Complete Summary

GUIDELINE TITLE

Imaging after total knee arthroplasty.

BIBLIOGRAPHIC SOURCE(S)

Weissman BN, Dalinka MK, Daffner RH, Jacobson JA, Morrison WB, Palmer WE, Resnik CS, Rubin DA, Schneider R, Schweitzer ME, Seeger LL, Steinbach LS, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Imaging after total knee arthroplasty. [online publication]. Reston (VA): American College of Radiology (ACR); 2006. 7 p. [45 references]

GUIDELINE STATUS

This is the current release of the guideline.

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
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SCOPE

DISEASE/CONDITION(S)

Complications after total knee arthroplasty (TKA)

GUIDELINE CATEGORY

Diagnosis
Evaluation

CLINICAL SPECIALTY

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 after total knee arthroplasty

TARGET POPULATION

Patients after total knee arthroplasty

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray, knee
    - Fluoroscopy
    - Tunnel views
    - Anteroposterior/ lateral, standing, and tangential patellar views
    - Arthrography
2. Computed tomography (CT), knee
3. Magnetic resonance imaging (MRI), knee
4. Nuclear medicine (NM)
    - Bone scan
    - Gallium scan
    - Bone and indium-111 white blood cell (WBC) scan
    - Indium-111 WBC and sulfur colloid scan
    - Immunoglobulin G (IgG) scan
5. Fluorodeoxyglucose positron emission tomography (FDG-PET)
6. Invasive (INV), aspiration, knee

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

The guideline developers reviewed published cost analyses.

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: Imaging After Total Knee Arthroplasty

Variant 1: Pain after TKA: initial evaluation.

Radiologic Procedure	Appropriateness Rating	Comments
X-ray, knee	9	Standing views of both legs can be used to assess the mechanical axis of both lower extremities.
X-ray, knee, fluoroscopy	1	
CT, knee	1	

Radiologic Procedure	Appropriateness Rating	Comments
MRI, knee	1	
NM, bone scan	1	
FDG-PET, knee	1	
INV, aspiration, knee	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: Pain after TKA: positive aspiration for infection.

Radiologic Procedure	Appropriateness Rating	Comments
CT, knee	1	
MRI, knee	1	
NM, bone scan	1	
NM, gallium scan	1	
NM, bone and indium-111 WBC scan	1	
NM, indium-111 WBC and sulfur colloid scan	1	
NM, IgG scan	1	
FDG-PET, knee	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 3: Pain after TKA: positive x-ray for loosening. Negative aspiration for infection.

Radiologic Procedure	Appropriateness Rating	Comments
X-ray, knee, fluoroscopy	1	
CT, knee	1	
MRI, knee	1	
NM, bone scan	1	
FDG-PET, knee	1	
X-ray, arthrography, knee	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 4: Pain after TKA: negative x-ray for loosening. Negative aspiration for infection.

Radiologic Procedure	Appropriateness Rating	Comments
CT, knee	7	For osteolysis or component malposition.
NM, bone scan	6	Reasonable screening test.
NM, indium-111 WBC and sulfur colloid scan	6	If persistent high clinical suspicion of infection.
MRI, knee	5	Expensive, less experience than other tests.
X-ray, knee, fluoroscopy	2	
NM, gallium scan	1	
NM, bone and indium-111 WBC scan	1	
NM, IgG scan	1	
FDG-PET, knee	1	
Appropriateness Criteria Scale		

Radiologic Procedure	Appropriateness Rating	Comments
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 5: Routine follow-up of asymptomatic patient with TKA.

Radiologic Procedure	Appropriateness Rating	Comments
X-ray, knee, AP/lateral, standing, and tangential patellar views	9	
X-ray, knee, tunnel views	1	
X-ray, knee, fluoroscopy	1	
CT, knee	1	
MRI, knee	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.

Summary of Literature Review

Routine Imaging

Radiography

The timing of postoperative radiographs has been evaluated in an effort to decrease costs. Postoperative in-hospital radiographs are thought unnecessary if the surgery was uncomplicated. Baseline radiographs are suggested at the first outpatient visit (e.g., at 6 weeks).

The effectiveness of radiographs obtained upon admission to a rehabilitation facility following hip or knee arthroplasty has been studied. A retrospective review examined the charts of 209 patients admitted after total knee replacement and found 2 patients (0.95%) had abnormal findings on radiographs. There was no

change in the length of hospital stay or the medical intervention required in these patients, leading the authors to conclude that routine radiography upon admission to a rehabilitation facility after knee replacement surgery is not cost effective.

Later follow-up is directed toward identifying any of the complications discussed below, particularly loosening.

Complications

Identification of the cause of a painful total knee arthroplasty (TKA) is important preoperatively since "…re-operation is unwise and frequently associated with suboptimal results" in cases of unexplained pain.

