

**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	17
		References		Study Quality												
		10 (18599231)		4												
		14 (31201467)		3												
		13 (29504320)		2												
		12 (30423642)		2												
		11 (32298371)		3												
		1 (28537759)		4												
US shoulder	May be appropriate	Strong	○ 0 mSv	○ 0 mSv [ped]	5	5	2	1	0	2	9	1	0	0	0	
		References		Study Quality												
		14 (31201467)		3												
		13 (29504320)		2												
		12 (30423642)		2												
		11 (32298371)		3												
		10 (18599231)		4												
		1 (28537759)		4												
CT arthrography shoulder	Usually not appropriate	Expert Consensus	☼☼☼☼ 10-30 mSv		1	1	14	1	0	1	1	0	0	0	0	

CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	15	1	1	0	0	0	0	0	0
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	14	0	2	0	1	0	0	0	0
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	15	1	1	0	0	0	0	0	0
MR arthrography shoulder	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	0	0	2	0	1	0	0	0
MRI shoulder without IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	11	1	2	0	2	1	0	0	0
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	1	0	1	0	1	0	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	15	1	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	15	1	0	1	0	0	0	0	0
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	14	0	0	0	1	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 mSv	○ 0 mSv [ped]	9	9	0	0	0	0	0	0	2	3	12
			References	Study Quality											
			42 (8865483)	4											
			41 (32077302)	3											

40 (28273425)	3
39 (2740508)	3
38 (15069134)	2
37 (3496760)	3
29 (32195972)	Good
28 (32241656)	4
27 (31831029)	Good

US shoulder	Usually appropriate	Strong	0 0 mSv	0 0 mSv [ped]	8	8	0	0	0	0	0	0	4	5	8
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References	Study Quality
51 (8633460)	4
50 (29075914)	3
49 (27755645)	2
48 (32117542)	2
47 (32190853)	Good
46 (32609088)	1
45 (19052931)	2
38 (15069134)	2
24 (19457838)	M

MR arthrography shoulder	Usually appropriate	Strong	0 0 mSv	0 0 mSv [ped]	7	7	1	0	0	1	4	0	4	1	6
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References	Study Quality
33 (10227520)	3
32 (12147844)	3
31 (20563802)	3
30 (31773187)	3
29 (32195972)	Good
28 (32241656)	4
27 (31831029)	Good
26 (19098184)	3
25 (1489363)	3

		24 (19457838)		M														
CT arthrography shoulder	May be appropriate	Strong	☼☼☼☼ 10-30 mSv		5	5	0	0	1	3	5	5	1	0	0			
		References		Study Quality														
		18 (18400443)		4														
		17 (22919041)		2														
		16 (19556150)		2														
		15 (15911667)		3														
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	May be appropriate	Strong	Varies	Varies	5	5	0	0	1	2	8	2	2	0	0			
		References		Study Quality														
		23 (31209618)		3														
		22 (27468666)		4														
		21 (31743987)		1														
		20 (32160504)		1														
MRI shoulder without and with IV contrast	Usually not appropriate	Strong	0 0 mSv	0 0 mSv [ped]	3	3	2	4	5	1	2	0	0	0	0	1		
		References		Study Quality														
		36 (24938663)		2														
		35 (26260536)		2														
		34 (12942203)		4														
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	14	0	1	1	1	0	0	0	0			
CT shoulder without IV contrast	Usually not appropriate	Limited	☼☼☼ 1-10 mSv		1	1	10	5	1	1	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	14	0	2	1	0	0	0	0	0			

Bone scan shoulder	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	15	1	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	15	1	1	0	0	0	0	0	0
Radiography shoulder additional views	Usually not appropriate	Limited	☼ <0.1 mSv		1	1	8	1	5	1	0	0	0	0	0

References	Study Quality
44 (30367278)	3
43 (15671396)	3
42 (8865483)	4

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	3	3	9

References	Study Quality
67 (27909786)	2
66 (33040221)	4
65 (33719606)	2
64 (30975645)	1
63 (28613120)	1
62 (22143923)	1
61 (24813322)	4
60 (31124934)	Good
59 (19959377)	2
58 (30204923)	2
57 (32114063)	1
56 (32451885)	2

		53 (8724130)			4										
CT shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv		1	1	14	2	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	12	1	1	1	1	1	0	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊗⊗⊗ 1-10 mSv		1	1	15	1	0	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	15	1	1	0	0	0	0	0	0
Radiography shoulder additional views	Usually not appropriate	Expert Consensus	⊕ <0.1 mSv		1	1	12	0	4	0	1	0	0	0	0

Variant 4: Chronic shoulder pain. Suspect labral pathology or shoulder 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	0	2	15

References	Study Quality
94 (29754193)	3
93 (30476457)	3
92 (8058959)	4
91 (9275908)	2
90 (29582141)	Good
89 (28604236)	Good
88 (27826700)	Good
73 (29549380)	3
31 (20563802)	3
30 (31773187)	3

MRI shoulder without IV contrast	Usually appropriate	Strong	0 mSv	0 mSv [ped]	8	8	0	0	0	1	2	0	5	6	3
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References	Study Quality
100 (28558115)	3
99 (27923707)	3
98 (32502712)	2
97 (29117482)	2
96 (29396694)	2
95 (21512082)	2
90 (29582141)	Good

