American College of Radiology ACR Appropriateness Criteria®

Chronic Shoulder Pain

Variant 1: Chronic shoulder pain. Initial imaging.

| D 1 | Appropriateness | riateness SOE Adults RRL Peds RRL Rating Median | | | | | | F | inal | Tabu | latio | ıs | | | |
|--------------------------|-------------------------|---|-------------------|------------------|---------|--------|----|---|------|------|-------|----|---|---|----|
| Procedure | Category | SOE | Adults RRL | Peds RRL | Rating | Median | 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 | 17 |
| | | References | | Study | Quality | | | | | | | | | | |
| | | 10 (18599231) | | | 4 | | | | | | | | | | |
| | | 14 (31201467) | | | 3 | | | | | | | | | | |
| | | 13 (29504320) | | | 2 | | | | | | | | | | |
| | | 12 (30423642) | 12 (30423642) | | 2 | | | | | | | | | | |
| | | 11 (32298371) | 11 (32298371) | | 3 | | | | | | | | | | |
| | | 1 (28537759) | • | | 4 | | | | | | | | | | |
| US shoulder | May be appropriate | Strong | O 0 mSv | O 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 | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 14 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 |
| MRI shoulder without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 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 | O 0 mSv | O 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.

| , n | Appropriateness | GOT. | A L L DDI | D 1 DD1 | . | 3.5.11 | | | F | inal ' | Гаbu | latio | ns | | |
|----------------------------------|------------------------|--------|------------|------------------|----------|--------|---|---|---|--------|------|-------|----|---|----|
| Procedure | Category | SOE | Adults RRL | Peds RRL | Rating | Median | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MRI shoulder without IV contrast | Usually appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 9 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 12 |

| References | Study Quality |
|---------------|---------------|
| 42 (8865483) | 4 |
| 41 (32077302) | 3 |

| | | | | | | | 1 | | | | | | | | |
|--------------------------|---------------------|---------------|---------|------------------|-----------|---|---|---|---|---|---|---|---|---|---|
| | | 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 | O 0 mSv | O 0 mSv [ped] | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 5 | 8 |
| | | References | | Study | y 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 | O 0 mSv | O 0 mSv [ped] | 7 | 7 | 1 | 0 | 0 | 1 | 4 | 0 | 4 | 1 | 6 |
| | | References | | Study | y 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 | | Stud | y 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 | | Stud | y Quality | | | | | | | | | | |
| | | 23 (31209618) | | | 3 | | | | | | | | | | |
| | | 22 (27468666) | | | 4 | | | | | | | | | | |
| | | 21 (31743987) | | | 1 | | | | | | | | | | |
| | | 20 (32160504) | | 1 | | | | | | | | | | | |
| MRI shoulder without and with IV contrast | Usually not appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 3 | 3 | 2 | 4 | 5 | 1 | 2 | 0 | 0 | 0 | 1 |
| | | References | | Stud | y 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 | | Stud | y 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.

| . | Appropriateness | GOT. | A L L. DDI | D 1 DD1 | T | 3.5.11 | | | F | inal ' | Гаbu | latio | ns | | |
|---|------------------------|--------|------------|----------|--------|--------|---|---|---|--------|------|-------|----|---|---|
| Procedure | Category | SOE | Adults RRL | Peds RRL | Rating | Median | 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) | G | lood | |
| 59 (19959377) | | 2 | |
| 58 (30204923) | | 2 | |
| 57 (32114063) | | 1 | |
| 56 (32451885) | | 2 | |

