Complete Summary

GUIDELINE TITLE

Routine admission and preoperative chest radiography.

BIBLIOGRAPHIC SOURCE(S)

McLoud TC, Davis SD, Aquino SD, Batra PV, Goodman PC, Haramati LB, Khan A, Leung AN, Rosado de Chritenson ML, Rozenshtein A, White CS, Kaiser LR, Raoof S, Expert Panel on Thoracic Imaging. Routine admission and preoperative chest radiography. [online publication]. Reston (VA): American College of Radiology (ACR); 2006. 5 p. [39 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. Routine admission and preoperative chest radiography. Reston (VA): American College of Radiology (ACR); 2000. 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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BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
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SCOPE

DISEASE/CONDITION(S)

Indications of cardiopulmonary disease

GUIDELINE CATEGORY

Evaluation
Screening

CLINICAL SPECIALTY

Cardiology
Family Practice
Geriatrics
Internal Medicine
Pulmonary Medicine
Radiology
Surgery

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To provide appropriate recommendations for routine admission and preoperative chest radiography

TARGET POPULATION

Patients undergoing pre-admission procedures prior to hospitalization or surgery

INTERVENTIONS AND PRACTICES CONSIDERED

X-ray, chest

- Routine admission
- Preoperative

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 recent peer-reviewed medical journals, and the major applicable articles were identified and collected.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
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 the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, 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

The guideline developers reviewed published cost analyses.

- The available evidence does not support a policy for performing routine admission or preoperative chest radiographs for all patients. Although there is no evidence showing that such a policy would lead to worse outcomes for patients, the finding that only 2% of chest radiographs lead to a change in management of patients suggests a high level of cost and inconvenience with potentially limited benefits.
- It has been shown that there is insufficient diagnostic yield to warrant the use of non-indicated chest radiography as part of a routine physical examination. Especially in a healthy population, screening chest radiographs have a high cost-benefit ratio. Scheduling a patient for surgery does not improve the benefit. Scheduling a patient for surgery does not improve the benefit. An operation, per se, does not constitute a risk factor requiring chest radiographs.

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: Routine Admission and Preoperative Chest Radiography

Variant 1: Asymptomatic; history and physical unremarkable.

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

Variant 2: Acute cardiopulmonary findings by history or physical.

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

Variant 3: Chronic cardiopulmonary disease in the elderly (older than age 65), previous chest x-ray within 6 months available.

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

Variant 4: Chronic cardiopulmonary disease in the elderly (older than age 65), previous chest x-ray within 6 months not available.

Radiologic Exam Procedure	Appropriateness Rating	Comments

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

Routine chest radiography obtained at the time of admission to hospital and in the preoperative setting has been a common practice. This guideline will address the use and efficacy of this practice in both settings. Most routine chest radiography is done in the preoperative setting rather than as part of a routine admission for medical reasons. However, several studies have addressed the use of routine chest radiography prior to nonsurgical procedures, at the time of admission for various medical conditions, and for all elderly patients admitted to the hospital. Several studies have also addressed the use of routine chest radiography prior to interventional but nonsurgical procedures. One study regarding the routine utilization of chest radiography prior to biliary lithotripsy reviewed a group of 75 patients referred for this procedure. All patients underwent posteroanterior (PA) and lateral chest radiographs. No significant pulmonary or pleural disease was noted in any of the patients. A similar study documented that routine chest radiography prior to angiography was not necessary in the absence of any specific clinical indications. In a series of 240 patients, no angiogram was postponed or canceled because of abnormalities detected on the routine chest radiograph.

Routine Admission Chest Radiography

Several studies have addressed the utility of routine chest radiographs in patients admitted for various clinical conditions, including acute gastrointestinal hemorrhage, acute stroke, and in the elderly. None of these studies supported the use of routine radiography in these patient groups unless there were clinical indications of cardiac or pulmonary disease. One research team prospectively studied 1,000 consecutive admissions to an acute geriatric ward and demonstrated that 35%-50% of these patients had little or no clinical indication for routine chest radiograph examination and that omitting this study in these patients would not have resulted in any significant chest conditions. The remainder of the population had signs and symptoms, other evidence of pulmonary or cardiovascular disease, or other clinical features that indicated the need for chest radiography. Of the 35% with no indication for chest radiography, 5.5% did have some abnormality, but in only 3 (less than 1%) was this considered to be significant. Of the 65% who had some indication for a chest radiograph, 17% of the total had known chronic cardiac or pulmonary disease and in these, radiologic findings did not contribute to further management.