Loosening

In one series, loosening was a cause of revision in 34% of cases performed 2 years or more after implant insertion. One group of researchers defined loosening on radiographs by the presence of prosthetic fracture, cement fracture, periprosthetic fracture, or gross component migration. Assessment of radiolucent lines has been an important tool in defining fixation and therefore, conversely, loosening. Loosening is suggested when 1) there is progressive widening of a lucent zone on follow-up examinations, 2) there is greater than a 2 mm wide lucent zone at the cement bone interface or any lucency at the metal-cement or metal-bone interface, or 3) the lucent zone is extensive, especially if around the pegs or stem of a component. These lucent lines should be distinguished from more diffuse bone loss that occurs in areas of decreased stress ("stress shielding").

Fluoroscopy may be useful to see lucent lines in profile that could be obscured on standard anterior-posterior (AP) radiographs.

Bone scintigraphy may be helpful in diagnosing loosening, especially when obtained many years after surgery. This delay in maximum utility is due to the observation that positive bone scans are noted in 20% of asymptomatic knees a year after surgery and in 12.5% of individuals 2 years postoperatively. Generally, increased isotope uptake on the static scan but not on the blood pool scans is thought more likely due to loosening than to infection. Normal scans are most helpful, indicating that loosening or infection is unlikely. Evaluation of 80 bone scans in patients with symptomatic TKAs found that the method distinguished abnormal patients (loosening or infection) from normal ones (sensitivity of 92.3%) but was unable to distinguish between these two abnormal conditions. The negative predictive value (NPV) of 95% made a normal scan reassuring. Serial bone scans may be more helpful than a single examination.

Infection

Infection occurs in 1% to 4% of TKAs and may be acute or delayed. Late infection has been defined as occurring at least 3 months post surgery. In one series, infection was responsible for 25.4% of early revisions and 7.8% of revisions performed more than 2 years after the initial operation. Early acute infections after TKA are usually clinically evident by pain, swelling, fever, systemic

symptoms, and erythema. *Staphylococcus epidermidis* and *staphylococcus aureus* are the most common organisms associated with these infections. Low grade or chronic infections may be more difficult to identify. One study, for example, noted that the diagnosis of infection was not obvious in 53% of knees prior to revision arthroplasty.

Clinical Features

Pain is the most common presenting symptom; however, it is a nonspecific finding. Night pain or pain at rest is typical of infection, whereas pain on weight bearing is more consistent with mechanical loosening. Some authors suggest that infection be excluded in all patients with persistent pain more than 6 months following joint replacement.

Loosening may result from infection. A knee may be infected without the presence of fever, chills, erythema, or swelling.

Laboratory

Laboratory findings are often nonspecific. Peripheral leukocyte counts are not elevated in most patients with infected prostheses. Sedimentation rates are abnormal in patients with infection but this finding may also be seen in uninfected patients, limiting the value of the test. A retrospective review of 68 patients undergoing hip and knee revision surgery indicated that C reactive protein (CRP) was significantly higher in patients with infection compared to those with loosening (sensitivity 79% for all prostheses), although a normal level did not exclude infection. A large multicenter study found CRP and joint aspiration to be the most useful tools to diagnose infection.

Aspiration

Knee joint aspiration has been found to be extremely useful in diagnosing joint infection after TKA. One study found a sensitivity, specificity, and accuracy of 100% for aspiration in a series of 43 knees with pain, instability, loosening, or suspected infection undergoing surgical revision. In contrast, radiographic findings did not separate infected from noninfected patients. Another study found joint aspiration to be 100% specific and 75% sensitive for diagnosing infection and to be the best test for diagnosing infection in a group of total hip and knee replacement patients. A third study found that early aspiration led to a significant reduction in the duration of treatment and a better outcome. In 16% of patients, more than 3 aspirations were necessary to obtain a positive culture. Another group of researchers noted that in contrast to aspiration of total hip replacements where false positive results are more common, aspirations of knee joints are more often falsely negative. This was thought to most often result from antibiotic treatment. At least 2 weeks off antibiotics is recommended before the aspiration is performed (with careful clinical monitoring for sepsis), but as long as a month may be necessary for cultures of aspirated fluid to become positive. Therefore, a repeat aspiration should be done weekly if the first aspiration is negative and clinical suspicion for infection remains high. Even with a negative preoperative aspiration, intra-operative tissue may indicate infection. Another group of researchers, after literature review and a multicenter trial, advocated CRP and

joint aspiration as the best tools for diagnosing prosthetic joint infection. When CRP level is greater than 10 mg/L, repeat joint aspiration or biopsy is suggested.

Radiographs

One study found radiographs not to be helpful since loosening, periostitis, focal osteolysis, and radiolucent lines were seen in both infected and uninfected knees. Most importantly, infection may be present with a "normal" radiographic appearance.