| | | 55 (20414950) | | 2 | | | | | | | | | | | |
|----------------------------------|-------------------------|---------------------|------------------------|------------------|---------|---|----|---|---|---|----|----|---|---|---|
| | | 55 (20414859) | | | | | | | | | | | | | |
| MOV 1 11 14 1W | | 54 (27554465) | | | Good | | | | | | | | | | |
| MRI shoulder without IV contrast | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 6 | 6 | 1 | 0 | 0 | 0 | 5 | 7 | 2 | 0 | 0 |
| | | References | | Study | Quality | | | | | | | | | | |
| | | 52 (31650966) | | | 4 | | | | | | | | | | |
| | | 68 (31816365) | | | 4 | | | | | | | | | | |
| | | 70 (14500211) | | | 4 | | | 1 | 1 | | | | | | |
| US shoulder | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 6 | 6 | 0 | 0 | 0 | 1 | 4 | 10 | 0 | 0 | 0 |
| | | References | | Study | Quality | | • | | | | | | | | |
| | | 71 (33151457) | | | 4 | | | | | | | | | | |
| MR arthrography shoulder | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 0 | 0 | 1 | 11 | 2 | 0 | 1 | 0 |
| | | References | | Study | Quality | | | | | | • | | | | |
| | | 26 (19098184) | | | 3 | | | | | | | | | | |
| | | 25 (1489363) | | | 3 | | | | | | | | | | |
| | | 24 (19457838) | | | M | | | | | | | | | | |
| | | 68 (31816365) | | | 4 | | | | | | | | | | |
| | | 69 (35297578) | | | 2 | | | | | | | | | | |
| CT arthrography shoulder | Usually not appropriate | Limited | ���� 10-30 mSv | | 1 | 1 | 12 | 1 | 3 | 0 | 1 | 0 | 0 | 0 | 0 |
| | | References | | Study | Quality | | | | | | | | | | |
| | | 18 (18400443) | | | 4 | | | | | | | | | | |
| CT shoulder with IV contrast | Usually not appropriate | Expert Consensus | ≎≎≎ 1-10 mSv | | 1 | 1 | 14 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| CT shoulder without IV contrast | Usually not appropriate | Limited | ��� 1-10 mSv | | 1 | 1 | 8 | 2 | 4 | 0 | 1 | 0 | 0 | 0 | 0 |
| | | References | | Study | Quality | | | | | | | | | | |
| | | 52 (31650966) | | | 4 | | | | | | | | | | |

53 (8724130) 4 CT shoulder without and with IV **���** 1-10 Usually not Expert 14 2 0 0 1 0 0 0 0 1 1 contrast mSv appropriate Consensus MRI shoulder without and with IV O 0 mSv Usually not Expert O 0 mSv 12 1 0 0 0 1 1 contrast appropriate [ped] Consensus Bone scan shoulder **⊕⊕⊕** 1-10 Usually not Expert 15 1 0 0 0 0 0 0 1 1 1 mSv appropriate Consensus FDG-PET/CT skull base to mid-**���� 3**-**����** 10-30 Usually not Expert 15 10 mSv 0 thigh 1 1 0 0 0 0 0 1 appropriate Consensus mSv [ped] Radiography shoulder additional Usually not Expert **♦** <0.1 mSv 12 0 0 0 0 0 0 1 4 1 1 views ` appropriate Consensus

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

| ъ . | Appropriateness | GOT. | A L L DDY | n i nni | - · | 3.6.11 | | | F | inal [| Fabu | latior | ıs | | |
|--------------------------|------------------------|--------|------------|------------------|--------|--------|---|---|---|--------|-------------|--------|----|---|----|
| Procedure | Category | SOE | Adults RRL | Peds RRL | Rating | Median | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MR arthrography shoulder | Usually appropriate | Strong | O 0 mSv | O 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 | O 0 mSv | O 0 mSv [ped] | 8 | 8 | 0 | 0 | 0 | 1 | 2 | 0 | 5 | 6 | 3 |
|----------------------------------|------------------------|--------------------------------|--------------------------|------------------|-----------|---|---|---|---|---|---|---|---|---|----------|
| | | References | | Study | y Quality | | | | | | | | | | <u> </u> |
| | | 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 |
| | | References | | Study | y Quality | | | | | | | | | | |
| | | 18 (18400443) | | | 4 | | | | | | | | | | |
| | | 76 (24155283) | | 4 | | | | | | | | | | | |
| | | 75 (31541346) | | 2 | | | | | | | | | | | |
| | | 75 (31541346) 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 |
| | | References | | Study | y 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 (310564 | | | 4 | | | | | | | | | | |
| | | 77 (304702 | 257) | | 3 | 1 | | | | | | | | | |
| MRI shoulder without and with IV contrast | Usually not appropriate | | O 0 mS | O 0 mSv [ped] | 3 | 3 | 4 | 2 | 4 | 4 | 1 | 0 | 0 | 0 | 0 |
| | | Referenc | es | Stud | dy Quality | | | | | | | | | | |
| | | 34 (129422 | 203) | | 4 | | | | | | | | | | |
| | | 89 (286042 | 236) | | Good | | | | | | | | | | |
| US shoulder | Usually not appropriate | | O 0 mSv | O 0 mSv [ped] | 2 | 2 | 8 | 2 | 3 | 0 | 3 | 1 | 0 | 0 | 0 |
| | | Referenc | es | Stud | dy Quality | • | ' | | | | | | | | |
| | | 101 (31912 | | | 3 | | | | | | | | | | |
| CT shoulder with IV contrast | Usually not appropriate | t Expert | ⊕⊕⊕ 1-1 | 0 | 1 | 1 | 15 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| CT shoulder without and with IV contrast | Usually not appropriate | | ��� 1-1 mSv | 0 | 1 | 1 | 15 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Bone scan shoulder | Usually not appropriate | | ��� 1-1 mSv | 0 | 1 | 1 | 16 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FDG-PET/CT skull base to mid- thigh | Usually not appropriate | | ���� 10- mSv | -30 | 1 | 1 | 16 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Radiography shoulder additional views | Usually not appropriate | | | Sv | 1 | 1 | 9 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | Referenc | es | Stud | dy Quality | | | | | | | | | | |
| | | 1 (285377 | 59) | | 4 | | | | | | | | | | |
| Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures | Usually not appropriate | | Varies | Varies | 1 | 1 | 13 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| | | Referenc | es | Stu | dy Quality | | | | | | | | | | |
| | | 23 (312096 | 518) | | 3 | | | | | | | | | | |