A more recent study recorded the chest radiographic findings in 200 patients who were admitted to an acute psychiatric ward. The chest radiograph was normal in 82% of these patients. Relevant abnormalities were noted in 5%, but all of them

were already known. In all cases, the screening test was of no practical value. Another group of researchers studied the impact of routine admission chest radiography on the treatment of patients on internal medicine wards at a Veterans Administration hospital in California. In a population of 294 patients, 36% had abnormalities noted on the routine admission chest radiograph. However, the findings were previously known to be chronic and stable in 86 patients and were new in only 20. Treatment was changed because of the chest radiographic results in only 4% of the patients, and in only one of these patients would appropriate treatment probably have been omitted had the chest radiograph not been obtained. The recommendation from this study was that routine chest radiographs should not be ordered solely because of admission. It is of particular interest to note that this patient population had a very high prevalence of both chronic cardiac and pulmonary disease.

Preoperative Chest Radiography

In the United States, more than $30 billion is spent on preoperative testing annually. Chest radiography is included in many centers for routine preoperative evaluation. As is evident, the study is a relatively low-cost, low-risk procedure to screen or evaluate for occult or known cardiopulmonary disease. However, in the past two decades, the efficacy of its use, along with other routine preoperative laboratory studies, has been the issue of multiple studies.

In 1979, the Royal College of Radiologists published a multicenter study that retrospectively examined 10,619 preoperative chest radiographs in patients undergoing elective noncardiopulmonary surgery. The conclusion was that the preoperative chest radiograph did not influence the decision to operate or the choice of anesthetic. Another study evaluated the usefulness of preoperative chest radiographs in 905 patients based upon risk factors including history of malignancy, recent history of smoking, exposure to toxic chemicals, or signs and symptoms of recent infection. It was concluded that a group of patients does exist for whom preoperative chest radiographs will predictably demonstrate no serious abnormalities and that this low-risk population constitutes the majority of the surgical population. A separate study evaluated the utility of preoperative chest radiographs in 3,883 patients and found that routine preoperative chest radiographs could be eliminated without undesirable effects on patient care or outcome. In a study of 1,000 patients, the recommendation was that preoperative chest radiographs should only be ordered when there is a cardiopulmonary abnormality suspected on the basis of the history and physical examination. The study emphasized that preoperative chest films should not be routine in any age group. A meta-analysis performed on 21 studies written between 1966 and 1992 reported that abnormalities were found in approximately 10% of routine preoperative chest radiographs. Only 1.3% of the abnormalities were unexpected on the basis of the history and physical examination. The test results were of sufficient importance to cause modification of management in only 0.1% of these cases. In 1997, a review of 46 empirical studies that included preoperative chest radiographs was published. The researchers concluded that the available evidence does not support the practice of routine chest radiographs for all patients.

A recent study in 2004 investigated the use of preoperative testing in morbidly obese patients undergoing gastric bypass. These patients are generally considered at high risk for perioperative and postoperative complications. Preoperative chest

radiographs revealed abnormalities in only 4%, none of which required preoperative intervention. The authors concluded that preoperative chest radiography was not mandatory for such patients as a routine preoperative evaluation, but could be used selectively on the basis of medical history.

Despite the lack of support in the literature, there remains wide variation in the use of preoperative chest radiographs. Some proponents believe that the study is an extension of a general physical examination and, as such, should be routinely included in a preoperative evaluation. However, it has been shown that there is insufficient diagnostic yield to warrant the use of nonindicated chest radiography as part of a routine physical examination. Especially in a healthy population, screening chest radiographs have a high cost-benefit ratio. Scheduling a patient for surgery does not improve the benefit. An operation, per se, does not constitute a risk factor requiring chest radiographs.

Others have cited medico-legal reasons as a justification for including chest radiographs in the preoperative evaluation. However, data are available to mitigate this contention. Routine preoperative chest radiography is not supported in the medical literature and, therefore, cannot be considered the standard of care. Also, several authors have shown that many abnormalities detected in laboratory screening tests should not be pursued. It can be argued that the risk of failure to follow-up an abnormal test presents a greater exposure to a lawsuit than not ordering a routine study.

One researcher reviewed the records of 369 surgical patients and determined that in 9% of cases the preoperative film was helpful for comparison in the management of postoperative chest radiographic findings. However, the actual effect of the baseline preoperative film on patient care could not be determined in this retrospective analysis. Another research team studied 1,262 patients who had a preoperative chest radiograph. Sixteen percent went on to have postoperative films. Their conclusion was that the comparisons had no "therapeutic consequences in any case." In the paper by the Royal College of Radiologists, 70% of postoperative complications developed in patients without serious cardiopulmonary disease. On this basis, and assuming there is at least some value in having preoperative films for comparison, the authors argued that it would be necessary to radiograph up to 90% of all surgical patients to be reasonably sure of having a baseline available for all those in whom a postoperative pulmonary complication develops.

Several authors have argued that there are adverse effects that result from routine preoperative chest radiographs. First is the unnecessary radiation exposure. Additional expense is another concern. Also, surgery may be delayed due to incidental findings or improper communication. As with routine nonsurgical chest radiographs, there is the additional cost and morbidity in the further evaluation of incidental findings such as solitary pulmonary nodules.

