



## Complete Summary

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### GUIDELINE TITLE

Shoulder trauma.

### BIBLIOGRAPHIC SOURCE(S)

Steinbach LS, Daffner RH, Dalinka MK, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Morrison WB, Pavlov H, Rubin DA, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Shoulder trauma. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [37 references]

### GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Newberg A, Dalinka MK, Alazraki N, Berquist TH, Daffner RH, DeSmet AA, el-Khoury GY, Goergen TG, Keats TE, Manaster BJ, Pavlov H, Haralson RH, McCabe JB, Sartoris D. Shoulder trauma. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):299-302.

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

## \*\* REGULATORY ALERT \*\*

### FDA WARNING/REGULATORY ALERT

**Note from the National Guideline Clearinghouse:** This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- [May 23, 2007, Gadolinium-based Contrast Agents](#): The addition of a boxed warning and new warnings about the risk of nephrogenic systemic fibrosis (NSF) to the full prescribing information for all gadolinium-based contrast agents (GBCAs).

## COMPLETE SUMMARY CONTENT

\*\* REGULATORY ALERT \*\*

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## SCOPE

### **DISEASE/CONDITION(S)**

Shoulder trauma

### **GUIDELINE CATEGORY**

Diagnosis  
Evaluation

### **CLINICAL SPECIALTY**

Emergency Medicine  
Family Practice  
Internal Medicine  
Nuclear Medicine  
Orthopedic Surgery  
Radiology

### **INTENDED USERS**

Health Plans  
Hospitals  
Managed Care Organizations  
Physicians  
Utilization Management

### **GUIDELINE OBJECTIVE(S)**

To evaluate the appropriateness of initial radiologic examinations for patients with shoulder trauma

### **TARGET POPULATION**

Patients with shoulder trauma

### **INTERVENTIONS AND PRACTICES CONSIDERED**

1. X-rays
  - Anteroposterior (AP) (Grashey recommended) views with internal and external humeral rotation

- Axillary
  - Impingement view
  - Scapular Y
2. Computed tomography (CT)
  3. Magnetic resonance imaging (MRI)
    - Routine MRI
    - Magnetic resonance (MR) arthrogram
  4. Arthrogram with or without computed tomography (CT)
  5. Ultrasound (US)
  6. Nuclear medicine, bone scan

## **MAJOR OUTCOMES CONSIDERED**

Utility of radiologic examinations in differential diagnosis

## **METHODOLOGY**

### **METHODS USED TO COLLECT/SELECT EVIDENCE**

Searches of Electronic Databases

### **DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE**

The guideline developer performed literature searches of peer-reviewed medical journals, and the major applicable articles were identified and collected.

### **NUMBER OF SOURCE DOCUMENTS**

The total number of source documents identified as the result of the literature search is not known.

### **METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE**

Weighting According to a Rating Scheme (Scheme Not Given)

### **RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE**

Not stated

### **METHODS USED TO ANALYZE THE EVIDENCE**

Systematic Review with Evidence Tables

### **DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE**

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

## **METHODS USED TO FORMULATE THE RECOMMENDATIONS**

Expert Consensus (Delphi)

### **DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS**

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed for reaching agreement in the formulation of the appropriateness criteria. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1 to 9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty (80) percent agreement is considered a consensus. This modified Delphi technique enables individual, unbiased expression, is economical, easy to understand, and relatively simple to conduct.

If consensus cannot be reached by this Delphi technique, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible. If "No consensus" appears in the rating column, reasons for this decision are added to the comment sections.

### **RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS**

Not applicable

### **COST ANALYSIS**

A formal cost analysis was not performed and published cost analyses were not reviewed.