Variant 5: Chronic shoulder pain. Suspect adhesive capsulitis. Initial radiographs normal or inconclusive. Next imaging study.

| | Appropriateness | 207 | | | | | | | I | inal | Tabu | latio | ns | | |
|---|---|----------------------------------|------------|------------------|-----------|--------|---|---|---|------|------|-------|----|---|---|
| Procedure | Category | SOE | Adults RRL | Peds RRL | Rating | Median | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MRI shoulder without IV contrast | Usually appropriate | Moderate | O 0 mSv | O 0 mSv [ped] | 8 | 8 | 1 | 0 | 0 | 0 | 2 | 2 | 1 | 5 | 6 |
| | | References | | Study | y 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 | y Quality | | | | | | | | | | |
| | | 23 (31209618) | | | 3 | | | | | | | | | | |
| | | 108 (28687319) |) | | 3 | | | | | | | | | | |
| | | 107 (27566475) |) | | 1 | | | | | | | | | | |
| | | 106 (33517741) |) | | 1 | | | | | | | | | | |
| | | 106 (33517741) 105 (28619380) | | | 2 | | | _ | _ | _ | | | | | |
| MR arthrography shoulder | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 1 | 0 | 0 | 3 | 7 | 2 | 2 | 0 | 0 |
| | | References | | Study | y Quality | | - | | | | | | | | |
| | | 109 (15358849) |) | | 3 | | | | | | | | | | |
| US shoulder | May be appropriate (Disagreement) | Expert Opinion | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 1 | 2 | 1 | 3 | 4 | 1 | 1 | 0 | 2 |
| | | References | | Study | y Quality | | | | | | | | | | |
| | | 108 (28687319) |) | | 3 | | | | | | | | | | |
| | | 117 (31782541) |) | | 3 | | | | | | | | | | |
| | | 116 (29770850) | | 3 | | | | | | | | | | | |
| | | 115 (28900523) | | 1 | | | _ | | _ | | | | | | |
| MRI shoulder without and with IV contrast | Usually not appropriate | 115 (28900523) | | | 2 | 2 | 4 | 5 | 5 | 0 | 1 | 0 | 0 | 0 | 0 |
| | | References | Study | y Quality | | | | | | | | | | | |

| | | 112 (26611904) | | | | | 2 | | | | | | | | | | |
|--|--------------------------|-----------------|---------------------|------------------------|-----|----------------------------|---------|-----|----|---|---|---|---|---|---|---|---|
| | | | | | | | 3 | | | | | | | | | | |
| | | | 111 (32591886) | , | | | 2 | | | | | | | | | | |
| | | | 110 (28729060) |) | | Т | 4 | | | 1 | | | | | | | 1 |
| CT arthrography shoulder | Usually approp | | Expert Consensus | ���� 10- mSv | ·30 | | 1 | 1 | 14 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 |
| CT shoulder with IV contrast | Usuall approp | y not oriate | Expert Consensus | ��� 1-10 mSv | 0 | | 1 | 1 | 15 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| CT shoulder without IV contrast | Usuall approp | | Expert Consensus | ��� 1-10 mSv | 0 | | 1 | 1 | 15 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| CT shoulder without and with IV contrast | Usuall approp | | Expert Consensus | ��� 1-10 mSv | 0 | | _ 1 | _ 1 | 15 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bone scan shoulder | Usuall _{approp} | | Expert Consensus | ��� 1-10 mSv | 0 | | 1 | 1 | 16 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| FDG-PET/CT skull base to mid-thigh | Usuall approp | y not oriate | Strong | ≎≎≎≎ 10- mSv | -30 | ���� 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 | Usuall approp | | Expert Consensus | | Sv | | 1 | 1 | 15 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |

