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The American College of Radiology will periodically define new practice guidelines and technical standards for radiologic practice to help advance the science of radiology and to improve the quality of service to patients throughout the United States. Existing practice guidelines and technical standards will be reviewed for revision or renewal, as appropriate, on their fifth anniversary or sooner, if indicated.

Each practice guideline and technical standard, representing a policy statement by the College, has undergone a thorough consensus process in which it has been subjected to extensive review, requiring the approval of the Commission on Quality and Safety as well as the ACR Board of Chancellors, the ACR Council Steering Committee, and the ACR Council. The practice guidelines and technical standards recognize that the safe and effective use of diagnostic and therapeutic radiology requires specific training, skills, and techniques, as described in each document. Reproduction or modification of the published practice guideline and technical standard by those entities not providing these services is not authorized.

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ACR PRACTICE GUIDELINE FOR THE PERFORMANCE OF PEDIATRIC AND ADULT CHEST RADIOGRAPHY

PREAMBLE

These guidelines are an educational tool designed to assist practitioners in providing appropriate radiologic care for patients. They are not inflexible rules or requirements of practice and are not intended, nor should they be used, to establish a legal standard of care. For these reasons and those set forth below, the American College of Radiology cautions against the use of these guidelines in litigation in which the clinical decisions of a practitioner are called into question.

The ultimate judgment regarding the propriety of any specific procedure or course of action must be made by the physician or medical physicist in light of all the circumstances presented. Thus, an approach that differs from the guidelines, standing alone, does not necessarily imply that the approach was below the standard of care. To the contrary, a conscientious practitioner may responsibly adopt a course of action different from that set forth in the guidelines when, in the reasonable judgment of the practitioner, such course of action is indicated by the condition of the patient, limitations on available resources, or advances in knowledge or technology subsequent to publication of the guidelines. However, a practitioner who employs an approach substantially different from these guidelines is advised to document in the patient record information sufficient to explain the approach taken.

The practice of medicine involves not only the science, but also the art of dealing with the prevention, diagnosis, alleviation, and treatment of disease. The variety and complexity of human conditions make it impossible to always reach the most appropriate diagnosis or to predict with certainty a particular response to treatment. Therefore, it should be recognized that adherence to these guidelines will not assure an accurate diagnosis or a

successful outcome. All that should be expected is that the practitioner will follow a reasonable course of action based on current knowledge, available resources, and the needs of the patient to deliver effective and safe medical care. The sole purpose of these guidelines is to assist practitioners in achieving this objective.

I. INTRODUCTION

Chest radiography is a proven and useful procedure for evaluation of the airways, lungs, pulmonary vessels, mediastinum, heart, pleura, and chest wall. The common and accepted practice consists of posteroanterior (PA) and left lateral radiographs obtained in the upright position. Under certain clinical circumstances and in certain patient populations (e.g., critically ill, postoperative, trauma, newborn), portable chest radiography may be indicated and should be performed in accordance with the [ACR Practice Guideline for the Performance of Pediatric and Adult Portable \(Mobile Unit\) Chest Radiography](#).

(For pediatric considerations, see section V.D.2.)

II. GOAL

The goal of the chest radiographic examination is to help establish the presence or the absence and the etiology of disease processes that involve the thorax or to follow their course.

III. INDICATIONS AND CONTRAINDICATIONS

Indications for chest radiography include, but are not limited to:

A. Evaluation of signs and symptoms potentially related to the respiratory, cardiovascular, and upper gastrointestinal systems, and the musculoskeletal system of the thorax. The chest radiograph may also help to evaluate thoracic disease processes, including systemic and extrathoracic diseases that secondarily involve the chest. Because the lungs are a frequent site of metastases, chest radiography may be useful in staging extrathoracic as well as thoracic neoplasms.

B. Follow-up of known thoracic disease processes to assess improvement, resolution, or progression.

C. Monitoring of patients with life-support devices and patients who have undergone cardiac or thoracic surgery or other interventional procedures.

