Complete Summary

GUIDELINE TITLE

Imaging after total hip arthroplasty (THA).

BIBLIOGRAPHIC SOURCE(S)

Weissman BN, Dalinka MK, Alazraki N, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Pavlov H, Rubin DA, Steinbach LS, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Imaging after total hip arthroplasty (THA). [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 8 p. [51 references]

GUIDELINE STATUS

This is the current release of the guideline.

It updates a previously published version: Keats TE, Dalinka MK, Alazraki N, Berquist TH, Daffner RH, DeSmet AA, el-Khoury GY, Goergen TG, Manaster BJ, Newberg A, Pavlov H, Schweitzer ME, Haralson RH 3rd, McCabe JB. Hip arthroplasty--radiography procedure recommendations. American College of Radiology. ACR Appropriateness Criteria. Radiology. 2000 Jun;215 Suppl:389-90.

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

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SCOPE

DISEASE/CONDITION(S)

Total hip arthroplasty (THA)

GUIDELINE CATEGORY

Evaluation

CLINICAL SPECIALTY

Orthopedic Surgery
Radiology

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of radiologic procedures for imaging after total hip arthroplasty (THA)

TARGET POPULATION

Patients who have had total hip arthroplasty (THA)

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray
2. Radiostereogrammetry
3. Nuclear medicine
    - Bone scan
    - Bone/gallium scan
    - White blood cell scan, Indium-111
4. Dual energy x-ray absorptiometry

5. Computed tomography
6. Quantitative computed tomography
7. Magnetic resonance imaging
8. Aspiration, image-guided
9. Aspiration/arthrography
10. Ciprofloxacin (infection) imaging

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in follow-up evaluation

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 recent 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.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria®

Clinical Condition: Imaging After Total Hip Arthroplasty (THA)

Variant 1: Follow-up of the asymptomatic patient with a THA.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, hip	9	
Radiostereogrammetry, hip	1	
NUC, bone scan	1	
NUC, bone/gallium scan	1	
DXA, hip	1	
CT, hip	1	
QCT, hip	1	
MRI, hip	1	
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: Evaluating patients with a painful primary THA -- suspected loosening and/or wear.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, hip	9	
CT, hip	5	For planning, if osteolysis is suspected or assessment of bone stock is needed. May be useful to see subtle wear. With multidetector, thin section CT, this study is providing more information.
Aspiration, hips, image-guided	5	Arthrography may be done to evaluate loosening. Injection of anesthetic may be helpful to localize the source of pain.

Radiologic Exam Procedure	Appropriateness Rating	Comments
NUC, bone/gallium scan	2	
DXA, hip	1	
Radiostereogrammetry, hip	1	
QCT, hip	1	
MRI, hip	1	Recent data suggests it may be helpful in certain cases.
NUC, bone scan	No consensus	May help determine if one or both components are loose or if other abnormalities are present. Varies by institution.
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: Evaluating patients with a painful primary THA -- suspected infection.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, hips	9	
Aspiration/arthrography, hips	9	Should be first exam following radiographs. Other studies may be helpful but not indicated routinely. Arthrography may document collections.
NUC, bone scan	3	Sensitive but not specific enough to be used as the sole procedure.
NUC, bone, Gallium scan	3	If bone scan is abnormal, gallium can follow to suggest infection.
NUC, WBC scan, Indium-111	3	WBC scan can be done without bone scan to diagnose infection, or can follow bone scan.
Ciprofloxacin (infection)	3	

Radiologic Exam Procedure	Appropriateness Rating	Comments
imaging		
CT, hip	1	Usually not indicated. Only if soft tissue abscesses suspected.
MRI, hip	1	Currently being investigated.
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.

Symptoms

Ninety percent of patients have good or excellent results after THA. Those with persistent postoperative pain after cemented prostheses may have had the incorrect diagnosis made originally, have infection, or, less commonly, have heterotopic bone formation. Studies of patients with uncemented prostheses indicate that pain occurring after an asymptomatic period suggests possible loosening. While patients with loosening or infection usually (but not always) have pain, those with particle disease and resulting osteolysis may be asymptomatic.

