Complete Summary

GUIDELINE TITLE

ACR Appropriateness Criteria® stress/insufficiency fracture, including sacrum, excluding other vertebrae.

BIBLIOGRAPHIC SOURCE(S)

Daffner RH, Weissman BN, Bennett DL, Blebea JS, Jacobson JA, Morrison WB, Resnik CS, Roberts CC, Rubin DA, Schweitzer ME, Seeger LL, Taljanovic M, Wise JN, Payne WK, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness Criteria® stress/insufficiency fracture, including sacrum, excluding other vertebrae. [online publication]. Reston (VA): American College of Radiology (ACR); 2008. 8 p. [48 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Manaster BJ, Grossman JW, Dalinka MK, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Morrison WB, Pavlov H, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Stress/insufficiency fracture, including sacrum, excluding other vertebrae. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 7 p. [38 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

DISEASE/CONDITION(S)

Stress/insufficiency fractures including sacrum, excluding other vertebrae

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Emergency Medicine
Family Practice
Geriatrics
Nuclear Medicine
Orthopedic Surgery
Radiology
Sports Medicine

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for stress/insufficiency fractures including sacrum, excluding other vertebrae

TARGET POPULATION

Patients with stress/insufficiency fractures including sacrum, excluding other vertebrae

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray, hip, sacrum and other areas of interest
2. Magnetic resonance imaging (MRI), hip, sacrum and other areas of interest, without contrast
3. Computed tomography (CT), hip, sacrum and other areas of interest, without contrast
4. Nuclear medicine (NUC), technetium (Tc)-99m bone scan with single photon emission computed tomography (SPECT), hip and other areas of interest

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

Not stated

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 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: Stress/Insufficiency Fracture, Including Sacrum, Excluding Other Vertebrae

Variant 1: Suspect stress/insufficiency fracture. First imaging modality.

Radiologic Procedure	Rating	Comments	RRL*

Radiologic Procedure	Rating	Comments	RRL*
X-ray area of interest	9	Radiograph is a required first step before consideration of other imaging.	NS
MRI area of interest without contrast	1		None
NUC Tc-99m bone scan with SPECT area of interest	1		Med
CT area of interest without contrast	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Variant 2: Suspect stress fracture in patient with need to know diagnosis, not hip or sacrum. Radiographs normal.

Radiologic Procedure	Rating	Comments	RRL*
X-ray area of interest repeat in 10 to 14 days	9	Many patients will recover in the interim and not return.	NS
MRI area of interest without contrast	9	In this clinical situation, many clinicians would wait until repeat radiograph is negative before going to MR; with an anxious patient or clinician, or repeated negative radiograph, MR is the favored next imaging modality.	None
NUC Tc-99m bone scan with SPECT area of interest	1	If the patient or clinician is too anxious to wait for repeat radiographs, could do MR or bone scan (but not both); panel prefers MR since it is usually more specific than bone scan.	Med
CT area of interest without contrast	1	Not indicated.	NS

Radiologic Procedure	Rating	Comments	RRL*
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Variant 3: Suspect stress fracture, not hip or sacrum. Radiographs normal. Bone scan positive and nonspecific.

Radiologic Procedure	Rating	Comments	RRL*
MRI area of interest without contrast	9		None
X-ray area of interest repeat in 10 to 14 days	7	For confirmation or question of complication.	NS
CT area of interest without contrast	5	If MRI contraindicated	NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Variant 4: Suspect stress fracture in otherwise normal patient. Radiographs and bone scan or MRI normal.

Radiologic Procedure	Rating	Comments	RRL*
MRI area of interest without contrast	2	Not indicated if radiographs and MRI were normal; but if the studies were radiographs and bone scan that were normal and there is persistent pain, the clinician might re-examine the diagnosis and consider MRI, looking for soft-tissue injury.	None
X-ray area of interest repeat in 10 to 14 days	1	Not necessary. No further imaging is warranted.	NS

Radiologic Procedure	Rating	Comments	RRL*
NUC Tc-99m bone scan with SPECT area of interest	1		Med
CT area of interest without contrast	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Variant 5: Clinical differential fracture versus metastasis in long bone. Radiographs normal, bone scan hot but nonspecific.

Radiologic Procedure	Rating	Comments	RRL*
MRI area of interest without contrast	9		None
X-ray area of interest repeat in 10 to 14 days.	1	Too anxiety producing. An occult metastasis is unlikely to appear on radiographs in this period.	NS
CT area of interest without contrast	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Variant 6: Clinical differential insufficiency fracture versus metastasis in sacrum. Radiographs normal, bone scan hot but nonspecific.