Bone Scan

It is usually stated that bone scintigraphy is useful for excluding infection but of limited value in detecting it. Thus sensitivity is high and specificity is low.

Increased uptake may persist on bone scan even at 2 years after surgery. Infection is more likely than aseptic loosening if there is increased uptake on both blood pool and delayed images. Analysis of 80 bone scans in patients with postoperative pain found that no patient with infection had a negative scan. Patients with abnormal scans should be further assessed.

White Blood Cell Scan

White blood cells (WBCs) may be labeled with technetium-99m or indium-111. Leucocyte scanning using indium-111 was introduced in the 1980s. Labeling leukocytes with indium-111 requires that the patient's venous blood sample be drawn and the WBCs isolated and labeled with indium-111 oxine. Indium-labeled WBCs are then injected intravenously prior to scanning. Accurate interpretation requires comparison of the indium isotope uptake to activity on bone scan; a positive indium scan for infection generally requiring increased indium-111 uptake either in a different distribution (an "incongruent" scan) or in greater intensity than on the bone scan. Indium labels both acute and chronic WBCs, and this may account for positive scans in other conditions in which inflammatory changes may be present, such as particle disease. A small sample of indium scans in uncomplicated postoperative TKA patients also showed that inflammation can persist around the operative site.

One study evaluated patients with loose or painful knee prostheses and found a sensitivity of 88%, specificity of 78%, positive predictive value (PPV) 75% and NPV of 90% for infection. The examination was not recommended as routine because of the expense, complexity and limited sensitivity, specificity, PPV, and accuracy. In equivocal cases, and when an experienced musculoskeletal pathologist is not available to interpret an intra-operative frozen section, these authors noted that a negative indium scan may be helpful to suggest the absence of infection.

Evaluation of indium scanning may lead to a high false positive rate that is thought to be due to marrow packing. The addition of technetium-99m-labeled sulfur colloid scanning has been investigated to reduce this. One study, however, found that low sensitivity and the potential for false negative results made this combination of scans of limited utility for diagnosing prosthetic infection, and

therefore it is no longer used in their institution. In that group of 22 total knee prostheses evaluated and later operated upon, there was a sensitivity of 66%, specificity of 100%, PPV of 100%, NPV of 88%, and accuracy of 91%. The addition of blood pool and flow scans was investigated to determine if hyperemia led to a match of bone indium uptake (and therefore, a falsely negative scan). These additional scans decreased the number of false negative findings (sensitivity of 83%, specificity of 94%, PPV of 83%, NPV of 94%). Overall, however, the performance of the indium/colloid scan protocol was again thought to be of limited clinical utility. Semiquantitative assessment of WBC scans has, however, produced > 90% sensitivity and specificity in one series. In another study, it was noted that positive indium WBC scan and sedimentation rates were the most predictive variables for detecting septic prostheses.

A study of a small series of total knee arthroplasties using indium-111 IgG found the sensitivity of this agent for infection to be high but its specificity low (sensitivity 100%, specificity 50%). In a multicenter trial of various methods for diagnosing hip and knee infections, scans using tagged white cells or radiolabelled immunoglobulin demonstrated a sensitivity of 74% and specificity of 76% for diagnosing infection. Literature review indicates sensitivities of 38% to 100% and specificities 41% to 100% for WBC scans of joint prostheses. These studies were, therefore, not recommended as routine for differentiating mechanical failure from occult infection in painful loose total knee prostheses.

FDG-PET

One study cites reports indicating that elevated glycolytic activity causes inflammatory cells such as neutrophils and activated macrophages to be fluorodeoxyglucose (FDG) avid at sites of inflammation and infection. Thus, fluorodeoxyglucose-positron emission tomography (FDG-PET) imaging may be useful for detecting infection after joint replacement. The examination is much faster (a few hours) and less expensive than combined bone, marrow, and indium scintigraphy. In one series, the use of FDG-PET scanning combined with bone scanning showed no advantage over hexamethylpropyleneamine oxime (HMPAO)-labeled WBC scan and bone scanning. Another study of 36 painful knee prostheses examined using 18F-FDG-PET scanning showed identification of 10 of 11 infected cases but false positive results in 7 cases (sensitivity of 90.9%, specificity of 72%, and accuracy of 77.8% for detecting infection). This was lower accuracy than for assessment of hip prostheses. The cause for the high number of false positives was not known. Another group of researchers found diffuse synovial and focal extrasynovial FDG-PET uptake in patients with component malrotation. They concluded that this test is noncontributory in individual patients with persistent pain.

Wear

Polyethylene thickness. The polyethylene articular surface of a total knee prosthesis may undergo true wear, deformation, and creep that lead to a decrease in the thickness of the polyethylene; these may be clinically referred to as "wear." Several methods have been used to study the thickness of the polyethylene and thus the extent of wear.

