Complete Summary

GUIDELINE TITLE

Acute respiratory illness in HIV-positive patients.

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, Raoof S, Expert Panel on Thoracic Imaging. Acute respiratory illness in HIV-positive patients. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [34 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: American College of Radiology (ACR), Expert Panel on Thoracic Imaging. Acute respiratory illness in HIV-positive patients. Reston (VA): American College of Radiology (ACR); 2003. 5 p. (ACR appropriateness criteria).

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
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SCOPE

DISEASE/CONDITION(S)

- Acute respiratory illness (including *Pneumocystis jiroveci* pneumonia, bacterial and viral pneumonia, tuberculosis, Kaposi sarcoma, and lymphadenopathy)

- Human immunodeficiency virus (HIV) infection

GUIDELINE CATEGORY

Diagnosis
Evaluation

CLINICAL SPECIALTY

Family Practice
Infectious Diseases
Internal Medicine
Nuclear 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 of acute respiratory illness in human immunodeficiency virus (HIV)-positive patients

TARGET POPULATION

Human immunodeficiency virus (HIV)-positive patients with acute respiratory illness

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray
2. Computer tomography (CT)
3. Nuclear medicine (NUC)
    - Gallium 67 scan
    - Diethylene triamine pentaacetic acid-Technetium (DTPA-Tc) scan
    - Thallium scan

MAJOR OUTCOMES CONSIDERED

Utility (i.e., sensitivity, specificity) of radiologic examination procedures 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 to reach agreement in the formulation of the appropriateness criteria. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as

developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1 to 9, indicating the most to the least 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 in HIV + Patient

Variant 1: Asymptomatic.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, chest	2	
CT, chest	2	

Radiologic Exam Procedure	Appropriateness Rating	Comments
NUC, lung, gallium 67 scan	2	
NUC, lung, DTPA-Tc scan	2	
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: Cough, dyspnea, chest pain, fever.

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 3: Negative, equivocal, or nonspecific chest radiograph.

Radiologic Exam Procedure	Appropriateness Rating	Comments
CT, chest	8	
NUC, lung, gallium 67 scan	2	
NUC, lung, DTPA-Tc scan	2	
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: Positive chest radiograph, diffuse infiltrates.

Radiologic Exam Procedure	Appropriateness Rating	Comments
CT, chest	4	
NUC, lung, gallium 67 scan	2	
NUC, lung, DTPA-Tc scan	2	
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 5: Positive chest radiograph, infection other than PCP suspected.

Radiologic Exam Procedure	Appropriateness Rating	Comments
CT, chest	4	
NUC, lung, gallium 67 scan	2	
NUC, lung, DTPA-Tc scan	2	
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: Positive chest radiograph, noninfectious disease suspected.

Radiologic Exam Procedure	Appropriateness Rating	Comments
CT, chest	8	
NUC, lung, thallium scan	2	
NUC, lung, gallium 67 scan	2	

Radiologic Exam Procedure	Appropriateness Rating	Comments
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) constitutes a group of signs and symptoms that develop over a brief interval (hours to weeks), some of which are constitutional such as fever, chills, and weight loss, and some of which are organ specific such as cough, shortness of breath, and chest pain. In human immunodeficiency virus (HIV)-infected individuals with ARI, a wide variety of diseases can have similar presentation. Clinical and demographic factors that help to rank the differential diagnosis include the degree of immunosuppression as reflected by the patients' CD4 cell count, whether or not they are being treated with highly active antiretroviral therapy (HAART), their country or region of origin and travel history, and their HIV risk factor. Radiographic findings play a role in narrowing the differential diagnosis and in guiding further diagnostic testing or procedures.

The chest radiograph is a basic and widely accepted diagnostic imaging tool in HIV-infected patients. When an HIV-infected patient presents with ARI, after obtaining the history and performing a physical examination, obtaining a chest radiograph is usually the next step. The vast majority of processes that cause ARI in HIV-infected individuals are associated with chest radiographic abnormalities, and several studies support obtaining an initial chest radiograph in HIV-infected patients with an ARI.