### **METHOD OF GUIDELINE VALIDATION**

Internal Peer Review

### **DESCRIPTION OF METHOD OF GUIDELINE VALIDATION**

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

#### ACR Appropriateness Criteria®

**Clinical Condition: Acute Shoulder Trauma (e.g., MVA, Sports)**

**Variant 1: Rule out fracture or dislocation.**

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, shoulder, AP views (Grashey recommended) with internal and external humeral rotation	9	
X-ray, shoulder, axillary lateral and/or scapular Y	9	
CT, shoulder	1	
MRI, shoulder	1	
Arthrogram, shoulder	1	
<p><b><i>Appropriateness Criteria Scale</i></b>  <b>1 2 3 4 5 6 7 8 9</b>  <b>1 = Least appropriate 9 = Most appropriate</b></p>		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

**Variant 2: Acute or recent trauma, normal recent radiographs, significant clinical symptoms.**

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI, shoulder	5	
US, shoulder	1	
CT, shoulder	1	
NUC, bone scan	1	
Arthrogram, shoulder	1	

<b>Radiologic Exam Procedure</b>	<b>Appropriateness Rating</b>	<b>Comments</b>
<b><i>Appropriateness Criteria Scale</i></b> <b>1 2 3 4 5 6 7 8 9</b> <b>1 = Least appropriate 9 = Most appropriate</b>		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

**Variant 3: Subacute shoulder pain - questionable bursitis or tendonitis, approximately 3 months duration. First study recommended.**

<b>Radiologic Exam Procedure</b>	<b>Appropriateness Rating</b>	<b>Comments</b>
X-ray, shoulder, AP views (Grashy recommended) with internal and external humeral rotation	9	
X-ray, shoulder, Axillary	No consensus	Some believe this is indicated.
X-ray, shoulder, Scapular Y	1	
US, shoulder	1	
CT, shoulder	1	
NUC, bone scan	1	
Arthrogram, shoulder	1	
CT arthrogram, shoulder	1	
MRI, shoulder, routine	1	
MRI, shoulder, MR arthrogram	1	
X-ray, shoulder, Impingement view	1	Majority believe not indicated.
<b><i>Appropriateness Criteria Scale</i></b> <b>1 2 3 4 5 6 7 8 9</b> <b>1 = Least appropriate 9 = Most appropriate</b>		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

**Variant 4: Subacute shoulder pain, suspect rotator cuff tear/impingement; over age 35. Normal plain radiographs or radiographs that demonstrate coracoacromial arch osteophytes/syndesmophytes.**

<b>Radiologic Exam Procedure</b>	<b>Appropriateness Rating</b>	<b>Comments</b>
MRI, shoulder, routine	9	
US, shoulder	7	With appropriate expertise.
Arthrogram, shoulder, with or without CT	5	Alternative if patient cannot have MR or if US expertise not available.
CT, shoulder	1	
MRI arthrogram, shoulder	1	
<b><i>Appropriateness Criteria Scale</i></b> <b>1 2 3 4 5 6 7 8 9</b> <b>1 = Least appropriate 9 = Most appropriate</b>		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

**Variant 5: Subacute shoulder pain, under age 35.**

<b>Radiologic Exam Procedure</b>	<b>Appropriateness Rating</b>	<b>Comments</b>
MRI arthrogram, shoulder	9	Either MR arthrogram or MR routine is appropriate. Depends on availability, expertise, and local conditions.
MRI, shoulder, routine	9	Either MR arthrogram or MR routine is appropriate. Depends on availability, expertise, and local conditions.
CT arthrogram, shoulder	4	This is the procedure of choice if MR is contraindicated or not available.
US, shoulder	1	US utility is limited in patients with a low likelihood of cuff disease.
Arthrogram, shoulder	1	
<b><i>Appropriateness Criteria Scale</i></b> <b>1 2 3 4 5 6 7 8 9</b> <b>1 = Least appropriate 9 = Most appropriate</b>		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

**Variant 6: Subacute shoulder pain, suspect instability/labral tear.**

<b>Radiologic Exam Procedure</b>	<b>Appropriateness Rating</b>	<b>Comments</b>
MRI arthrogram, shoulder	9	
MRI, shoulder, routine	7	With high field/high resolution and appropriate expertise, this is a good alternative to MRA.
CT arthrogram, shoulder	4	This is the procedure of choice if MR contraindicated or not available. This may change in the future with evolving CT technology.
US, shoulder	1	
Arthrogram, shoulder	1	
<p><b><i>Appropriateness Criteria Scale</i></b>  <b>1 2 3 4 5 6 7 8 9</b>  <b>1 = Least appropriate 9 = Most appropriate</b></p>		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

**Summary**

The shoulder is the joint that is the most unstable, has the most mobility, and is difficult to assess clinically.

