NGC banner

Guideline Summary NGC-7917

Guideline Title

ACR Appropriateness Criteria® chest pain, suggestive of acute coronary syndrome.

Bibliographic Source(s)

Mammen L, White RD, Woodard PK, Carr JJ, Earls JP, Hendel RC, Ho VB, Hoffman U, Ryan T, Schoepf J, White CS, Expert Panel on Cardiac Imaging. ACR Appropriateness Criteria® chest pain, suggestive of acute coronary syndrome. [online publication]. Reston (VA): American College of Radiology (ACR); 2010. 6 p. [58 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.

Scope

Disease/Condition(s)

Chest pain suggestive of acute coronary syndrome

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Cardiology

Emergency Medicine

Internal Medicine

Radiology

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of radiologic procedures for patients with chest pain suggestive of acute coronary syndrome

Target Population

Patients with chest pain suggestive of acute coronary syndrome

Interventions and Practices Considered

1. Single photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI)
   - Rest and stress
   - Rest only
2. Ultrasound (US) echocardiography
   - Transthoracic stress
   - Transthoracic resting
   - Transesophageal
3. Computed tomography angiography (CTA)
   - Coronary arteries
   - Coronary arteries with advanced low dose techniques
4. Computed tomography (CT)
   - Chest, with contrast

- Coronary calcium

5. Coronary arteriography
6. X-ray, chest
7. Magnetic resonance imaging (MRI)
   - Heart with stress, with or without contrast
   - Heart function and morphology, with or without contrast
8. Magnetic resonance angiography (MRA), coronary arteries
9. Positron emission tomography (PET), heart stress

Major Outcomes Considered

Utility of radiologic examinations in differential diagnosis

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches:

1. Articles that have abstracts available and are concerned with humans
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 5 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

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 Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence for all articles included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member forms his/her own opinion based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the American College of Radiology (ACR) Appropriateness Criteria® Evidence Table Development document (see "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Modified Delphi Technique

When the data available from existing scientific studies are insufficient, the American College of Radiology Appropriateness Criteria (ACR AC) employs systematic consensus techniques to determine appropriateness. The ACR AC panels use a modified Delphi technique to determine the rating for a specific procedure. A series of surveys are conducted to elicit each individual panelist's expert opinion of the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario based on the available data. ACR staff distributes surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. Voting surveys are completed by panelists without consulting other panelists. The ratings are integers on a scale between 1 and 9, where 1 means the panel member feels the procedure is "least appropriate" and 9 means the panel member feels the procedure is "most appropriate." Each panel member has one vote per round to assign a rating. The surveys are collected and de-identified and the results are tabulated and redistributed after each round. A maximum of three rounds are conducted. The modified Delphi technique enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive bias from fellow panelists in a simple, standardized and economical process.

Consensus among the panel members must be achieved to determine the final rating for each procedure. If eighty percent (80%) of the panel members agree on a single rating or one of two consecutive ratings, the final rating is determined by the rating that is closest to the median of all the ratings. Up to three voting rounds are conducted to achieve consensus.

If consensus is not reached through the modified Delphi technique, the panel is convened by conference call. The strengths and weaknesses of each imaging examination or procedure are discussed and a final rating is proposed. If the panelists on the call agree, the rating is accepted as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached, "No consensus" appears in the rating column and the 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: Chest Pain, Suggestive of Acute Coronary Syndrome

Radiologic Procedure	Rating	Comments	RRL*
SPECT MPI rest and stress	8	Intermediate-to-high likelihood for coronary artery disease. There is abundant literature available on clinical utility.	radioactive radioactive radioactive radioactive
Arteriography coronary	8	Gold standard, invasive.	radioactive radioactive radioactive
SPECT MPI rest only	7	In the setting of ongoing chest pain, high negative predictive value. Tc-99m is the most commonly used radionuclide agent for this test. RRL may be higher if Thallium (Tl-201) used.	radioactive radioactive radioactive