Imaging Techniques

Radiographs shortly after surgery are recommended as a baseline for future evaluation and are particularly important after revision surgery. The schedule for obtaining radiographs is uncertain and depends on the presence or absence of symptoms. The NIH consensus panel indicates that "appropriate x-ray examination" is required throughout life with periodic examination, perhaps at 5-year intervals, after the first 5 years. A review of 18,486 primary total hip arthroplasties in patients with osteoarthritis found radiological follow-up in order to monitor component loosening to be unnecessary in asymptomatic patients in the first five postoperative years. In asymptomatic patients with bone ingrowth prostheses, radiography may also be useful to gauge fixation early in the postoperative course. They are also helpful in identifying bone loss from aggressive granulomatous disease, although the sensitivity of radiographs in detecting osteolysis is limited. Since this complication occurs most often several years postoperatively, one study recommends radiographs in asymptomatic patients beginning 3 years after surgery.

All symptomatic patients should undergo radiography. Availability of old radiographs to compare to new ones facilitates the diagnosis of subtle changes such as may occur in loosening or in particle disease, or of rapid changes such as may occur with infection.

Roentgen Stereophotogrammetric Analysis

Roentgen stereophotogrammetric analysis (radiostereometry) is a technique that utilizes three components to achieve highly accurate measurements of component position. First, opaque reference markers are placed in the bone near the prosthesis (usually at the time of surgery). Second, two radiographs are obtained simultaneously using two radiographic tubes that are angled to each other. Third, a calibration cage is placed beneath the table. Sophisticated mathematical analysis is then performed. One study investigated the accuracy of this technique by performing duplicate measurements. The 99% confidence limits were 0.16 mm for proximal to distal translation, 0.3 degree for anterior posterior rotation, 0.8 degree or rotation about the longitudinal axis (anteversion-retroversion), and 0.34 degree for varus/valgus tilt. Radiostereometry has been used for the early detection of component migration and prosthetic wear. Because of its complexity, however, this test remains largely a research method.

Dynamic Computed Tomography

Dynamic computed tomography is performed by obtaining CT slices through the collar of the prosthesis and the femoral condyles with the leg in maximum internal and external rotation. Change in relative position has been shown in one series to correlate with loosening at surgery.

Bone Scintigraphy

Bone scintigraphic appearances after total hip arthroplasty are varied, reflecting the stress on the adjacent bone as well as any complications that occur. One study of asymptomatic cemented total hip prostheses indicated that persistent increased uptake could be seen at the tip of the femoral stem in about 10% of patients at 1 to 3 years after surgery; at the greater trochanter in 20%; and at the acetabulum in 12% at 2 years. The femoral shaft uptake decreased by 9 months after surgery. These authors recommend that a baseline bone scan be obtained between 9 and 12 months after surgery.

Normal bone scan appearances after uncemented total hip replacements depend on the type of prosthetic components used. One group of investigators examined 25 asymptomatic prostheses serially for two years after THA and found that bone phase images showed uptake at the tip of each prosthesis at some time during the study. Increased blood flow or focal blood pool activity should suggest a complication. Uptake at the area distal to the tip or along the lateral tip increased in some cases in the 12 to 24 month follow-up. Indium-111 WBC scanning also showed increased activity at the tip of the prosthesis in 80% of uncomplicated uncemented prostheses. These authors noted that baseline three-phase bone scans and In-111 WBC scans are of value.

Evaluation of Patient with Suspected Infection

Infection occurs in 1-2% of primary total hip arthroplasties and is even more frequent after revision procedures. Approximately one third of infections develop in the first 3 months, another one third within the first year, and another one third more than 1 year after surgery. Loosening occurring within the first 2 years after surgery suggests infection. Infection of failed hip prostheses may be underestimated since organisms may reside in a biofilm. As summarized in one report, no test is perfectly sensitive and specific for the diagnosis. This includes

radiography. One study evaluated radiographs of 20 infected THAs and found half to be normal.