Radiologic Procedure	Rating	Comments	RRL*
CT sacrum without contrast	8	First choice. Definitive for diagnosis of fracture.	Med
MRI sacrum without contrast	6	Alternative choice may show other cause for pain or the fracture.	None

Radiologic Procedure	Rating	Comments	RRL*
X-ray sacrum repeat in 10 to 14 days	1		Low
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Variant 7: Suspect insufficiency fracture in sacrum/pelvis; elderly patient. Radiographs normal. Bone scan hot in linear pattern typical for fracture.

Radiologic Procedure	Rating	Comments	RRL*
MRI area of interest without contrast	6	For confirmation.	None
CT area of interest without contrast	4	For confirmation.	NS
X-ray area of interest repeat in 10 to 14 days	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Variant 8: Suspect insufficiency fracture in osteoporotic patient or patient on long-term corticosteroid therapy, not hip. Radiographs normal.

Radiologic Procedure	Rating	Comments	RRL*
X-ray area of interest repeat in 10 to 14 days	9	Panel agrees one of these three exams should be done. The clinical condition and location will dictate which. If the diagnosis is not urgent, repeat radiographs may be all that is necessary. If there is greater urgency, the panel favors MRI over	NS

Radiologic Procedure	Rating	Comments	RRL*
		bone scan because bone scans can be falsely negative in this patient population.	
MRI area of interest without contrast	9	Panel agrees one of these three exams should be done. The clinical condition and location will dictate which. If the diagnosis is not urgent, repeat radiographs may be all that is necessary. If there is greater urgency, the panel favors MRI over bone scan because bone scans can be falsely negative in this patient population.	None
NUC Tc-99m bone scan with SPECT area of interest	9	Panel agrees one of these three exams should be done. The clinical condition and location will dictate which. If the diagnosis is not urgent, repeat radiographs may be all that is necessary. If there is greater urgency, the panel favors MRI over bone scan because bone scans can be falsely negative in this patient population.	Med
CT area of interest without contrast	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Variant 9: Suspect insufficiency fracture in osteoporotic patient or patient on long-term corticosteroid therapy; not hip. Radiographs and bone scan or MRI normal at 48 hours.

Radiologic Procedure	Rating	Comments	RRL*
X-ray area of interest repeat in 10 to 14 days	9	If diagnosis is nonurgent, repeat radiographs; otherwise go to MRI. Bone scan may be falsely negative in this patient population.	NS
MRI area of interest	9	If diagnosis is nonurgent, repeat	None

Radiologic Procedure	Rating	Comments	RRL*
without contrast repeat in 10 to 14 days		radiographs; otherwise go to MRI. Bone scan may be falsely negative in this patient population.	
CT area of interest without contrast	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Variant 10: Suspect subacute insufficiency fracture of hip in osteoporotic patient or patient on corticosteroid therapy. Radiographs normal.

Radiologic Procedure	Rating	Comments	RRL*
MRI hip without contrast	9	A limited MRI exam may yield the diagnosis. May need to proceed to full MRI.	None
NUC Tc-99m bone scan with SPECT hip	5	If MRI contraindicated	Med
CT hip without contrast	1		Med
X-ray hip repeat in 10 to 14 days	1		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			***Relative Radiation Level**

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

Summary of Literature Review

Stress fractures are osseous injuries that result from muscle action on bones. They occur in two varieties: fatigue fractures that are due to abnormal activity on bone of normal mineralization, and insufficiency fractures that are due to normal activity on bones that are deficient in mineral. Both varieties are now being more frequently recognized as the cause of pain in patients. Although many fatigue/insufficiency fractures are self-limited because they heal with or without

diagnosis, there is usually value to making the diagnosis. With continued activity, some stress fractures will progress to completion and require more invasive treatment or delay in return to activity. Also the differential diagnosis of stress/insufficiency fractures includes entities that would be treated significantly differently than stress fractures (osteoid osteoma or osteomyelitis in the younger patient, metastases in the older patient).

Radiographs

The clinical setting is often highly suggestive of the diagnosis of fatigue or insufficiency fractures. Such clinical settings include repetitive or new athletic activity for fatigue fractures, osteoporosis, irradiated bone, or resumption of activity post-arthroplasty for insufficiency fractures. Specific athletic activities often result in specific sites of fatigue fracture. Insufficiency fractures also occur at fairly predictable sites. Thus, radiographic diagnosis using such pattern and site recognition is usually quite specific. Late radiographic findings may be quite typical in appearance as well: linear sclerosis, often perpendicular to the major trabecular lines. However, early radiographic findings are less specific (subtle periosteal reaction; "gray cortex sign") or even nonexistent. Radiographs in stress fractures may be negative initially in 60% to 82% and remain negative in 46% to 60%, depending on different specifications of bone scan "gold standards". Radiographs are more likely to be negative initially in older or osteoporotic patients with insufficiency fractures. Additionally, radiographs may remain negative depending on the timing of re-imaging, the patient's metabolic bone status, and the type and location of the fracture. Thus, radiographs are specific but significantly insensitive. All references agree that radiographs should be the initial imaging modality; if the findings are conclusive, no further imaging need be performed.