US echocardiography transthoracic stress	7	When resting echo and cardiac enzymes are normal.	O
US echocardiography transthoracic resting	6	Primarily for evaluating wall motion abnormalities and aortic dissection.	O
CTA coronary arteries	6	For those with low to intermediate likelihood for coronary artery disease, in the absence of cardiac enzyme elevation and ischemic ST changes.	radioactive radioactive radioactive radioactive
X-ray chest	5	Primarily a survey for noncardiac etiologies of chest pain.	radioactive
CT chest with contrast	5	Primarily for noncardiac etiologies such as pulmonary embolism and aortic dissection.	radioactive radioactive radioactive
MRI heart with stress with or without contrast	5	Limited experience in the clinical setting and lack of availability. See statement regarding contrast in text under "Anticipated Exceptions."	O
PET heart stress	4	Lack of widespread use and availability.	radioactive radioactive radioactive
MRI heart function and morphology with or without contrast	4	Primarily for the possibility of aortic dissection. See statement regarding contrast in text under "Anticipated Exceptions."	O
US echocardiography transesophageal	3	Relative contraindication for acute coronary syndrome.	O
CT coronary calcium	2	Not validated in the acute setting.	radioactive radioactive radioactive
MRA coronary arteries	2	Technically challenging and lack of widespread use and protocol availability.	O
CTA coronary arteries with advanced low dose techniques	No Consensus	Lack of data in the acute setting.	radioactive radioactive radioactive
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

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

Summary of Literature Review

Acute chest pain is a frequent presentation in emergency departments. Along with other important disease entities (e.g., aortic dissection, pulmonary embolus), clinical symptoms may raise the possibility of acute myocardial ischemia. Acute coronary syndromes (ACS) include ST-segment elevation myocardial infarction (STEMI), non-STEMI (NSTEMI), and unstable angina (UA). Being able to establish the diagnosis rapidly and accurately may be lifesaving. The immediate cardiac workup consists of an electrocardiogram (ECG) and cardiac biomarkers. In the acute setting, even if there are no ischemic changes on ECG, a cardiac workup is indicated. Because research has demonstrated that patients having a STEMI have improved outcomes if percutaneous intervention (PCI) is performed within 90 minutes of arrival to a hospital, if ECG changes and clinical examination suggest that the patient is suspected of having a STEMI, the patient will be urgently transferred to a cardiac catheterization laboratory for invasive angiography and coronary revascularization.

In stable patients without ST elevation, an initially conservative approach may be considered. In patients with active chest pain, an ECG with no ischemic changes, and an initial negative troponin, rest single photon emission computed tomography (SPECT) has been demonstrated to be useful. However, it has been shown to be less sensitive than stress SPECT imaging if the chest pain has subsided. Stress echocardiography may be equally considered in acute chest pain patients as well. Noninvasive imaging may be indicated for risk stratification before discharge in both low- and intermediate-risk patients who have been free of ischemia for a minimum of 12-24 hours. This approach also serves to identify patients with latent ischemia who could benefit from more aggressive revascularization.

In clinically stable UA/NSTEMI patients, cardiac catheterization in a nonemergent setting has advantages which may outweigh the benefits of performing urgent intervention. This select group of patients with UA/NSTEMI may be selected for "early but nonurgent angiography/intervention," also referred to as "upstream therapy." In the interval prior to angiography, these patients may benefit from aggressive antiplatelet therapy. In this group of patients selected for nonurgent invasive angiography, noninvasive imaging may be the intermediate step between the emergency department and discharge, hopefully improving confidence regarding the safety of the discharge.

Noncoronary etiologies for chest pain may also be established with imaging, the results of which may alter the patient's post-discharge care altogether. It is not uncommon for a patient to have acute chest pain occurring from either other cardiovascular causes or noncardiac etiologies. Patients may have predisposing cardiac risk factors and pain characteristics that place them in the triage category of intermediate probability for coronary artery disease (CAD).

Further cardiac risk stratification of this subgroup of patients is recommended before discharge, and noninvasive imaging is necessary to exclude ischemia as an etiology.

The available noninvasive cardiac imaging modalities include chest radiography (CXR), rest SPECT myocardial perfusion imaging (MPI), stress SPECT MPI, echocardiography (transthoracic and transesophageal), multidetector computed tomography (MDCT), positron emission tomography (PET) (metabolic and perfusion), and magnetic resonance imaging (MRI).