Computed Tomography

Prospective evaluation of patients with painful total hip arthroplasties using helical CT has shown that periosteal new bone formation was always associated with infection (100% specificity) but had only 16% sensitivity. Soft tissue findings were more accurate. Fluid collections in muscles and perimuscular fat had a 100% positive predictive value and the absence of joint distension a 96% negative predictive value.

Ultrasonography

Ultrasonographic findings may suggest infection after THA. One study found that a thick capsule (3.2 mm bone capsule distance) was 100% sensitive for the diagnosis but not entirely specific (74%). The combination of intraarticular effusion with extraarticular extension was indicative of infection.

Joint Aspiration

Joint aspiration, although not perfect, is "perhaps the most useful investigative tool for definitive confirmation of the presence or absence of infection." The sensitivity of preoperative aspiration ranges from 50-93% and the specificity from 82-97%. Thus, both false positive and false negative studies occur. Debate remains regarding the indications for arthrography. Some investigators indicate that aspiration may be particularly useful when there is no clinical suspicion of infection, while others suggest aspiration when there is an elevated erythrocyte sedimentation rate or C-reactive protein or clinical suspicion remains.

Magnetic Resonance Imaging

Magnetic resonance imaging (MRI) has demonstrated a peripherally enhancing juxta-articular fluid collection connecting to the implant in a patient with periprosthetic infection.

Technetium-99m Bone Scan

Technetium-99m bone scans are thought to be sensitive but not specific for postoperative infection. One study noted that a positive bone scan strongly suggests loosening or infection, while a negative scan does not exclude these abnormalities. Another study found that a negative bone scan makes infection very unlikely. The pattern of bone scan uptake is probably unreliable in differentiating infection from loosening.

Gallium-67 Citrate

Gallium-67 citrate accumulates in areas of infection but also in areas of new bone formation. Mechanisms of gallium uptake include granulocyte uptake, direct bacterial uptake, and lactoferrin binding and binding to bacterial siderophores. False negative scans may occur in patients treated with antibiotics. A positive

gallium scan is very likely to indicate infection, but a normal scan does not exclude infection (sensitivity 37%, specificity 100%).

Indium-111-Labeled White Blood Cells

Indium-111-labeled WBCs may accumulate at the site of a number of inflammatory processes, including acute osteomyelitis, acute exacerbations of chronic osteomyelitis, septic arthritis, abscesses, and rheumatoid arthritis, but also in heterotopic bone, Paget disease, and other disorders. The sensitivity of the indium WBC scans for infection decreases as the chronicity of the infection increases. Sensitivities for the diagnosis of infection after total joint replacement range from 50-100% and specificities from 45-100%.

In addition to Indium-111, leukocytes may be labeled with Tc-99m stannous colloid. Tc-99m-labeled leukocyte scanning is less expensive than Indium-111-labeled leukocyte scintigraphy and has better imaging characteristics and greater availability. Tc99-m stannous colloid labels both granulocytes and monocytes, which should offer improved detection of chronic infections such as those associated with total joint replacement. The addition of marrow imaging to leukocyte scanning has improved accuracy to 90%. Delayed Tc99-m leukocyte imaging may be helpful.

One study noted that until additional studies are done, the routine use of Indium-111-labeled immunoglobulin-G cannot be recommended.

Tc 99-m-labeled antibiotic (ciprofloxacin) has been used to evaluate orthopedic infections. This agent should be specific for infection as opposed to other inflammatory processes, although mild uptake in noninfective inflammation and foreign body reaction does occur. Antibiotic treatment may interfere with uptake of this agent. One study found a sensitivity of 85%, specificity of 92%, and accuracy of 88% in orthopedic infections (including 18 total hip replacements). This was compared to 78%, 100%, and 90%, respectively, for the bone gallium combination. The ciprofloxacin scanning procedure enables studies to be performed at 1 and 4 hours and with improved resolution in contrast to the delay for gallium and Indium-111 labeled WBC scanning. Ciprofloxacin is not taken up in normal bone marrow, and its uptake is independent of the white blood cell count.