All radiographic shoulder studies should include frontal examinations with both internal and external humeral rotation. The frontal views can be done straight AP. AP to the scapula by turning the patient into a 30 degree posterior oblique (Grashey) projection, or in both projections, but the committee recommends obtaining at least one of the frontal projections in the Grashey position to profile the glenohumeral joint. Some patients should have an axillary lateral view, a scapular Y view, or both; one or the other is advisable if there is a question of instability or dislocation. The transthoracic view has little to offer but still seems to turn up when outside films become available for review. There have been several reports assessing special views for the evaluation of shoulder impingement and the anterior acromion. An upright 30-degree caudad-angled radiograph or a suprascapular outlet view will suffice in most cases.

Arthrography was the mainstay of evaluation for rotator cuff tear until the advent of shoulder MRI. Arthrography is currently used only as a potential study in patients with suspected rotator cuff disease who have a contraindication to MRI,

in regions where shoulder US expertise is not available. CT is useful for characterizing fractures if more information is needed pre-operatively. It can demonstrate fracture complexity, displacement and angulation, especially with the use of reformations. CT arthrography is a second-line procedure for shoulders with suspected instability or labral disorders, when magnetic resonance (MR) arthrography and MRI are unavailable or contraindicated. US can be used to evaluate the tendons of the rotator cuff and the biceps. It is operator-dependent and limited in evaluation of the other important deep shoulder structures and marrow. It can be used to determine if a partial-thickness or full-thickness rotator cuff tear is present. Shoulder MRI is currently the procedure of choice for evaluation of occult fractures and the shoulder soft tissues, including the tendons, ligaments, muscles, and labrocapsular structures.

MRI can aid in detecting osseous and soft tissue abnormalities that may predispose to or be the result of shoulder impingement. The soft tissue abnormalities in the supraspinatus tendon, subacromial bursa, and biceps tendon are well seen. The osseous lesions include morphologic abnormalities of the acromion, acromioclavicular joint, and coracoacromial ligament. When a tendon has a signal intensity abnormality without focal disruption or associated findings to suggest a partial-thickness tear, the terms "tendinosis" or "tendinopathy" have been used to signify an underlying tendon degeneration or inflammation. These terms suggest that there is a chronic, often pre-existing degenerative process. The presence of tendinous enlargement and a heterogeneous signal pattern that demonstrates diffuse increased signal intensity on T1-weighting often with a slight increase in signal intensity on T2-weighting, is seen in patients with tendinosis. Partial-thickness tears of the rotator cuff can be seen inferiorly at the articular surface, superiorly at the bursal surface, or within the tendon substance. Tears at the articular surface are the most common type of partial-thickness tears. These are the only types of partial-thickness tears demonstrated by conventional shoulder arthrography. Full-thickness tears of the rotator cuff tendons can be accurately identified using conventional non-arthrographic MRI with high sensitivity and specificity. Increased signal intensity extending from the inferior to the superior surface of the tendon on all imaging sequences is an accurate sign of a full-thickness rotator cuff tear. Ten percent of rotator cuff tears will only present with morphologic changes. Tendon retraction, muscle atrophy, and fatty infiltration are important prognosticators. This type of information can be useful for decisions regarding conservative versus operative repair, type of operative repair (open, mini open, or arthroscopic cuff repair; substitute or muscle transfer) and to provide a postoperative prognosis. If there is any question concerning the distinction between a full-thickness and partial-thickness tear, MR arthrography is recommended. It is particularly helpful if the abnormal signal intensity extends from the undersurface of the tendon.

