Complete Summary

GUIDELINE TITLE

Imaging evaluation of suspected ankle fractures.

BIBLIOGRAPHIC SOURCE(S)

Dalinka MK, Alazraki NP, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Morrison WB, Pavlov H, Rubin DA, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Imaging evaluation of suspected ankle fractures. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 4 p. [29 references]

GUIDELINE STATUS

This is the current release of the guideline.

It updates a previously published version: Dalinka MK, Alazraki N, Berquist TH, Daffner RH, DeSmet AA, El-Khoury GY, Goergen TG, Keats TE, Manaster BJ, Newberg A, Pavlov H, Haralson RH, McCabe JB, Sartoris D. Imaging evaluation of suspected ankle fractures. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):239-41. [20 references]

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

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SCOPE

DISEASE/CONDITION(S)

Ankle fractures

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Emergency Medicine
Family Practice
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 suspected of ankle fractures

TARGET POPULATION

Patients suspected of ankle fractures

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray
    - Anterposterior (AP) view
    - Lateral view
    - Mortise view

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

Published cost analyses were 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: Suspected Ankle Fracture.

Variant 1: Patient Meeting Ottawa Rules.

1. Inability to bear weight immediately after the injury OR
2. Point tenderness over the medial malleolus, or the posterior edge or inferior tip of the lateral malleolus or talus or calcaneus OR
3. Inability to ambulate for four steps in the emergency room

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, ankle, AP view	9	
X-ray, ankle, Lateral view	9	
X-ray, ankle, Mortise view	9	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

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

The musculoskeletal expert panel has reviewed pertinent articles dealing with more than 21,000 adult patients with ankle injuries. Some of the reviewed papers were written by authors from the United States and deal with various issues, including the impact of the clinical history on performance, missed fractures, the role of the physical examination, and overutilization and cost containment. The driving force behind most of the studies from Great Britain and Canada relate to the establishment of clinical criteria that would decrease the number of ankle radiographs without missing significant injuries.

In one large series, radiographs were obtained in 89% of all patients who presented to the emergency room with a history of extremity trauma; only 17% of these cases had abnormalities that altered treatment. Ankle radiographs account for approximately 10% of all radiographs ordered in the emergency room; they are the third most common study ordered and are exceeded in frequency only by chest and cervical spine films. One study reported that more than 92% of patients with ankle trauma in the ER setting had radiographs ordered. One retrospective review of more than 600 patients, found that less than 25% had adequate physical examinations, and more than 99% had radiographs. In another study, all patients for whom radiographs were ordered were subjected to a physical examination by the radiology resident; there were no significant differences in the percentages of indicated studies ordered by triage personnel and residents in the emergency room. The percentage of significant injuries detected on the radiographs was equivalent for the two groups. It is, therefore, not surprising that nurse practitioners, nurses, and medical students had similar percentages of abnormal x-rays because radiographs were ordered by almost everyone seen with ankle trauma.

One study concluded that it is possible to establish guidelines that would increase the quality and efficiency of service and influence the diagnostic skills and referral habits of physicians ordering ankle radiographs in the emergency room. One author utilized a simple guideline "no swelling adjacent to a malleolus, no radiographs." A prospective study of 500 patients with inversion injuries of the ankle concluded that radiographs should be performed only for patients with distal fibula tenderness or inability to bear weight, or who are older than age 60. In their case, material swelling was absent in 11% of malleolar fractures and in two of four calcaneal fractures. Another study analyzed 2,000 ankle injuries and concluded that swelling alone is an unreliable indicator of injury and that patients with minimal pain and swelling who are able to bear weight do not require radiographs. Other authors in a number of well designed, elaborate papers, have concluded that focal tenderness over the malleolus and the inability to bear weight will detect virtually 100% of patients with significant ankle fractures. They evaluated 1,032 patients prospectively and validated their criteria on 453 new patients. They believed that if this rule were used, significant fractures could be detected with a sensitivity of 1 (100%) and a confidence level of 95%. Foot and ankle radiographs could be reduced 30% without missing any significant injuries. When these rules were implemented there was a decrease in the number of ankle films ordered, which decreased patient waiting times and costs without patient dissatisfaction or missed fractures. This study was confirmed at an independent site, who reported a 19% reduction in ankle and midfoot radiographs.

