Complete Summary

GUIDELINE TITLE

Acute respiratory illness.

BIBLIOGRAPHIC SOURCE(S)

Haramati LB, Davis SD, Goodman PC, Khan A, Leung AN, McLoud TC, Rosado de Christenson ML, Rozenshtein A, White CS, Kaiser LR, Expert Panel on Thoracic Imaging. Acute respiratory illness. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [18 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Westcott J, Davis SD, Fleishon H, Gefter WB, Henschke CI, McLoud TC, Pugatch RD, Sostman HD, Tocino I, White CS, Yankelevitz D, Bode FR. Acute respiratory illness. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215 (Suppl):645-8.

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
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INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES
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DISCLAIMER

SCOPE

DISEASE/CONDITION(S)

Acute respiratory illness

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Pulmonary Medicine
Radiology

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for patients with acute respiratory illness

TARGET POPULATION

Patients with acute respiratory illness

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray
2. Computed tomography (CT)

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

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: Acute Respiratory Illness

Variant 1: Greater than 40 years old.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	8	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Variant 2: Dementia, any age.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	8	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9**		

Radiologic Exam Procedure	Appropriateness Rating	Comments
1 = Least appropriate 9 = Most appropriate		

Variant 3: Less than 40 years old, negative physical exam, and no other signs, symptoms, or risk factors.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	4	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Variant 4: Less than 40 years old, positive physical exam, or other risk factors.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	8	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Variant 5: Complicated pneumonia.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray chest	9	
CT, chest	8	If pneumonia is not resolving or intervention is contemplated.
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 6: Suspected SARS.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	9	
CT, chest	9	If chest radiograph is normal or equivocal.
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 7: Suspected Anthrax.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	9	
CT, chest	8	If lungs or mediastinum are abnormal on chest radiographs and anthrax is suspected.
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 8: Febrile, neutropenic.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	9	
CT, chest	8	If chest radiograph is normal or equivocal.
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 9: Acute asthma uncomplicated.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	4	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Variant 10: Acute asthma, suspected pneumonia, pneumothorax.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	9	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Variant 11: Acute exacerbation of COPD, "uncomplicated" (no history of CAD or CHF, no leukocytosis, bandemia, fever, or chest pain).

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	7	
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 12: Acute exacerbation of COPD with one or more of the following: leukocytosis, bandemia, pain, history of CAD or CHF.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	9	
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.

Acute respiratory illness (ARI) is defined as one or more of the following: cough, sputum, chest pain, dyspnea, (with or without fever). The work-up of a patient with ARI, including the need for chest radiography and computed tomography (CT), depends on many factors, including severity of the illness; age of patient; presence of fever, leukocytosis or hypoxemia; clinical history; presence of other risk factors; and physical examination. Not all studies concur as to which patients with ARI should have chest x-rays.

In a study of 1,102 outpatients with ARI, the researchers found patient age, the physical examination, and the presence or absence of hemoptysis to be important factors. Only 4% (7/175) of patients with symptoms of ARI, a negative physical examination, no hemoptysis, and age < 40 years had acute significant radiographic findings, whereas patients either over 40, with hemoptysis, or with a positive physical examination had a much higher incidence of chest x-ray abnormalities. In a study of 464 patients with ARI, the authors also found a low incidence (3%) of pneumonia in patients with negative physical examinations. A notable exception was found for patients with dementia, in whom the incidence of pneumonia was very high regardless of the results of the physical examination. Conversely, in a study of 221 patients with ARI researchers found that 77 (35%) had new clinically important findings. Furthermore, the clinical findings did not differ significantly between those with positive radiographic findings and those with negative findings (i.e., clinical history and physical examination were poor predictors of x-ray detected abnormality). Patients with substance abuse have an increased risk of acute respiratory illness due to two mechanisms: respiratory pump failure and pulmonary pathology. Respiratory pump failure generally does not have radiographic manifestations. However pulmonary pathology includes multiple diagnosis with chest radiographic manifestations, including aspiration, pulmonary edema, pneumonia, hemorrhage, and septic emboli.

Another study found a low incidence (4%) of pneumonia in febrile, but otherwise asymptomatic, neutropenic patients with a normal physical examination. Other researchers evaluated the utility of thin-section CT in a group of febrile neutropenic patients with normal or nonspecific chest radiographs. There were 146 episodes in 87 patients. Among the 14% with nonspecific chest radiographs, CT suggested pneumonia in all. 48% had a normal chest radiograph, but CT findings of pneumonia. Of these, a specific pathogen was identified in 43%. Both chest radiographs and CTs were normal in 38%. The CT changed patient's therapy in 18%.

According to American Thoracic Society guidelines, posterioranterior (PA) (and lateral when possible) chest radiography should be obtained whenever pneumonia is suspected in adults. Findings on chest radiography are one of several parameters used to determine: (1) which patients should be hospitalized (greater than one lobe involvement, cavitation, rapid progression, presence of pleural effusion); and (2) which patients should be classified as severe (bilateral or multilobar involvement $\geq$ 50% progression within 48 hours). CT may play a role in the management of severe pneumonia. It can serve as a guide to pleural drainage or localize an appropriate site for biopsy. Severe pneumonias bear a strong relationship to etiologic pathogens and have implications for antimicrobial

treatment. Patients with severe pneumonia should be considered as candidates for intensive care unit admission

The need for chest roentgenography in adult patients with acute asthma is controversial. One group of researchers found clinically important (i.e., patient management affected) radiographic findings in 9% of their patients and concluded that chest radiography is indicated. However, another study observed that 99% of their patients either had normal chest radiographic exams or showed only slightly prominent markings or hyperinflation. Other researchers reported that patients with acute asthma rarely have pneumonia. One study recommended chest x-rays only when pneumonia or pneumothorax are suspected. But another study found significant chest radiographic abnormalities in 34% of adults whose asthma exacerbation warranted admission to the hospital.