Chest Radiography

The utility of the CXR is primarily for ruling out conditions that may masquerade as an acute myocardial ischemia as well as defining secondary findings that may accompany acute myocardial infarction. Acute pulmonary edema can be seen on the chest radiograph without enlargement of the cardiac silhouette in patients with acute myocardial infarction and no prior history of ischemic damage or associated mitral valve disease. However, CXR is insufficient to confirm or exclude the presence of significant coronary artery disease. Other cardiovascular entities, such as aortic aneurysms, aortic dissections, and pulmonary embolism may be suggested from the CXR but with lower sensitivity than other imaging modalities such as MDCT. Noncardiac findings associated with chest pain that can be identified on the CXR include pneumothorax, fractured ribs, pleural effusions, and pneumonia.

Single Photon Emission Computed Tomography/Myocardial Perfusion Imaging

SPECT perfusion scintigraphy is an important test in the assessment for myocardial ischemia. In patients with active chest pain, an ECG with no ischemic changes, and an initial negative troponin, rest SPECT has been demonstrated to be the test of choice. It has been shown to be less sensitive than stress SPECT imaging, however, if performed after the chest pain has subsided. The commonly used radionuclide agents are TI-201 (Thallium) chloride and (Technetium) Tc-99m-labeled agents (e.g., sestamibi, tetrofosmin). There is abundant literature describing the use of SPECT in ACS. The absence of a perfusion defect on an acute rest study is associated with a very high negative predictive value for ACS evaluation. A perfusion defect which becomes apparent or becomes larger during exercise stress or pharmacologic stress defines ischemic myocardium.

Recently new software algorithms such as iterative reconstruction, maximum a posteriori noise regularization, and resolution-recovery, and new hardware and detector materials have become available, allowing for image acquisitions at significantly shorter acquisition times (one fifth to one half of previous acquisition times), or alternatively at lower doses compared to conventional algorithms.

Echocardiography

Stress echocardiography has been shown to be a modality equivalent to stress SPECT MPI in the acute setting in low to intermediate risk patients, with a stress pharmacologic agent such as dobutamine, inducing focal wall motion abnormalities in the region(s) of ischemia. Overall left ventricular function can also be assessed. The presence of left ventricular aneurysms, pseudoaneurysms, effusions, and valvular dysfunction can be determined as well.

The primary utility of transesophageal echocardiography (TEE) in the setting of acute chest pain is in ruling out aortic dissection in unstable patients. TEE is also used to further define valvular dysfunction or intracardiac thrombus, which can be sequelae of ischemic events in the subacute setting. Because of the invasive nature of TEE and because there is limited information that can be added in the setting of acute chest pain, this modality is generally not indicated in the workup of acute chest-pain patients.

Multidetector Computed Tomography

In stable patients with suggested ACS with a low or intermediate probability of CAD, in whom follow-up ECG and cardiac biomarker measurements are normal, performance of a noninvasive coronary imaging test (i.e., coronary CT angiography [CCTA]) is reasonable as an alternative to stress testing or selective coronary angiography. CCTA has a high negative predictive value for the detection of coronary atherosclerosis with or without significant stenosis and may be a potential alternative to stress imaging in the emergency department setting in patients at low to intermediate risk for CAD. In addition, CT has a well-established role in identifying aortic aneurysms, aortic dissections, pulmonary embolism, pericardial disease, and lung parenchymal disease, all of which can also present with acute chest pain.

Of note, CCTA results may be limited in patients with high heart rates (>65 beats/min) uncontrolled by beta blocker or other rate-limiting agents, and in patients who have intractable arrhythmias, or calcium scores greater than 400-600 Agatston Units.

Recent advances in cardiac CT imaging technology allow for further reduction of the radiation dose from CCTA; available new dose-reducing techniques include prospective triggering, adaptive statistical iterative reconstruction, and high-pitch spiral acquisition. However, these newer low-dose techniques may not be the appropriate choice in all patients due to their dependency on a combination of factors, including heart rate, rhythm, and clinical indication. Thus, while these techniques are promising in terms of reducing patient radiation dose, their overall accuracy and utility as compared to standard CCTA techniques are not yet completely defined.

