Complete Summary

GUIDELINE TITLE

Acute trauma to the knee.

BIBLIOGRAPHIC SOURCE(S)

Pavlov H, Saboeiro GR, Campbell SE, Dalinka MK, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Morrison WB, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Acute trauma to the knee. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 9 p. [97 references]

GUIDELINE STATUS

This is the current release of the guideline.

It updates a previous published version: ACR Appropriateness Criteria™ for acute trauma to the knee. Reston (VA): American College of Radiology (ACR); 2001. 8 p. (ACR appropriateness criteria). [92 references]

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

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
EVIDENCE SUPPORTING THE RECOMMENDATIONS
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
QUALIFYING STATEMENTS
IMPLEMENTATION OF THE GUIDELINE
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES
IDENTIFYING INFORMATION AND AVAILABILITY
DISCLAIMER

SCOPE

DISEASE/CONDITION(S)

Acute trauma to the knee

GUIDELINE CATEGORY

Diagnosis

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 acute trauma to the knee

TARGET POPULATION

Patients with acute trauma to the knee

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray
2. Nuclear medicine (NUC), bone scan (single photon emission computed tomography [SPECT]/triple-phase bone imaging [TPBI])
3. Computed tomography (CT)
4. Magnetic resonance imaging (MRI)
5. Ultrasound (US)(doppler sonography)
6. Arthrogram
7. Magnetic resonance angiography (MRA)
8. Angiogram

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 participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, 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 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 the 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 Trauma to the Knee

Variant 1: Patient any age (excluding infants)-–fall or twisted injury, no focal tenderness, no effusion; able to walk.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, knee	2	
NUC, bone scan (SPECT/TPBI)	2	
CT, knee	2	
MRI, knee	2	

Radiologic Exam Procedure	Appropriateness Rating	Comments
US, knee	2	
Arthrogram, knee	2	
MRA, knee	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

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

Variant 2: Patient, any age (excluding infants)-–fall or twisting injury, with one or more of following: focal tenderness, effusion, inability to bear weight. First study.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, knee	9	
MRI, knee	5	
NUC, bone scan (SPECT/TPBI)	2	
CT, knee	2	
US, knee	2	
Arthrogram, knee	2	
MRA, knee	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

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

Variant 3: Injury to knee 2 days ago, mechanism unknown. Focal patellar tenderness, effusion, able to walk.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, knee	9	

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI, knee	5	
NUC bone scan (SPECT/TPBI)	2	
CT, knee	2	
US, knee	2	
Arthrogram, knee	2	
MRA, knee	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

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

Variant 4: Significant trauma to knee from motor vehicle accident, suspect posterior knee dislocation.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, knee	9	
MRI, knee	9	
Angiogram/MRA/Doppler, knee	7	If MRA chosen, MRI will be done at same time.
NUC, bone scan (SPECT/TPBI)	2	
CT, knee	2	
US, knee	2	
Arthrogram, knee	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

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

Clinical decision rules for evaluating the acutely injured knee have been studied by various investigators, who determined that their application can considerably reduce the number of radiographs ordered without missing a clinically significant fracture. Although different parameters and definitions were used for the various decision rules, there were sufficient similarities between the investigations to allow usable conclusions to be drawn.

In patients of any age except for infants, the clinical parameters used for not requiring a radiograph following knee trauma are as follows:

- Patient is able to walk without a limp
- Patient had a twisting injury and there is no effusion

The clinical parameters for *ordering* knee radiographs in this population following trauma are as follows:

- Joint effusion within 24 hours of direct blow or fall
- Palpable tenderness over fibular head or patella
- Inability to walk (four steps) or bear weight immediately or in the emergency room or within a week of the trauma
- Inability to flex knee to 90 degrees

It was determined that normal radiographs could be expected in the *absence* of immediate swelling, ecchymosis, deformity, increased warmth, or abrasion/laceration. It was further stated that a fracture could be excluded if the single lateral view of the knee was normal, eliminating the need for additional radiographic views. In general, these studies excluded patients with superficial skin injuries, gross deformity, a palpable mass, a penetrating injury, prosthetic hardware, altered consciousness (from alcohol and drug use), multiple injuries, decreased limp sensation, or a history indicating an elevated risk of fracture. They also excluded pregnant patients, those who were returning for reassessment, and patients with injury for more than seven days.

In addition to the clinically significant fractures, occult bony injuries may occur that are not evident on radiograph and are best diagnosed on MRI or triple-phase bone scan (TPBS). Newer MRI techniques are very sensitive and specific to these lesions. The TPBS is sensitive but cannot determine the exact anatomical injury.

Although lateral patellar dislocation may be reduced at the time of presentation in the emergency room, there is usually focal patellar tenderness on clinical exam. The injury is associated with a definite pattern of bony injuries on radiographs and on the MRI examination; a medial reticulum injury may also be evident. These patients typically do not require surgery. A complete knee dislocation, even if spontaneously reduced, constitutes a potential threat to the popliteal nerve or artery. MRA or Doppler should be performed to evaluate the artery. If MRA is performed, an MRI should also be performed to identify ligamentous injuries and associated pathology. Additionally, it has been reported that a bifurcate ligament injury equates to a knee dislocation in terms of severity of ligamentous injury and frequency of major arterial injuries.

Decision rules for the evaluation of soft-tissue injuries are being investigated and have not yet been published. Soft tissue injuries (meniscal injuries, chondral

surface injuries, and ligamentous disruption) are best evaluated by MRI. In addition to MRI, SPECT has also been reported to be accurate for diagnosing meniscal injuries, while sonography has been shown to be diagnostic for acute anterior cruciate ligament (ACL) injuries in the presence of a hemarthrosis or for follow-up of ACL injuries.

As with ankle injuries, decision rules are applicable to patients with an acutely injured knee and can significantly decrease the use of radiographs without the likelihood of missing a clinically important fracture. More than 92% of radiographs for acute knee pain in the emergency rooms across the United States are negative for fractures. The knee exam in the emergency room exemplifies how many low-cost but high-volume tests contribute as much to the escalating health care costs as high-cost but low-volume procedures. A decrease in the inappropriate usage of radiographs could in theory result in a shorter waiting time in emergency rooms and radiograph departments, and also decrease costs for the health care system without loss of quality.

Abbreviations

- CT, computed tomography
- MRA, magnetic resonance angiography
- MRI, magnetic resonance imaging
- NUC, nuclear medicine
- SPECT, single photon emission computed tomography
- TPBI, triple-phase bone imaging
- 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 acute trauma to the knee

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)

Pavlov H, Saboeiro GR, Campbell SE, Dalinka MK, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Morrison WB, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Acute trauma to the knee. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 9 p. [97 references]

ADAPTATION

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

DATE RELEASED

1998 (revised 2005)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The 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: Helene Pavlov, MD (*Principal Author*); Gregory R. Saboeiro, MD; Scot E. Campbell, MD; Murray K. Dalinka, MD (*Panel Chair*); Richard H. Daffner, MD; Arthur A. De Smet, MD; George Y. El-Khoury, MD; John B. Kneeland, MD; B.J. Manaster, MD, PhD; William B. Morrison, MD; David A. Rubin, MD; Robert Schneider, MD; Lynne S. Steinbach, MD; Barbara N. Weissman, MD; Robert H. Haralson III, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

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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 summary was updated by ECRI on July 31, 2002. The updated information was verified by the guideline developer on October 1, 2002. This summary was updated by ECRI on February 6, 2006.

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