D. Compliance with government regulations that may mandate chest radiography. Examples include surveillance PA chest radiographs for active tuberculosis or occupational lung disease or exposures, or other surveillance studies required by public health law.

E. Preoperative radiographic evaluation when cardiac or respiratory symptoms are present or when there is a significant potential for thoracic pathology that may compromise the surgical result or lead to increased perioperative morbidity or mortality.

For the pregnant or potentially pregnant patient, see the [ACR Practice Guideline for Imaging Pregnant or Potentially Pregnant Adolescents and Women with Ionizing Radiation](#).

IV. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

See the [Practice Guideline for General Radiography](#).

A. Physician

Additionally, physicians interpreting pediatric chest radiographs should also have had 3 months of documented formal training in pediatric radiology, including interpretation and formal reporting of pediatric chest radiographs.

Physicians whose residency or fellowship training did not include the above may still be considered qualified to interpret pediatric chest radiographs when the following are documented:

1. The physician has supervised and interpreted chest radiographs for at least 2 years.
2. An official interpretation (final report) was generated for each study.

B. Radiologic Technologist

If pediatric chest radiography is to be performed, documented training in pediatric chest radiography is required (in addition to the qualifications listed under the general radiography guideline).

V. SPECIFICATIONS OF THE EXAMINATION

A. The written or electronic request for chest radiography should provide sufficient information to demonstrate the medical necessity of the examination and allow for its proper performance and interpretation.

Documentation that satisfies medical necessity includes 1) signs and symptoms and/or 2) relevant history (including known diagnoses). Additional information regarding the specific reason for the examination or a provisional diagnosis would be helpful and may at times be needed to allow for the proper performance and interpretation of the examination.

The request for the examination must be originated by a physician or other appropriately licensed health care provider. The accompanying clinical information should be provided by a physician or other appropriately licensed health care provider familiar with the patient's clinical problem or question and consistent with the state's scope of practice requirements. (ACR Resolution 35, adopted in 2006)

B. A standard chest examination should include an erect PA and left lateral projection made during full inspiration. The examination may be modified by the physician or qualified technologist depending on the clinical circumstances (e.g., when young children are not yet able to stand, supine images are performed). Other positions that may be used occasionally include supine, oblique, decubitus, or lordotic. Views in expiration or with nipple markers may also be used. At times a single view, such as an anteroposterior (AP) or PA view is appropriate.

C. The chest radiograph should include both of the lung apices and costophrenic angles. The mid-thoracic vertebral bodies and the left retrocardiac pulmonary vessels should be appropriately defined. The scapulae should be positioned off of the lungs on the PA view, and the arms should be elevated for the lateral view. The vertebral column should be centered between the clavicles. The radiographic beam should be appropriately collimated to include the structures listed while limiting exposure of the remainder of the patient and should not exceed the geometry of the image receptor.

D. Technical Factors

1. Adults: For a PA chest radiograph, the mean entrance skin exposure (ESE) should not exceed 0.3 mGy per exposure, and the exposure time should not exceed 40 msec. A high-kilovoltage technique (120-150 kVp) should be employed. An antiscatter technique (e.g., grid or air gap) should be used that reduces scatter at least as much as a 10:1 grid (preferably 12:1 grid). Technique charts should be posted for use by technologists in the radiographic room. An optimally exposed radiograph should display the lung parenchyma at a mid-gray level.
2. Newborns, infants, and children: In newborns and infants, a supine chest radiograph is preferred. For an AP or PA chest radiograph, the mean ESE should range from 0.05 to 0.3 mGy per exposure, respectively, for a 1-year-old to adult-sized patient using a 200-speed image receptor. The kVp should be selected to provide adequate contrast; it should range from as low as 60 for infants to as high as 150 for adult-sized patients.