One study examined single leg standing frontal radiographs of the knees for assessing of polyethylene thickness. Two types of measurement were made: 1) minimum distance from the metallic femoral condyle to the metal backing baseplate, and 2) minimum distance from the metallic femoral condyle to a line through the top surface of the baseplate at its widest dimension. The latter method proved more accurate and less affected by tilting of the tibial component. Overall, 87% of measurements using the second method were within 1 mm of the known implant thickness (accuracy roughly +/- 1 mm initially). However, accuracy decreased for evaluating polyethylene thickness in patients with wear requiring revision.

Because of the tilt of the tibial component in some cases, fluoroscopy has been used to align radiographs perpendicular to the joint surface. This allows measurement of the thickness of the polyethylene liner so that decreases in liner thickness (indicating wear) can be measured. Correction for magnification is made using the known diameter of a portion of the tibial component. In vivo assessment has shown repeatability (precision) of these measurements to be 0.2 mm with a 99% confidence level. The major source of variation is angulation of the tube in the craniocaudal direction; a 0.33 mm (6.5%) change in mean insert thickness is seen per degree of angulation. Another researcher noted that the magnification error cannot be reduced to ≤1 mm using fluoroscopy.

Varus/valgus stress has been added to the fluoroscopic examination to improve evaluation of polyethylene thickness. The coefficient of variation for repeat examination was 3.4%.

Granulomas. Oblique posterior femoral condylar radiographs have been recommended for evaluating the posterior condyles after TKA. This method was thought to be especially helpful when a posterior stabilized prosthesis is in place.

Sonography is under investigation for evaluating the thickness of polyethylene liners but is not in general use.

Focal osteolysis due to wear particles may be visible on radiographs, and routine surveillance has been suggested even in asymptomatic patients for this assessment. In one study, focal osteolysis was defined as an isolated area of lucency measuring at least 3 mm in diameter. It may be difficult to differentiate these lytic defects from stress shielding (osteoporosis).

Computed Tomography

One study recommends using computed tomography (CT) examination in patients with painful knee prostheses and equivocal radiographs, particularly for:

1. Loosening: to show the extent and width of lucent zones that may be less apparent on radiographs.
2. Osteolysis: CT is superior to radiographs for this diagnosis. These authors recommend CT be obtained in patients with painful knee prostheses with normal or equivocal radiographs and increased uptake on all three phases of a bone scan to look for osteolysis.
3. Assessing rotational alignment of the femoral component.
4. Detecting subtle or occult periprosthetic fractures.

Arthrography CT may be useful in documenting large displaced polyethylene fragments. In one case, arthrography CT allowed identification of the nonopaque polyethylene fragment of the tip of a posterior stabilized prosthesis.

Magnetic Resonance Imaging

Improved pulse sequences and techniques have facilitated the evaluation of the periprosthetic soft tissues and bone, allowing demonstration of focal osteolysis and inflammatory synovitis, as well as ligament and tendon abnormalities.

Patellar Complications

Patellar complications include subluxation, dislocation, fracture, component loosening or wear, impingement, and osteonecrosis. Radiographs are usually satisfactory for diagnosing patellar complications. Malposition of femoral and tibial components may affect patellar alignment. The rotation of tibial and femoral components may be evaluated on CT examination using anatomical landmarks. MRI may also allow this evaluation.

Patellar fractures occur in up to 3.8% of patients, usually within the first few postoperative years. Most are not associated with prior injury, and many are asymptomatic, highlighting the importance of radiography for their identification. Risk factors include older age, osteonecrosis, lateral release, surgical technique, incorrect prosthetic alignment (femorotibial or patellofemoral), and improper patellar resection. Transverse fractures are thought to be associated with patellar maltracking, while vertical fractures often occur through a fixation hole.

Abbreviations

- AP, anteroposterior
- CT, computed tomography
- FDG-PET, fluorodeoxyglucose positron emission tomography
- IgG, immunoglobulin G
- INV, invasive
- MRI, magnetic resonance imaging
- NM, nuclear medicine
- TKA, total knee arthroplasty
- 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 evaluation of patients after total knee arthroplasty

POTENTIAL HARMS

- Aspirations of knee joints are often falsely negative.
- Indium scanning and fluorodeoxyglucose positron emission tomography (FDG-PET) can render false positive results

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
Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Weissman BN, Dalinka MK, Daffner RH, Jacobson JA, Morrison WB, Palmer WE, Resnik CS, Rubin DA, Schneider R, Schweitzer ME, Seeger LL, Steinbach LS, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Imaging after total knee arthroplasty. [online publication]. Reston (VA): American College of Radiology (ACR); 2006. 7 p. [45 references]

ADAPTATION

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

DATE RELEASED

2006

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

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

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 Institute on April 25, 2007.

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