The nature and distribution of pulmonary findings on the chest radiograph will often suffice in suggesting a diagnosis or differential diagnosis. Bacterial pneumonia caused by infection with the usual organisms is the most common cause of ARI in acquired immune deficiency syndrome (AIDS) patients. The chest radiographic finding of focal or multifocal consolidation associated with fever, sputum production, and leukocytosis is usually diagnostic. Viral pneumonia can also present with bilateral reticular opacities on chest radiographs. If the viral infection is cytomegalovirus, there will often be cytomegalovirus infection in other organs (e.g., retinitis, esophagitis), and the patients will have very low CD4 counts (less than $50/mm^3$). On CT, cytomegalovirus will often demonstrate small, ill-defined nodules, peribronchial thickening, and foci of bronchiectasis. Congestive heart failure due to AIDS cardiomyopathy can also show reticular interstitial opacities. If bilateral nodular or reticular opacities are present without lymphadenopathy or pleural effusion and the CD4 count is less than $200/mm^3$, a diagnosis of Pneumocystis jiroveci pneumonia (PCP) can be suggested. Several studies found that the severity of the radiographic abnormality correlated with both severity of illness and mortality in patients with PCP.

It is now accepted that a normal or only subtly abnormal chest radiograph can occasionally occur in patients with tuberculosis, cytomegalovirus pneumonia, and PCP among other processes. If there is a high clinical suspicion of a pulmonary

infection in the setting of a normal chest radiograph, a CT may be warranted to assess for subtle abnormalities. Miliary or disseminated tuberculosis or nodal disease can be readily evident on CT in the face of a normal or near-normal chest radiograph. Small airways disease with mild bronchiectasis, peribronchial thickening, foci of mucoid impaction, and air trapping may be evident only on CT. Patients who have a normal chest radiograph and PCP will usually have focal areas of ground glass opacity evident on CT.

Exercise desaturation, an elevated lactate dehydrogenase (LDH), and a low diffusion capacity are all associated with PCP and add supportive evidence to a typical chest radiographic appearance. Sputum induction will often confirm the diagnosis. In the setting of a negative sputum induction, some practices treat empirically for PCP if the chest radiographic and clinical findings are typical. Otherwise, fiberoptic bronchoscopy (FOB) with bronchoalveolar lavage and/or biopsy is the usual practice. One group of researchers proposed some compelling arguments for using CT early in the diagnostic evaluation of PCP. When the presence or absence of ground glass opacity on CT was used as the diagnostic criterion, patients were classified as "possible PCP" or "not PCP." CT had a high sensitivity and specificity. This is supported by the findings of one study that found ground glass, reticular, and cystic changes in the lung on high resolution CT (HRCT) in patients with PCP. In contrast, those with tree-in-bud nodules had other diagnoses. The authors concluded that patients with "possible PCP" should go on to direct testing, (induced sputum, bronchoalveolar lavage) whereas a diagnosis of "not PCP" can be used to avoid empiric treatment and direct testing. They also point out that CT has higher sensitivity and specificity and is cheaper than gallium scanning and provides an immediate result, in contrast to the 48 to 72-hour delay for gallium. There is, however, literature supporting the utility of performing DTPA-Tc and gallium 67 lung scans in patients with suspected PCP and negative or atypical chest radiographs. In two different studies, gallium lung scans were positive (94% and 100%, respectively) in patients with PCP. In another study, the researchers noninvasively detected 34 of 36 patients with PCP using a combination of DTPA lung scanning while inducing sputum and were thus able to reduce the need for bronchoscopy.

CT is widely accepted when noninfectious AIDS-related intrathoracic diseases are suspected, when the chest radiograph shows findings atypical for PCP, or when FOB is not diagnostic. The CT findings can frequently suggest the diagnosis or at least limit the diagnostic possibilities, and may identify optimal sites for obtaining a biopsy. According to another group of researchers, in a series of 128 AIDS patients, they found that CT was 93% accurate in excluding disease and 94% and 93% accurate in rendering confident diagnoses of PCP and Kaposi sarcoma, respectively. Another study demonstrated the utility of thallium and gallium scanning for diagnosing Kaposi sarcoma. In this series, a thallium-positive, gallium-negative pattern had a high specificity of 95% for the diagnosis of Kaposi sarcoma. However, the sensitivity decreased from 89% to 37% in patients who had opportunistic infections.