One research team studied the utility of chest radiography in 242 patients with acute exacerbations of chronic obstructive pulmonary disease (COPD) (i.e., dyspnea). Of this group, 135 patients (56%) had asthma, and 107 (44%) had emphysema and chronic bronchitis. Chest x-rays were abnormal in 14% but resulted in significant change in management in only 4.5%. They concluded that the chest x-ray is indicated only if the worsening dyspnea is accompanied by leukocytosis, bandemia, chest pain, or edema or by a history of coronary artery disease or congestive heart failure (CHF).

Emerging infections and biological warfare agents have come to recent attention as causes of acute respiratory illness. Severe acute respiratory syndrome (SARS) emerged in China in late 2002. The etiologic agent is a novel coronavirus (SARS-CoV) that appears to have originated in Himalayan palm civets and crossed the species barrier. In February 2003 the Program for Monitoring Emerging Diseases identified this novel presentation of pneumonia which because of air travel, rapidly spread across continents to involve patients in at least 27 countries. Despite its very recent emergence, there is already literature supporting the utility of chest radiography in patients with known or suspected SARS. The different studies described the chest radiographic findings of SARS during the Hong Kong and Toronto epidemics. Chest radiographs were abnormal in 78 to 80% of patients at presentation. The most common chest radiographic finding was a unifocal opacity with a peripheral and basilar predominance. Multifocal or diffuse opacities could be present initially or develop as the disease progressed. Patients whose disease progressed were generally older, had more comorbidities, and had a higher fatality rate. Cavitation, pleural effusion, and lymphadenopathy were not features of SARS.

Thin section chest CT findings of SARS have been described by three different studies. The most common findings are ground glass opacities and crazy paving. More extensive findings include focal or multifocal consolidation. One group of researchers described pleural effusions and pneumomediastinum developing in 26% of patients scanned during the course of their illness. Another group describes a major role for CT in patients who have a high clinical suspicion for SARS and a normal chest radiograph. In their series, all 17 patients in that category had CT findings of SARS.

Anthrax is endemic in the soil of Texas, Oklahoma, and the Mississippi Valley. During the 20th century a number of countries developed weapon-grade anthrax

to be used as a biological warfare agent. Much of modern medical experience with anthrax arises from a Soviet military accident in 1979 in which 42 people died of anthrax, and from cases of anthrax that developed in the U.S. in 2001 as a result of biological warfare. Anthrax comes in three forms: cutaneous, gastrointestinal, and inhalational. 95% of anthrax is cutaneous, but the inhalational form is the most deadly. Inhalation of anthrax spores leads to hemorrhagic lymphadenitis and mediastinitis, sometimes accompanied by necrotizing pneumonia. The chest radiographic findings include widened mediastinum and hila, often accompanied by pleural effusions and parenchymal opacities. One study described the CT findings in two patients who survived inhalational anthrax. The CT characteristics were very suggestive of the diagnosis and included hyperattenuating hilar and mediastinal lymphadenopathy and hemorrhagic pleural effusion. Less specific findings included mediastinal edema, peribronchial thickening, and pleural effusion.

Based on these studies, the chest x-ray seems warranted in ARI when one or more of the following are present: age >40; dementia; a positive physical examination; hemoptysis; associated abnormalities (leukocytosis, hypoxemia); or other risk factors, including coronary artery disease, congestive heart failure, or drug-induced acute respiratory failure. X-ray also seems warranted for any adult patient with clinical suspicion of pneumonia. It appears that in patients with ARI, who are <40 years of age, chest radiography is not routinely indicated unless there are other abnormalities, a positive physical exam, or other risk factors. It also appears that chest radiographic examination is not indicated in most patients with exacerbations of COPD (including asthma) unless there is a suspected complication such as pneumonia or pneumothorax or unless one or more of the following are present: leukocytosis, bandemia, chest pain, edema, or a history of coronary artery disease or CHF. Chest CT may be warranted in complicated cases of severe pneumonia and in febrile neutropenic patients with normal or nonspecific chest radiographic findings. In patients with a normal chest radiograph and a high clinical suspicion of SARS, CT can be helpful in making the diagnosis.

Abbreviations

- CAD, coronary artery disease
- CHF, congestive heart failure
- COPD, chronic obstructive pulmonary disease
- CT, computed tomography
- SARS, severe acute respiratory syndrome

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 with severe respiratory illness

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)

Haramati LB, Davis SD, Goodman PC, Khan A, Leung AN, McLoud TC, Rosado de Christenson ML, Rozenshtein A, White CS, Kaiser LR, Expert Panel on Thoracic Imaging. Acute respiratory illness. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [18 references]

ADAPTATION

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

DATE RELEASED

1995 (revised 2005)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

GUIDELINE COMMITTEE

Committee on Appropriateness Criteria, Expert Panel on Thoracic Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: Linda B. Haramati, MD; Sheila D. Davis, MD; Philip C. Goodman, MD; Arfa Khan, MD; Ann N. Leung, MD; Theresa C. McLoud, MD; Melissa L. Rosado de Christenson, MD; Anna Rozenshtein, MD; Charles S. White, MD; Larry R. Kaiser, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

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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

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