When using high-kVp techniques on larger patients, an antiscatter technique (e.g., grid or air gap) should be selected to reduce scatter equivalent to that of a 10:1 grid (preferably 12:1 grid). After establishing the correct kVp as a function of patient size, a tube current should be selected which makes the exposure time as short as feasible for fixed radiographic units, to minimize patient motion during the exposure. The selected mAs and kVp should produce an image that displays the lung parenchyma at a mid-gray level.

E. The following quality control (QC) procedures should be applied to chest radiography:

1. When the examination is completed, the images should be reviewed by qualified personnel, either a physician or a radiologic technologist.
2. Images of less than optimal diagnostic quality should be repeated as necessary. A repeat-rate program should be part of the QC process.
3. Each film or image should be permanently marked with the patient's name, identification number, right or left side, patient position, and the date and the time of the examination. Labeling the image with the patient's date of birth is strongly recommended.

VI. DOCUMENTATION AND REPORTING

New images should be compared with prior chest examinations and/or other pertinent studies that may be available.

An official interpretation (final report) of the examination should be included in the patient's medical record. Reporting should be in accordance with the [ACR Practice Guideline for Communication of Diagnostic Imaging Findings](#).

VII. EQUIPMENT SPECIFICATIONS

The equipment requirements include a diagnostic radiographic unit with a rotating anode tube and tube filtration sufficient to achieve a half-value layer (HVL) greater than 3 mm of aluminum at 100 kVp. A grid should be used for adult radiography. At least a 10:1 grid (preferably 12:1 grid) with a minimum of 103 lines per inch (stationary) or 80 lines per inch (reciprocating) is recommended.

Radiographs shall be exposed only with equipment having a beam-limiting device that provides rectangular collimation.

There should be at least a 72-inch source-image distance (SID) to minimize magnification for routine upright projections. A 40-inch SID may be used when clinically necessary (e.g., supine positioning, infants and young children, immobilized patients, etc.).

The nominal source (focal spot) shall not exceed 2.0 mm; 0.6-1.2 mm is the recommended range.

For analog studies, intensifying screens shall be used. Any film-screen combination with a speed of at least 200 may be used.

Automatic processing is preferable with carefully controlled temperature and maintenance. A constant time and temperature shall be employed for manual processing.

Photostimulable phosphor plates or digital imaging techniques are an acceptable alternative to film-screen radiography, but require careful quality control. Since image degradation from scattered radiation is greater with photostimulable plates than with film-screen imaging, grids may be needed for radiographs of small patients.

VIII. RADIATION SAFETY IN IMAGING

Radiologists, medical physicists, radiologic technologists, and all supervising physicians have a responsibility to minimize radiation dose to individual patients, to staff, and to society as a whole, while maintaining the necessary

diagnostic image quality. This concept is known as “as low as reasonably achievable (ALARA).”

Facilities, in consultation with the medical physicist, should have in place and should adhere to policies and procedures, in accordance with ALARA, to vary examination protocols to take into account patient body habitus, such as height and/or weight, body mass index or lateral width. The dose reduction devices that are available on imaging equipment should be active or manual techniques should be used to moderate the exposure while maintaining the necessary diagnostic image quality. Patient radiation doses should be periodically measured by a medical physicist in accordance with the appropriate ACR Technical Standard. (ACR Resolution 17, adopted in 2006)

IX. QUALITY CONTROL AND IMPROVEMENT, SAFETY, INFECTION CONTROL, AND PATIENT EDUCATION CONCERNS

Policies and procedures related to quality, patient education, infection control, and safety should be developed and implemented in accordance with the ACR Policy on Quality Control and Improvement, Safety, Infection Control, and Patient Education Concerns appearing elsewhere in the ACR Practice Guidelines and Technical Standards book.

The lowest possible radiation dose consistent with acceptable diagnostic image quality should be used particularly in pediatric examinations. Radiation doses should be determined periodically based on a reasonable sample of pediatric examinations. Technical factors should be appropriate for the size and the age of the child and should be determined with consideration of parameters such as characteristics of the imaging system, organs in the radiation field, lead shielding, etc. Guidelines concerning effective pediatric technical factors are published in the radiological literature.

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