In the clinical setting, radiographs of the foot and ankle are often obtained together even though the pain can almost always be localized to one area or another. One study stated that ordering both reflects an inadequate clinical examination; on the rare occasions when fifth-metatarsal fractures occur in association with inversion injuries of the ankle, they can be detected clinically. In the presence of an inversion injury of the ankle, foot radiographs have no role in management. It is widely accepted that an adequate radiograph of the ankle should include the base of the fifth metatarsal bone distal to the tuberosity.

The committee believed that the guidelines established and confirmed by these authors should be adopted in the evaluation of patients with ankle trauma. These guidelines for obtaining ankle radiographs in patients with the following clinical findings: 1) inability to bear weight immediately after the injury, or 2) point tenderness over the medial malleolus, or the posterior edge or inferior tip of the lateral malleolus or talus or calcaneus, or 3) inability to ambulate for four steps in the emergency room. It has been convincingly demonstrated that one can approach a sensitivity of 100% in excluding significant ankle fractures using these simple criteria. Limiting ankle radiographs to patients who meet these criteria can eliminate a considerable number of ankle and midfoot radiographs (estimated range 19-36%) without missing significant injuries. This would result in a considerable savings in patient cost and waiting time.

The validation and cost effectiveness of these rules has since been confirmed in multiple subsequent series.

An evaluation of the traumatized ankle should consist of AP, lateral, and mortise views of the ankle. Additional views can be added to the minimal series in questionable cases. The fifth metatarsal base distal to the tuberosity should be seen on at least one projection. The use of a pertinent clinical history for the site of point tenderness will decrease the miss rate for subtle fractures by approximately 50%.

One study utilized a reverse oblique view of the ankle in addition to the three standard views and found that 10 of 29 fractures were seen only on the reverse oblique view; seven of the ten were avulsion fractures of the anterolateral aspect of the calcaneus. These figures should be confirmed by others, as this is a high percentage of missed fractures and a very high percentage of avulsion fractures of the calcaneus.

Other authors have shown that occult fractures of the ankle may present with an ankle effusion in the absence of a visible fracture. They found that approximately one third of patients with effusions in the absence of a visible fracture will have a fracture on CT of the ankle. Another study used multidetector CT (MDCT) of the ankle in multitrauma patients and compared the MDCT findings with the radiographs. When compared to MDCT, radiographs were 87% sensitive in the detection of calcaneal fractures, 78% sensitive in talar fractures and 25-33% sensitive in midfoot fractures. Only 5 of 21 Lisfranc fracture dislocations were detected on radiographs. They recommended MDCT for patients with high energy polytrauma and in those with complex foot and ankle fractures.

Another study compared low field (0.2 Tesla) magnetic resonance imaging and conventional radiography and found no statistical difference in the detection of acute fractures of the distal extremities.

Abbreviation

AP, anteroposterior

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

- Appropriate selection of radiologic exam procedures to evaluate patients suspected of ankle fractures
- Limiting ankle radiographs to patients who meet specific criteria can eliminate a considerable number of ankle and mid-foot radiographs (estimated range 19-36%) without missing significant injuries. This would result in a considerable savings in patient cost and waiting time.

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)

Dalinka MK, Alazraki NP, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Morrison WB, Pavlov H, Rubin DA, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Imaging evaluation of suspected ankle fractures. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 4 p. [29 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

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: Murray K. Dalinka, MD; Naomi P. Alazraki, MD; 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; Helene Pavlov, MD; David A. Rubin, 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 March 6, 2006.

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