CT arthrography shoulder	May be appropriate	Strong	☼☼☼☼ 10-30 mSv		6	6	0	0	0	1	1	7	4	2	2
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References	Study Quality
18 (18400443)	4
76 (24155283)	4
75 (31541346)	2
74 (30174813)	2
73 (29549380)	3
72 (22358006)	2

CT shoulder without IV contrast	May be appropriate	Strong	☼☼☼ 1-10 mSv		6	6	0	0	0	1	4	7	1	1	1
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References	Study Quality
87 (28756510)	1
86 (30898131)	4
85 (28593363)	4
84 (33270465)	3
83 (29198939)	3
82 (32712787)	2
81 (12728039)	4
80 (15827355)	4
79 (10462730)	4

			78 (31056471)		4													
			77 (30470257)		3													
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			
		References		Study Quality														
		34 (12942203)		4														
		89 (28604236)		Good														
US shoulder	Usually not appropriate	Limited	0 0 mSv	0 0 mSv [ped]	2	2	8	2	3	0	3	1	0	0	0			
		References		Study Quality														
		101 (31912757)		3														
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	15	0	1	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	1	0	0	0	0	0			
Bone scan shoulder	Usually not appropriate	Expert Consensus	☹☹☹ 1-10 mSv		1	1	16	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	16	0	1	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			
		References		Study Quality														
		1 (28537759)		4														
Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures	Usually not appropriate	Limited	Varies	Varies	1	1	13	0	3	0	0	0	0	1	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	2	2	1	5	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	3	4	7
		References		Study Quality											
		23 (31209618)		3											
		108 (28687319)		3											
		107 (27566475)		1											
		106 (33517741)		1											
		105 (28619380)		2											
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											
		108 (28687319)		3											
		117 (31782541)		3											
		116 (29770850)		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											

112 (26611904)	3
111 (32591886)	2
110 (28729060)	4

CT arthrography shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕⊕ 10-30 mSv		1	1	14	0	2	0	1	0	0	0	0
CT shoulder with IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	15	1	1	0	0	0	0	0	0
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	15	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	15	1	1	0	0	0	0	0	0
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	16	0	1	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	13	0	3	0	0	0	1	0	0

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

Radiography shoulder additional views	Usually not appropriate	Expert Consensus	⊕ <0.1 mSv		1	1	15	0	1	0	1	0	0	0	0
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Variant 6: Chronic shoulder pain. Suspect biceps tendon abnormality. 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]	8	8	0	0	0	0	1	2	4	6	4

References	Study Quality
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			144 (27765501)		3													
			143 (31864608)		3													
			142 (32241666)		4													
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														
			23 (31209618)		3													
			122 (31351537)		4													
CT arthrography shoulder	May be appropriate	Strong	⊕⊕⊕⊕ 10-30 mSv		5	5	1	0	1	0	8	2	2	0	3			
		References		Study Quality														
			16 (19556150)		2													
			17 (22919041)		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														
			19 (29573902)		3													
			141 (31955231)		3													
			140 (28872528)		4													
MR arthrography shoulder	May be appropriate	Expert Consensus	○ 0 mSv	○ 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	13	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	14	0	2	0	0	1	0	0	0			
MRI shoulder without and with IV contrast	Usually not appropriate	Expert Consensus	○ 0 mSv	○ 0 mSv [ped]	1	1	14	0	0	1	1	1	0	0	0			
Bone scan shoulder	Usually not appropriate	Expert Consensus	⊕⊕⊕ 1-10 mSv		1	1	16	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	15	0	2	0	0	0	0	0	0
US shoulder	Usually not appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	1	1	10	1	3	0	1	0	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	0
		References		Study Quality											
		148 (28735840)		3											
		147 (30528438)		2											
		146 (28943071)		4											
		145 (28395944)		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 mSv	○ 0 mSv [ped]	9	9	1	0	0	0	1	1	2	2	10
		References		Study Quality											
		152 (31078406)		4											
		151 (14730038)		4											
		150 (32241657)		4											
MRI shoulder without IV contrast	Usually appropriate	Strong	○ 0 mSv	○ 0 mSv [ped]	9	9	0	0	0	0	0	0	5	2	10
		References		Study Quality											
		156 (27914845)		4											
		155 (28214172)		2											

			154 (31563430)		2													
			153 (22469406)		4													
CT arthrography shoulder	Usually appropriate	Limited	☼☼☼☼ 10-30 mSv		7	7	1	0	0	0	2	5	3	5	1			
			References		Study Quality													
			73 (29549380)		3													
US shoulder	Usually appropriate	Limited	○ 0 mSv	○ 0 mSv [ped]	7	7	0	0	0	0	2	1	6	3	5			
			References		Study Quality													
			158 (29398398)		3													
			157 (21719319)		2													
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	15	0	1	1	0	0	0	0	0			
CT shoulder without IV contrast	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	14	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	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	13	1	1	0	0	0	0	0	0			
Bone scan shoulder	Usually not appropriate	Expert Consensus	☼☼☼ 1-10 mSv		1	1	16	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	15	2	0	0	0	0	0	0	0			
Radiography shoulder additional views	Usually not appropriate	Expert Consensus	☼ <0.1 mSv		1	1	15	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.