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

| n 1 | Appropriateness | COF | 4 1 14 DD1 | D I DDI | D 41 | 3.7.11 | | | F | inal ' | Гabu | latio | ns | | |
|--------------------------|------------------------|------------|------------|------------------|---------|--------|---|---|---|--------|------|-------|----|---|---|
| Procedure | Category | SOE | Adults RRI | L Peds RRL | Rating | Median | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MR arthrography shoulder | Usually appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 8 | 8 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 6 | 4 |
| | | References | | Study | Quality | | | | | | | | | | |

| | | 125 (9609174) | | | 2 | | | | | | | | | | |
|---|------------------------|----------------|---------|------------------|---------|---|---|---|---|---|---|---|---|---|---|
| | | 128 (28528385) | | | 2 | | | | | | | | | | |
| | | 127 (28983764) | | | 2 | | | | | | | | | | |
| | | 126 (31346668) | | | 2 | | | | | | | | | | |
| MRI shoulder without IV contrast | Usually appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 6 | 5 |
| | | References | | Study | Quality | | | | | | | | | | |
| | | 130 (24891814) | | | 3 | | | | | | | | | | |
| | | 129 (12591665) | | | 3 | | | | | | | | | | |
| | | 131 (15111894) | | | 2 | | | | | | | | | | |
| | | 137 (30937471) | | | 2 | | | | | | | | | | |
| | | 136 (30271779) | | | 2 | | | | | | | | | | |
| | | 135 (27885850) | | | 2 | | | | | | | | | | |
| | | 134 (29573932) | | | 2 | | | | | | | | | | |
| | | 133 (30639523) | | | 2 | | | | | | | | | | |
| | | 132 (31153372) | | | 2 | | | | | | | | | | |
| Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures | Usually appropriate | 132 (31153372) | | | 8 | 8 | 0 | 0 | 1 | 0 | 2 | 2 | 3 | 2 | 7 |
| | | References | | Study | Quality | | | | | | | | | | |
| | | 22 (27468666) | | | 4 | | | | | | | | | | |
| | | 124 (31187487) | | | 3 | | | | | | | | | | |
| | | 123 (31712838) | | | 1 | | | | | | | | | | |
| | | 122 (31351537) | | | 4 | | | | | | | | | | |
| | | 121 (27582534) | | | 2 | | | | | | | | | | |
| US shoulder | Usually appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 7 | 7 | 0 | 0 | 0 | 1 | 4 | 3 | 1 | 3 | 5 |
| | | References | | Study | Quality | | | | | | | | | | |
| | | 138 (31054148) | | | 4 | | | | | | | | | | |
| | | 139 (31545834) | | | 3 | | | | | | | | | | |

| CT arthrography shoulder | May approp | Limited | ≎≎≎≎ 10-30 mSv |) | 4 | 4 | 3 | 1 | 2 | 4 | 5 | 1 | 1 | 0 | 0 |
|---|------------------|---------------------|--------------------------|------------------|-----------|---|----|---|---|---|---|---|---|---|---|
| | | References | | Study | y Quality | | | | | | | | | | |
| | | 118 (30853414) |) | | 2 | | | | | | | | | | |
| | | 119 (28842745) |) | | 3 | | | | | | | | | | |
| CT shoulder with IV contrast | Usuall approp | Expert Consensus | ≎≎≎ 1-10 mSv | | 1 | 1 | 15 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| CT shoulder without IV contrast | Usuall approp | Limited | ��� 1-10 mSv | | 1 | 1 | 13 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| | | References | | Study | y Quality | | | | | | | | | | |
| | | 120 (21367551) |) | | 2 | | | | | | | | | _ | |
| CT shoulder without and with IV contrast | Usuall approp | Expert Consensus | ��� 1-10 mSv | | 1 | 1 | 15 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| MRI shoulder without and with IV contrast | Usuall approp | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 1 | 1 | 0 | 1 | 2 | 0 | 0 | 0 |
| Bone scan shoulder | Usuall approp | Expert Consensus | ��� 1-10 mSv | | 1 | 1 | 16 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FDG-PET/CT skull base to mid-thigh | Usuall approp | Expert Consensus | ���� 10-30 mSv | 0 | 1 | 1 | 16 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Radiography shoulder additional views | Usuall approp | Expert Consensus | � <0.1 mSv | | 1 | 1 | 15 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |

Variant 7: Chronic shoulder pain. Initial radiographs demonstrate osteoarthritis. Next imaging study.

| D 1 | Appropriate | teness | COE | 4 1 14 DD | \T | D I DDI | D 41 | 3.7.11 | | | F | inal ' | Гаbи | latio | ns | | |
|----------------------------------|----------------------|--------|------------|-----------|----|------------------|---------|--------|---|---|---|--------|------|-------|----|---|---|
| Procedure | Categor | | SOE | Adults RR | | Peds RRL | Rating | Median | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MRI shoulder without IV contrast | Usually appropria | | Limited | O 0 mSv | , | O 0 mSv [ped] | 7 | 7 | 0 | 0 | 0 | 0 | 3 | 5 | 3 | 4 | 2 |
| | | | References | | | Study | Quality | | | | | | | | | | |

| | | 144 (27765501) | | | 3 | | | | | | | | | | |
|---|------------------|---------------------|-------------------|------------------|-----------|---|----|---|---|---|---|---|---|---|---|
| | | 143 (31864608) | | | 3 | | | | | | | | | | |
| | | 142 (32241666) |) | | 4 | | _ | 1 | 1 | | | ı | | | |
| Image-guided anesthetic +/- corticosteroid injection shoulder or surrounding structures | May approp | 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 approp | 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 approp | 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 approp | 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 | Usuall approp | Expert Consensus | ��� 1-10 mSv | | 1 | 1 | 13 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 |
| CT shoulder without and with IV contrast | Usuall approp | Expert Consensus | ��� 1-10 mSv | | 1 | 1 | 14 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 |
| MRI shoulder without and with IV contrast | Usuall approp | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 14 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| Bone scan shoulder | Usuall approp | Expert Consensus | ��� 1-10 mSv | | 1 | 1 | 16 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |

| FDG-PET/CT skull base to mid-thigh | Usuall approp | | Expert Consensus | ���� 10-3 mSv | 30 | ���� 3- 10 mSv [ped] | 1 | 1 | 15 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
|---------------------------------------|------------------|-----------------|---------------------|------------------|----|----------------------------|---------|---|----|---|---|---|---|---|---|---|---|
| US shoulder | Usuall approp | y not oriate | Limited | O 0 mSv | | O 0 mSv [ped] | 1 | 1 | 10 | 1 | 3 | 0 | 1 | 0 | 0 | 0 | 0 |
| | • | | References | | • | Study | Quality | | | | | | | | | | |
| | | | 142 (32241666) |) | | | 4 | | _ | | | | | | | | |
| Radiography shoulder additional views | Usuall approp | y not oriate | Strong | ≎ <0.1 mS | Sv | | 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.

| D 1 | Appropri | iateness | COE | 4 1 14 DD | · T | D I DDI | D. (| 24.11 | | | F | inal ' | Tabu | latio | ns | | |
|----------------------------------|----------------|------------------------------|----------------|-----------|-----|------------------|---------|--------|---|---|---|--------|------|-------|----|---|----|
| Procedure | Categ | gory | SOE | Adults RR | L | Peds RRL | Rating | Median | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MR arthrography shoulder | Usua approp | | Limited | O 0 mSv | ′ | O 0 mSv [ped] | 9 | 9 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 10 |
| | | References 152 (31078406) | | | | Study | Quality | | | | | | | | | | |
| | | 152 (31078406) | |) | | | 4 | | | | | | | | | | |
| | | | 151 (14730038) |) | | | 4 | | | | | | | | | | |
| | | | 150 (32241657) |) | | | 4 | | _ | | | | | | | | |
| MRI shoulder without IV contrast | Usua approp | | Strong | O 0 mSv | ′ | O 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 | | | | | 1 | | | 1 | | | |
| 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 | O 0 mSv | O 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 approp | | Limited | Varies | Varies | 5 | 5 | 0 | 0 | 2 | 2 | 10 | 1 | 0 | 0 | 0 |
| | | References | | Study Quality | | 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 | 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 | 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.