Evaluation of Patient with Suspected Loosening and/or Wear

Late aseptic loosening is the most common reason for implant failure. One study evaluated 18,486 primary cemented, uncemented, and combined total hip arthroplasties performed for osteoarthritis followed at least 10 years. The prevalence of acetabular loosing ranged from 0.6-13.9% and of femoral loosening from 1.7-12.5%.

Tc-99m-labeled antigranulocyte antibody Fab' fragments imaging is a more readily available, simpler examination than Indium-111-labeled autologous leukocyte scanning and has replaced that examination in Europe. A sensitivity of 91% and specificity of 47% have been found for the diagnosis of infected total hip arthroplasties.

Fluorine 18 FDG PET has been utilized in diagnosing of infection after joint replacement, but has performed similarly to three-phase bone scintigraphy.

Radiographs

Loosening is usually evaluated on radiographs. However, despite the presence of radiographic features indicating loosening, symptoms may be absent. As pointed out in one study, there is discrepancy in the identification and quantification of lucent zones, which are important indicators of radiographic loosening.

Roentgen stereogrammetry allows the detection of small changes in component position. One study found that the magnitude of subsidence in the first 2 years is a risk factor for subsequent component revision. Thus, the risk of femoral revision at 5-7 years postoperative was greater than 50% if subsidence was 1.2 mm or more during the first two years; the relative risk of revision increased 5.2 times for each mm of subsidence. One study defined loosening as migration (change in component position over time) demonstrated at roentgen stereogrammetry. Patients with migration showed signs of loosening on arthrography, scintigraphy, or at revision surgery, whereas those without migration detected with this technique did not demonstrate any evidence of loosening.

Dual Energy X-ray Absorptiometry

Dual energy x-ray absorptiometry (DXA) scanning of patients with loose prostheses indicated a decrease in bone mineral density (BMD) in every Gruen zone in comparison to the opposite unoperated hip. While comparison to the opposite side may be suboptimal, the pattern of bone loss differed from that associated with normal remodeling around successful prostheses.

Arthrography

The role of arthrography in documenting loosening of cemented components has been extensively studied. One group of investigators used refined criteria, high injection pressure, and subtraction technique and found a sensitivity of 96% and a specificity of 92% for demonstrating femoral component loosening and a sensitivity of 97% and a specificity of 68% for acetabular component loosening. Optimal arthrographic technique is important to demonstrate loosening.

The efficacy of arthrography in defining loosening of uncemented components is less well studied and less certain. One study analyzed contrast arthrography in 12 uncemented femoral components and found a sensitivity of 50% and a specificity of 100% for loosening evaluated at surgery. Contrast arthrography in 31 uncemented femoral components in another study showed a sensitivity of 59% and a specificity of 64%, lower than the results for cemented femoral components (sensitivity 76%, specificity 70%).

Anesthetic

Intra-articular injection of anesthetic that results in pain relief indicates an intra-articular cause for the symptoms. One study notes that pain relief suggests an intra-articular process, while the absence of pain relief is not helpful.

Bone Scan

The absence of increased uptake on bone scan is thought to be strong evidence against prosthetic complication. One study, however, found that even the combination of bone scan and radiography was only about 84% sensitive and 92% specific for loosening in patients without obvious radiographic loosening.

Intra-articular Radionuclide

Injection of intra-articular radionuclide was first used for evaluation of femoral component loosening, but later procedural changes allowed both acetabular and femoral components to be evaluated. The procedure is usually coupled with a bone scan, and the isotope injection is performed at the time of contrast arthrography. In one series of uncemented components, this study was 70% sensitive and 100% specific for femoral loosening with increased sensitivity over the contrast examination. In another study, the nuclear arthrogram performed better than or equal to the contrast arthrogram for evaluation of cemented and uncemented components. The combination of radionuclide and arthrographic procedures is advantageous. In a small series involving uncemented femoral stems, the sensitivity of combined exams was 90%, and the specificity was 100% when both studies were negative.

Magnetic Resonance Imaging

Initial investigations have suggested that MRI may also have a role in the evaluation of prosthetic complications. In one series, MRI documented femoral component loosening as low signal fluid collections parallel to the component on fast-spin-echo T1-weighted images.