If lung nodules or masses with or without cavitation are present on the chest radiograph and the sputum is unrevealing, a chest CT should be performed. CT better delineates the distribution and morphology of the parenchymal disease. CT also has an advantage in demonstrating associated hilar and mediastinal lymphadenopathy, which may alter the differential diagnosis. The differential

diagnosis for lung nodules and masses depends in part on the patient's immune status and HIV risk factors. Bacterial infection can occur at any level of immunity, although its frequency increases as CD4 declines, and it occurs more often in HIV-infected patients whose risk factor was intravenous drug use. In one series of studies, bacterial infection was the most common etiology of lung nodules seen on CT. Tuberculosis was second. In areas where fungal infections are endemic, that diagnosis rises in the differential diagnosis. The authors noted that nodule size less than 1cm, fever, and cough favored an infectious etiology for the nodules. Neoplasms also can cause nodules and masses. Kaposi sarcoma has its highest prevalence in HIV-infected gay men. In that population, especially if the patient has a low CD4 count and cutaneous or oropharyngeal Kaposi sarcoma, lung nodules and masses will often be due to Kaposi sarcoma. The radiographic findings can mimic infection. Acutely, patients with Kaposi sarcoma can present with hemoptysis. FOB with bronchial inspection will reveal the typical violaceous endobronchial Kaposi sarcoma lesions in most cases. AIDS-related lymphoma is predominantly an extranodal disease. Lung nodules and masses are often present if there is thoracic involvement. These patients are often acutely ill with "B" symptoms. CT will often show lymphadenopathy or abdominal visceral involvement that is not evident on the chest radiograph.

Lymphadenopathy may be evident on chest radiographs, although CT is much more sensitive in its detection. When an HIV-infected patient is acutely ill and has lymphadenopathy, the differential diagnosis includes tuberculosis, other mycobacterial infections, fungal infection, and lymphoma among more common etiologies. In patients with tuberculosis who are evaluated with contrast-enhanced CT, central low attenuation lymphadenopathy is highly suggestive of the correct diagnosis. The pattern of associated parenchymal and pleural disease, described above, will also help prioritize the differential diagnosis.

Pleural effusions are rarely present in patients with PCP. Bacterial pneumonia, tuberculosis, and fungal infections all can be associated with pleural effusions. Kaposi sarcoma may have effusions in the later stages. Kaposi sarcoma effusions are often hemorrhagic. Pleural involvement with AIDS-related lymphoma is not rare. Patients may have effusions or masses. While the chest radiograph is usually adequate to demonstrate the presence of a pleural effusion, if the patient does not respond to antibiotic therapy or develops a complicated effusion, CT may be helpful in guiding the choice of a site for biopsy or drainage.

Recommendation

Chest radiography is indicated early in the evaluation of AIDS patients with ARI. Most respiratory diseases will be associated with abnormal chest radiographic findings. If the radiograph is normal or equivocal and clinical suspicion for disease is high, CT can be performed to evaluate for subtle pulmonary abnormalities and lymphadenopathy. CT also plays a role in weighting a differential diagnosis and guiding diagnostic and therapeutic procedures in those with abnormal chest radiographs. Nuclear scintigraphy, including gallium 67 and DTPA-Tc, can be helpful in diagnosing PCP, and the combination of thallium and gallium scanning has shown utility in the diagnosis of Kaposi sarcoma.

Abbreviations

- CT, computed tomography
- NUC, nuclear medicine
- DTPA-Tc, Diethylenetriamine pentaacetic acid-Technetium
- PCP, *Pneumocystis jiroveci* pneumonia

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 radiographic imaging procedures for evaluation of human immunodeficiency virus (HIV)-positive patients with acute 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
Living with Illness

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, Raoof S, Expert Panel on Thoracic Imaging. Acute respiratory illness in HIV-positive patients. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [34 references]

ADAPTATION

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

DATE RELEASED

2003 (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 (*Principal Author*); Sheila D. Davis, MD (*Panel Chair*); 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; Suhail Raoof, MBBS

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

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This guideline updates a previous version: American College of Radiology (ACR), Expert Panel on Thoracic Imaging. Acute respiratory illness in HIV-positive patients. Reston (VA): American College of Radiology (ACR); 2003. 5 p. (ACR appropriateness criteria).

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 November 12, 2004. The information was verified by the guideline developer on December 21, 2004. This summary was updated by ECRI on March 22, 2006.

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