The shoulder joint is the most unstable joint in the body. Instability can be difficult to diagnose, and the pain produced by the unstable shoulder could be mistaken for that of shoulder impingement, cervical disc disease, acromioclavicular joint disease, and other processes. During the last decade, MRI has allowed for direct visualization of many of the lesions related to instability, aiding in diagnosis as well as therapeutic planning and follow-up. Although high resolution non-enhanced MRI has been shown to have high accuracy rates for demonstrating labral tears, direct MR arthrography with intra-articular injection of a dilute gadolinium solution has gained popularity during the last decade because

of its ability to distend the joint and outline labral and capsular structures as well as the undersurface of the rotator cuff.

### **Abbreviations**

- AP, anteroposterior
- CT, computed tomography
- MRI, magnetic resonance imaging
- MVA, motor vehicle accident
- NUC, nuclear medicine
- US, ultrasound

### **CLINICAL ALGORITHM(S)**

Algorithms were not developed from criteria guidelines.

## **EVIDENCE SUPPORTING THE RECOMMENDATIONS**

### **TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS**

The recommendations are based on analysis of the current literature and expert panel consensus.

## **BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS**

### **POTENTIAL BENEFITS**

Selection of appropriate radiologic imaging procedures for evaluation of patients with shoulder trauma

### **POTENTIAL HARMS**

Not stated

## **QUALIFYING STATEMENTS**

### **QUALIFYING STATEMENTS**

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate

imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

### IMPLEMENTATION TOOLS

Personal Digital Assistant (PDA) Downloads

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better

### IOM DOMAIN

Effectiveness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Steinbach LS, Daffner RH, Dalinka MK, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Morrison WB, Pavlov H, Rubin DA, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Shoulder trauma. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [37 references]

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

1995 (revised 2005)

## **GUIDELINE DEVELOPER(S)**

American College of Radiology - Medical Specialty Society

## **SOURCE(S) OF FUNDING**

American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

## **GUIDELINE COMMITTEE**

Committee on Appropriateness Criteria, Expert Panel on Musculoskeletal Imaging

## **COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE**

*Panel Members:* Lynne S. Steinbach, MD; Murray K. Dalinka, MD; Richard H. Daffner, MD; Arthur A. DeSmet, MD; George Y. El-Khoury, MD; John B. Kneeland, MD; B.J. Manaster, MD, PhD; William B. Morrison, MD; Helene Pavlov, MD; David A. Rubin, MD; Barbara N. Weissman, MD; Robert H. Haralson III, MD

## **FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST**

Not stated

## **GUIDELINE STATUS**

This is the current release of the guideline.

This guideline updates a previous version: Newberg A, Dalinka MK, Alazraki N, Berquist TH, Daffner RH, DeSmet AA, el-Khoury GY, Goergen TG, Keats TE, Manaster BJ, Pavlov H, Haralson RH, McCabe JB, Sartoris D. Shoulder trauma. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):299-302.

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

## **GUIDELINE AVAILABILITY**

Electronic copies: Available in Portable Document Format (PDF) from the [American College of Radiology \(ACR\) Web site](#).

ACR Appropriateness Criteria® *Anytime, Anywhere*™ (PDA application). Available from the [ACR Web site](#).

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

## **AVAILABILITY OF COMPANION DOCUMENTS**

The following is available:

- ACR Appropriateness Criteria®. Background and development. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the [American College of Radiology \(ACR\) Web site](#).

## **PATIENT RESOURCES**

None available

## **NGC STATUS**

This summary was completed by ECRI on May 6, 2001. The information was verified by the guideline developer as of June 29, 2001. This NGC summary was updated by ECRI on January 31, 2006. This summary was updated by ECRI Institute on May 17, 2007 following the U.S. Food and Drug Administration (FDA) advisory on Gadolinium-based contrast agents. This summary was updated by ECRI Institute on June 20, 2007 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents.

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