Bone Scan

Radionuclide bone scans have long been accepted as extremely sensitive for detecting stress/insufficiency fractures, especially if single photon emission computed tomography (SPECT) is used. The objection to the studies quoting high accuracy for bone scan is that, in each, a positive bone scan is taken as the "gold standard" for detecting stress fractures and therefore sensitivity is 100%. However, depending on the staging criteria for bone scan pattern, the abnormalities may in fact be stress reactions rather than actual stress fractures. Nonetheless, it is clear that bone scans show stress fractures days to weeks earlier than radiographs in many instances, and differentiate between osseous and soft-tissue injury as well. In some cases, the pattern of fracture is such that the diagnosis is secure, and no further imaging is required (for example, the "H sign" or linear and vertical distribution of sacral insufficiency fractures). However, in most cases bone scans lack specificity (with synovitis, arthritis, degenerative joint disease, stress reactions, and tumor appearing similar), and supplemental imaging may be necessary for conclusive diagnosis or to avoid false positives.

Because of the sensitivity of bone scan, 80% of all fractures show some scan abnormality 24 hours post injury and 95% at 72 hours. A normal bone scan generally excludes a diagnosis of stress/insufficiency fracture, and the patient may return to normal activity. However, there are exceptions. Elderly or osteoporotic patients may have a delay in bone scan activity that may last several

days. Patients using corticosteroids may also have less sensitive bone scan results.

Computed Tomography (CT)

Because bone scan is often nonspecific, the length of time necessary for the examination, and the frequency with which supplemental imaging is required, there is a growing body of literature suggesting that cross sectional imaging should supersede bone scan as the imaging of choice for stress fracture when the radiograph is negative. There are specific sites for which CT is particularly well-suited, such as sacrum and tarsal navicular.

However, axial CT alone may have false negatives due to the constraint of the axial plane (in one study, half of stress fractures were inadequately demonstrated on CT). Therefore, if CT is used to confirm stress fracture in a long bone, reformatting is necessary. Fine detail may be achieved using thinner sections and high detector (16-64 slices) scanners.

Magnetic Resonance Imaging (MRI)

MRI is extremely sensitive and appears to demonstrate stress abnormalities as early as bone scan does and with as much sensitivity. Indeed, the recent literature favors MRI as the procedure of choice for making an early diagnosis of either variety of stress fracture. In this regard, it outperforms radiography, radionuclide scanning, and CT. Short tau inversion recovery (STIR) sequences are emerging as the favored initial sequence for MRI screening. With a small field of view (FOV), STIR and/or T1 imaging will usually demonstrate a fracture line, surrounded by edema. In the absence of an actual stress fracture, stress reaction or muscle/tendon injuries are identified in the STIR sequence. Thus, a careful MRI may be as sensitive as a bone scan, but also considerably more specific. One study suggests that MRI exam of an osseous stress injury may contain prognostic as well as diagnostic information, with demonstration of an actual fracture line or cortical signal portending that a longer healing time will be required.

The critical time for MRI becoming positive has not yet been established, although it seems that the edema pattern would be present within hours of the injury. Furthermore, the linearity in the distribution of abnormal signal is highly suggestive of stress fracture and serves to differentiate these injuries from bone tumors, which tend to have a globular pattern.

The choice of cross sectional imaging modality has not always been clear cut. Earlier studies demonstrated that the MRI pattern was nonspecific and even confusing when only edema and not the fracture line is shown. This problem seems particularly severe in differentiating sacral or pelvic insufficiency fractures from metastases. These fractures are being recognized with greater frequency as knowledge of their occurrence has become more widely known. Compounding the problem is the fact that many patients suffering from these insufficiency fractures have a history of previous malignancy, including treatment with radiation (which increases the risk of insufficiency fracture). Overreliance on nonspecific low-signal T1 and high-signal T2 MRI patterns can lead to misdiagnosis of stress fractures as more aggressive lesions. The use of in-phase and out-of-phase MR sequences is most reliable in differentiating benign stress fractures from pathologic fractures.

STIR sequences can be helpful in that they are more likely to demonstrate not only the edema pattern but also the fracture lines themselves. In some of these cases, CT may be necessary to add specificity to the diagnosis.