Evaluation of Patients with Suspected Stress Shielding

Bone loss associated with decreased stress occurs around both cemented and uncemented prostheses. Although these changes may be frequent, they may not affect the long-term results. Cortical thinning, increased porosity, and decreased bone density are indicators of stress shielding on radiographs. Radiographs, however, are insensitive indicators of bone loss. One study evaluated the ability of three orthopedic surgeons to agree on the presence of bone loss around prostheses under optimal radiographic conditions. "Excellent" agreement was not achieved until bone loss averaged 70%.

Dual-Energy X-ray Absorptiometry

Dual-energy x-ray absorptiometry has been used to assess periprosthetic bone density. Reproducibility is severely compromised if identical hip rotation is not achieved on follow up examinations. One study found precision of the DXA exam to average 3.8% with a standard deviation of 1.2%. Another study noted that bone loss was obvious on radiographs when about 35% of bone loss was present on DXA scanning.

Quantitative Computed Tomography

Quantitative computed tomography (QCT) has demonstrated changes in acetabular density with time after total hip replacement.

Particle Disease (Aggressive Granulomatous Disease)

Localized areas of bone resorption occur around total hip arthroplasties in response to the release of small particles. The condition may occur in response to cement and/or polyethylene or metal particles. It is more frequent after uncemented total hip arthroplasties than cemented ones and is a more frequent complication than infection, dislocation, or extensive heterotopic bone formation. Loosening may or may not accompany the condition.

Radiographs

Radiographs are typically the first method of identifying these areas of bone resorption. One study found the area of the lesions to double in 2.2 years and the number of lesions to increase with time. However, particularly in the acetabulum, considerable bone loss is necessary before lesions are identified with certainty.

Computed Tomography

Improved CT scanning techniques enable better demonstration of bone adjacent to prostheses and may find a role for identifying granulomas. CT scans have helped determine the extent and location of clinically silent osteolysis. One study suggests a baseline CT scan seven to ten years after THA; additional follow-up CTs may then be done.

Magnetic Resonance Imaging

On MRI, focal periprosthetic intraosseous masses of low T1 and heterogeneous, largely low to intermediate T2 signal have been described in cases of aggressive granulomatous disease. Peripheral and some internal enhancement of these granulomas have been noted after intravenous gadolinium injection.

Summary

A large number of techniques are available for evaluating total hip arthroplasties. Radiographs, however, remain the standard imaging modality. Joint aspiration is the best available test for evaluation of joint infection. CT and MRI hold potential for assessing granulomatous disease.

Abbreviations

- CT, computed tomography
- DXA, dual energy x-ray absorptiometry
- MRI, magnetic resonance imaging
- NUC, nuclear medicine
- QCT, quantitative computed tomography
- WBC, white blood cell

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 imaging after total hip arthroplasty (THA)

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)

Weissman BN, Dalinka MK, Alazraki N, Daffner RH, DeSmet AA, El-Khoury GY, Kneeland JB, Manaster BJ, Pavlov H, Rubin DA, Steinbach LS, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Imaging after total hip arthroplasty (THA). [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 8 p. [51 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: Barbara N. Weissman, MD (*Principal Author*); Murray K. Dalinka, MD (*Panel Chair*); Naomi Alazraki, MD; Richard H. Daffner, MD; Arthur A. DeSmet, MD; George Y. El-Khoury, MD; John B. Kneeland, MD; B.J. Manaster, MD, PhD; Helene Pavlov, MD; David A. Rubin, MD; Lynne S. Steinbach, MD; Robert H. Haralson III, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

It updates a previously published version: Keats TE, Dalinka MK, Alazraki N, Berquist TH, Daffner RH, DeSmet AA, el-Khoury GY, Goergen TG, Manaster BJ, Newberg A, Pavlov H, Schweitzer ME, Haralson RH 3rd, McCabe JB. Hip arthroplasty--radiography procedure recommendations. American College of Radiology. ACR Appropriateness Criteria. Radiology. 2000 Jun;215 Suppl:389-90.

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 NGC summary was completed by ECRI on February 10, 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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