In 1984, the Royal College of Radiologists published a set of guidelines for the ordering of preoperative chest radiographs. Their parameters included scheduled cardiopulmonary surgery, age, suspected metastatic disease, acute respiratory symptoms, and recent immigration from a country where tuberculosis (TB) is endemic. Since then, multiple authors have proposed their recommendations and guidelines for the use of preoperative chest radiographs. Other parameters

presented include smoking, emergency cases, immunosuppressed patients, and American Society of Anesthesiologists (ASA) grades. Unfortunately, most of these publications base their conclusions upon statistical evaluation of the diagnostic yield of the chest radiograph interpretation. Some of the "positive" reports have included such findings as rib fractures, linear scarring, sub-segmental atelectasis, pleural scarring and mild increased cardiothoracic ratio which would likely have little to no effect on perioperative management. The real measure of the efficacy of routine chest radiographs in the preoperative setting is the impact on patient management and outcome analysis. It is in this context that a prospective study would greatly contribute to determining the appropriateness criteria to establish which patients would truly benefit from preoperative chest radiographs.

This review of the literature supports the summary of one group of researchers who carried out an exhaustive review of the literature for all types of preoperative testing including routine preoperative and admission chest radiographs. They concluded that:

- No randomized controlled trials of the effectiveness of routine preadmission or preoperative chest radiographs have been published. All available evidence reports the results of case series.
- Few studies allow the outcome of routine chest radiographs to be distinguished from those of indicated chest radiographs, and fewer have gone beyond abnormalities to examine the impact on clinical management.
- Findings from routine preoperative chest radiographs are reported as abnormal in 2.5%–37% of cases and lead to a change in clinical management in 0%–2.1% of cases. The effect on patient outcome is unknown.
- Both abnormality yield and impact on patient management rise with age and poorer anesthesiology status.
- Limited evidence on the value of chest radiography as a baseline measure suggests that it will be of value in less than 5% of patients.

In 2005, a meta-analysis of manuscripts published between 1966 and 2004 addressed the value of screening preoperative chest radiographs. All eligible studies were reviewed, and data were extracted individually by two authors. Of the reported studies, the diagnostic yield of the preoperative chest radiograph was found to increase with age. However, most of the abnormalities consisted of chronic disorders such as cardiomegaly and chronic obstructive pulmonary disease which were already identified clinically. When further investigations were performed, the proportion of patients who had a change in management was low (10% of investigated patients). Postoperative pulmonary complications were similar between patients with preoperative chest radiographs (12.8%) and patients who did not have preoperative chest radiographs (16%). The authors concluded that an association between preoperative screening chest radiographs and a decrease in morbidity and mortality could not be established. The conclusion appears warranted that chest radiographs should not be performed on patients younger than age 70 and without risk factors. For patients older than age 70, there is insufficient evidence against performance of routine chest radiographs.

The available evidence does not support a policy for performing routine admission or preoperative chest radiographs for all patients. Although there is no evidence showing that such a policy would lead to worse outcomes for patients, the finding

that only 2% of chest radiographs lead to a change in management of patients suggests a high level of cost and inconvenience with potentially limited benefits.

Because of the lack of adequate prospective studies, particularly studies that deal with the effect of admission and preoperative chest radiographs on patient outcome, a recommendation from the American College of Radiology that these studies not be obtained may be somewhat premature. However, given the current evidence, routine preoperative and admission chest radiographs are not recommended except when the following conditions exist:

- Acute cardiopulmonary disease is suspected on the basis of history and physical examination.
- There is a history of stable chronic cardiopulmonary disease in an elderly (older than age 65) patient without a recent chest radiograph within the past six months.

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

Appropriate use of preoperative and admission chest radiographs

POTENTIAL HARMS

Several authors have argued that there are adverse effects that result from routine preoperative chest radiographs. First is the unnecessary radiation exposure. Additional expense is another concern. Also, surgery may be delayed due to incidental findings or improper communication. As with routine nonsurgical chest radiographs, there is the additional cost and morbidity in the further evaluation of incidental findings such as solitary pulmonary nodules.

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 United States 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

Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

McLoud TC, Davis SD, Aquino SD, Batra PV, Goodman PC, Haramati LB, Khan A, Leung AN, Rosado de Chritenson ML, Rozenshtein A, White CS, Kaiser LR, Raoof S, Expert Panel on Thoracic Imaging. Routine admission and preoperative chest radiography. [online publication]. Reston (VA): American College of Radiology (ACR); 2006. 5 p. [39 references]

ADAPTATION

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

DATE RELEASED

2000 (revised 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 Thoracic Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: Theresa C. McLoud, MD; Sheila D. Davis, MD; Suzanne L. Aquino, MD; Poonam V. Batra MD; Philip C. Goodman, MD; Linda B. Haramati, MD; Arfa Khan, MD; Ann N. Leung, 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

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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 NGC summary was updated by ECRI on August 17, 2006.

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