	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	1	1	0	1	2	0	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	14	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	14	0	1	0	0	0	0	0	0
Radiography shoulder additional views	Usually not appropriate	Expert Consensus	⊕ <0.1 mSv		1	1	13	0	2	0	0	0	0	0	0

**Variant 7: Chronic shoulder pain. Initial radiographs demonstrate osteoarthritis. 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 0 mSv	0 0 mSv [ped]	7	7	0	0	0	0	3	4	3	3	2
	References			Study Quality											

		144 (27765501)	3																
		142 (32241666)	4																
		143 (31864608)	3																
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	May be appropriate	Limited	Varies	Varies	6	6	0	0	1	0	5	4	5	0	0				
			References		Study Quality														
			122 (31351537)		4														
			23 (31209618)		3														
CT arthrography shoulder	May be appropriate	Strong	⊕⊕⊕ 10-30 mSv		5	5	1	0	1	0	7	2	2	0	2				
			References		Study Quality														
			17 (22919041)		2														
			16 (19556150)		2														
CT shoulder without IV contrast	May be appropriate	Limited	⊕⊕⊕ 1-10 mSv		5	5	0	0	0	1	9	4	1	0	0				
			References		Study Quality														
			140 (28872528)		4														
			19 (29573902)		3														
			141 (31955231)		3														
MR arthrography shoulder	May be appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	3	9	1	2	0	0				
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	11	0	0	1	2	1	0	0	0				
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	12	0	2	0	0	1	0	0	0				
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	12	0	0	1	1	1	0	0	0				
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	14	0	0	0	1	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	2	0	0	0	0	0
US shoulder	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	1	1	10	1	3	0	1	0	0	0
		References				Study Quality								
		142 (32241666)				4								
Radiography shoulder additional views	Usually not appropriate	Strong	⊕ <0.1 mSv		1	1	13	0	1	0	1	0	0	0
		References				Study Quality								
		145 (28395944)				2								
		148 (28735840)				3								
		146 (28943071)				4								
		147 (30528438)				2								

**Variant 8: Chronic shoulder pain. History of prior rotator cuff repair. Suspect rotator cuff disorders or subacromial subdeltoid bursitis. 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 0 mSv	0 0 mSv [ped]	9	9	1	0	0	0	1	1	2	2	8
		References				Study Quality									
		151 (14730038)				4									
		150 (32241657)				4									
		152 (31078406)				4									
MRI shoulder without IV contrast	Usually appropriate	Strong	0 0 mSv	0 0 mSv [ped]	9	9	0	0	0	0	0	0	4	2	9
		References				Study Quality									
		153 (22469406)				4									
		154 (31563430)				2									

		156 (27914845)	4												
		155 (28214172)	2												
CT arthrography shoulder	Usually appropriate	Limited	⊕⊕⊕ 10-30 mSv		7	7	1	0	0	0	2	5	3	3	1
	References		Study Quality												
	73 (29549380)		3												
US shoulder	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	2	1	5	3	4
	References		Study Quality												
	157 (21719319)		2												
	158 (29398398)		3												
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	May be appropriate	Limited	Varies	Varies	5	5	0	0	2	2	10	1	0	0	0
	References		Study Quality												
	149 (31084488)		1												
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	13	0	1	1	0	0	0	0	0
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	12	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	13	1	0	1	0	0	0	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	1	1	0	0	0	0	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	14	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	2	0	0	0	0	0	0	0
Radiography shoulder additional views	Usually not appropriate	Expert Consensus	⊕ <0.1 mSv		1	1	13	1	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).