MRI may, however, also demonstrate other reasons for occult pelvic pain, such as soft-tissue abnormality or the supra-acetabular stress fractures recently described in some osteoporotic patients. Conversely, it is recommended that MRI for hip fractures also include the sacrum since stress fractures of the sacrum appear to be associated with stress-related hip pain in young adult patients.

MRI of long bones often shows the fracture line itself. In this case, MRI is not only sensitive but also specific (fracture line seen in 11 of 14 stress fractures, 7 of 9 hip fractures, and 13 of 13 true positive hip fractures. The sites where this phenomenon has been evaluated most completely are the hip and acetabulum, which may yield false negatives early on both radiographs and bone scan of the osteoporotic patient. Some experts recommend that a single T1 MRI sequence in the plane of interest be performed and initially evaluated when stress fracture is suspected. If a fracture line is clearly seen, the examination may be terminated. If the question persists after the single sequence, other MRI sequences may be used for more complete examination (e.g., STIR or FSE T2 sequences for even more sensitive evaluation of marrow edema, or nearby soft-tissue injury). Intravenous contrast should not be required. In a younger patient population (e.g., military recruits), STIR imaging was found to have a higher accuracy than T1 imaging and may be chosen as the initial MRI sequence.

Another circumstance that deserves specific attention is the longitudinal stress fracture, particularly in the tibia. Up to 25% may appear normal on radiographs, but CT or MRI findings are characteristic. MRI is very sensitive to the bone marrow edema accompanying these longitudinal fractures, and may give a misleadingly aggressive appearance.

Ultrasound has not been shown to be useful in diagnosing longitudinal stress fractures.

Summary

In summary, patients with suspected fatigue or insufficiency fractures should be imaged initially with radiographs. In many instances the abnormality will be apparent. If radiographs are not adequate to solve the clinical problem, MRI is the clear-cut choice for imaging, particularly in the elite athlete, in the elderly, and in those patients who are dependent on using the injured limb in their work. CT, particularly in cases of insufficiency fractures of the sacrum and pelvis, may be needed to confirm the diagnosis.

Abbreviations

- CT, computed tomography
- Med, medium
- MRI, magnetic resonance imaging
- NS, not specified
- NUC, nuclear medicine
- SPECT, single photon emission computed tomography

- Tc, technetium

Relative Radiation Level	Effective Dose Estimated Range
None	0
Minimal	<0.1 mSv
Low	0.1-1 mSv
Medium	1-10 mSv
High	10-100 mSv
*RRL assignments are not included for some examinations. The RRL assignments for the IP (in progress) exams will be available in future releases.	

CLINICAL ALGORITHM(S)

None provided

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 to evaluate possible stress/insufficiency fractures

POTENTIAL HARMS

Nuclear medicine (NUC) bone scans may render false negative results in osteoporotic patients or patients on long-term corticosteroid therapy. Axial computed tomography (CT) alone may also have false negatives due to the constraint of the axial plane (in one study, half of stress fractures were inadequately demonstrated on CT).

Relative Radiation Level (RRL)

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level indication has been included for

each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Additional information regarding radiation dose assessment for imaging examinations can be found in the American College of Radiology (ACR) Appropriateness Criteria® Radiation Dose Assessment Introduction document (see "Availability of Companion Documents" field).

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)

Daffner RH, Weissman BN, Bennett DL, Blebea JS, Jacobson JA, Morrison WB, Resnik CS, Roberts CC, Rubin DA, Schweitzer ME, Seeger LL, Taljanovic M, Wise JN, Payne WK, Expert Panel on Musculoskeletal Imaging. ACR Appropriateness Criteria® stress/insufficiency fracture, including sacrum, excluding other vertebrae. [online publication]. Reston (VA): American College of Radiology (ACR); 2008. 8 p. [48 references]

ADAPTATION

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

DATE RELEASED

1995 (revised 2008)

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: Richard H. Daffner, MD; Barbara N. Weissman, MD; D. Lee Bennett, MD; Judy S. Blebea, MD; Jon A. Jacobson, MD; William B. Morrison, MD; Charles S. Resnik, MD; Catherine C. Roberts, MD; David A. Rubin, MD; Mark E. Schweitzer, MD; Leanne L. Seeger, MD; Mihra Taljanovic, MD; James N. Wise, MD; William K. Payne, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Manaster BJ, Grossman JW, Dalinka MK, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Morrison WB, Pavlov H, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Stress/insufficiency fracture, including sacrum, excluding other vertebrae. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 7 p. [38 references]

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 are 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.
- ACR Appropriateness Criteria® radiation dose assessment introduction. American College of Radiology. 2 p. Electronic copies: Available from the American College of Radiology 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 28, 2006. This summary was updated by ECRI Institute on June 29, 2009.

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