Positron Emission Tomography

A stress PET examination can reliably demonstrate myocardial blood flow using Rubidium-82 (Rb-82) or Nitrogen-13 (N-13) ammonia. Limited data are available for PET perfusion studies in the setting of acute chest pain, although there is growing evidence for diagnostic and prognostic applications in chronic coronary disease. PET can also document anaerobic metabolism using F (Fluorine)-18 fluorodeoxyglucose and other metabolic tracers. This technology is not universally available and, therefore, is probably not indicated in the workup of the acute chest pain patient.

Magnetic Resonance Imaging

MRI has modest utility in patients with suspected ischemia in the acute setting. Limitations to this technique are principally equipment availability and the high level of expertise required of technologists and interpreting physicians. Access to the patient may be more difficult in the magnetic environment if the patient's stability should deteriorate.

However, cardiac MRI delayed post contrast imaging and edema-weighted imaging provides definitive assessment of the size, distribution, and mural extent of acute or remote myocardial infarction. Cine MRI has utility in demonstrating wall motion abnormalities which may accompany acute or chronic ischemic heart disease, and dynamic contrast-enhanced perfusion cardiac MRI can demonstrate myocardial perfusion abnormalities. MRI, like CT, can also identify noncardiac findings of chest pain, such as aortic dissection. Although MR coronary angiography has not been

established in general practice, both angiographic and phase-contrast flow continue to be developed for coronary artery assessment in research centers.

Summary

- A number of imaging modalities may be utilized in evaluating stable patients with chest pain suggestive of acute coronary syndrome and who are not selected for urgent cardiac catheterization.
- Although cardiac catheterization is the mainstay for evaluation of patients in whom acute coronary syndrome is being considered, in the clinically stable patient with UA/NSTEMI, alternative noninvasive imaging modalities may be appropriate.
- Noninvasive imaging in this setting includes myocardial perfusion scanning, coronary CT angiography, and echocardiography. These tests may be performed as an intermediate step and may improve confidence regarding the safety of discharge from the emergency department.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Abbreviations

- CT, computed tomography
- CTA, computed tomography angiography
- MPI, myocardial perfusion imaging
- MRA, magnetic resonance angiography
- MRI, magnetic resonance imaging
- PET, positron emission tomography
- SPECT, single photon emission computed tomography
- Tc-99m, technetium 99-m
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
radioactive	<0.1 mSv	<0.03 mSv
radioactive radioactive	0.1-1 mSv	0.03-0.3 mSv
radioactive radioactive radioactive	1-10 mSv	0.3-3 mSv
radioactive radioactive radioactive radioactive	10-30 mSv	3-10 mSv
radioactive radioactive radioactive radioactive radioactive	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as NS (not specified).

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 the evaluation of patients with chest pain, suggestive of acute coronary syndrome

Potential Harms

Gadolinium-based Contrast Agents

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m^2), and almost never in other patients. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m^2. For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

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. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see "Availability of Companion Documents" field).

Contraindications

Contraindications

Transesophageal echocardiography is relatively contraindicated in acute coronary syndrome.

Qualifying Statements

Qualifying Statements

The 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)

Mammen L, White RD, Woodard PK, Carr JJ, Earls JP, Hendel RC, Ho VB, Hoffman U, Ryan T, Schoepf J, White CS, Expert Panel on Cardiac Imaging. ACR Appropriateness Criteria® chest pain, suggestive of acute coronary syndrome. [online publication]. Reston (VA): American College of Radiology (ACR); 2010. 6 p. [58 references]

Adaptation

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

Date Released

1995 (revised 2010)

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 Cardiac Imaging

Composition of Group That Authored the Guideline

Panel Members: Leena Mammen, MD; Richard D. White, MD (*Panel Chair*); Pamela K. Woodard, MD (*Panel Vice-Chair*); J. Jeffrey Carr, MD, MSCE; James P. Earls, MD; Robert C. Hendel, MD; Vincent B. Ho, MD, MBA; Udo Hoffman, MD; Thomas Ryan, MD; Joseph Schoepf, MD; Charles S. White, MD

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 are available:

- ACR Appropriateness Criteria® overview. 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® literature search process. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria® evidence table development. Reston (VA): American College of Radiology; 4 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria® radiation dose assessment introduction. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in PDF from the ACR Web site.
- ACR Appropriateness Criteria® manual on contrast media. Reston (VA): American College of Radiology; 90 p. Electronic copies: Available in PDF from the ACR Web site.

Patient Resources

None available

NGC Status

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