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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.

Revised 2008 (Resolution 30)\*

## **ACR–SPR–SSR PRACTICE GUIDELINE FOR THE PERFORMANCE OF RADIOGRAPHY OF THE EXTREMITIES IN ADULTS AND CHILDREN**

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### **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 of 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**

This guideline was revised by the American College of Radiology (ACR) in collaboration with the Society for Pediatric Radiology (SPR) and the Society for Skeletal Radiology (SSR).

Radiography is a proven and useful procedure for evaluation of the bones, joints, and soft tissues of the extremities. It should be performed for valid medical reasons, using the minimum radiation dose necessary to obtain a diagnostic quality examination. It is often the first study to be performed for evaluating pathology of the extremities, and additional specialized examinations may be required to complete the evaluation.

This guideline provides recommendations for performing extremity radiography and should be applied in accordance with the [ACR–SPR Practice Guideline for General Radiography](#).

### **II. INDICATIONS**

Indications for radiography of the extremities include, but are not limited to:

1. Trauma.
2. Pain.
3. Suspected physical abuse such as in infants and young children (see the [ACR–SPR Practice Guideline for Skeletal Surveys in Children](#)).
4. Metabolic diseases, nutritional deficiencies, and skeletal changes from systemic disease.
5. Benign and malignant neoplasms.
6. Primary non-neoplastic bone pathology.
7. Arthropathies.
8. Infections.
9. Preoperative or postoperative evaluation and/or follow-up.
10. Congenital syndromes and developmental disorders.
11. Vascular lesions.
12. Evaluation of soft tissues in an extremity (e.g., suspected foreign body).
13. Correlation of abnormal skeletal findings on other imaging studies.

### III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

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

### IV. SPECIFICATIONS OF EXAMINATION

A. The written or electronic request for a radiograph of the extremities 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 scope of practice requirements. (ACR Resolution 35, adopted in 2006)

All facilities should have protocols for standard radiographs of each anatomic area. These protocols should be designed to optimize diagnostic information, while minimizing radiation exposure. Gonadal shielding should be used when appropriate.

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

If the examination is performed, the abdomen and pelvis should be shielded with a lead apron or similar device.

B. The following table lists the minimum recommended views in routine circumstances. However, the views may be modified for any given clinical situation. Additional views may be warranted as part of the initial examination, or after review of the initial radiographs, to clarify suspected pathology. Furthermore, additional imaging examinations may be indicated based on the evaluation of the radiographs. In skeletal surveys for systemic disease, anteroposterior (AP) views are often sufficient.

**Table 1: Minimum Recommended Routine Views**

<b>Anatomic Area</b>	<b>Views</b>
Scapula	AP and lateral
Clavicle	AP and AP angulated view
Acromioclavicular joints	Upright AP and outlet view coned to the AC joint
Shoulder	Two views, one of which should be AP and additional view(s) as indicated by clinical circumstances
Humerus	AP and lateral
Elbow	AP and lateral
Forearm	AP and lateral
Wrist	PA, lateral, and oblique
Hand	PA, oblique, and lateral (fanned fingers)
Hand bone age	PA, left hand and wrist
Fingers	PA, lateral, and oblique
Hip	AP and lateral (frog-leg or true lateral)
Pelvis	AP
Femur	AP and lateral
Patella	PA, lateral, and patellar
Knee	AP and lateral
Tibia-fibula	AP and lateral
Ankle	AP, lateral, and oblique (mortise)
Os calcis	Lateral and axial
Foot	AP, lateral, and oblique
Toes	AP, lateral, and oblique

### C. Specific Considerations for the Pediatric Patient

1. A grid should not be used for extremity radiography in the infant and small child.
2. The kVp and mAs technique charts should be individualized according to patient size and age.

3. All efforts should be made to minimize radiation exposure to the health care workers and family members involved in patient positioning and immobilization.
4. Metabolic survey imaging of the child should include at least one PA view of the wrist, and an AP view of the knee.
5. When imaging a symptomatic bone or joint, comparison radiographs of the corresponding contralateral bone or joint are generally not indicated; however, limited comparison views may be helpful to verify or exclude pathology after initial review of the symptomatic extremity in some children. Furthermore, certain pathologic processes may warrant simultaneous evaluation of both the right and left sides; this is particularly true for disorders of the hip, for which AP and frog-leg views of the entire pelvis, with appropriate use of gonadal shielding, may be indicated.
6. Other than of the hip, comparison views of the uninvolved extremity are not recommended as a routine procedure, but limited comparison views may be helpful to verify or exclude pathology after initial review of the images in some children.

## V. DOCUMENTATION

Reporting should be in accordance with the [ACR Practice Guideline for Communication of Diagnostic Imaging Findings](#).

## VI. EQUIPMENT SPECIFICATIONS

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

## VII. RADIATION SAFETY IN IMAGING

Radiologists, medical physicists, radiologic technologists, and all supervising physicians have a responsibility to minimize radiation dose to individual patients, 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; if not, manual techniques should be used to moderate the exposure while maintaining the necessary diagnostic image quality. Periodically, radiation exposures should be

measured and patient radiation doses estimated by a medical physicist in accordance with the appropriate ACR Technical Standard. (ACR Resolution 17, adopted in 2006 – revised in 2009, Resolution 11)

## VIII. QUALITY CONTROL AND IMPROVEMENT, SAFETY, INFECTION CONTROL, AND PATIENT EDUCATION

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 appearing under the heading *Position Statement on QC & Improvement, Safety, Infection Control, and Patient Education* on the ACR web page (<http://www.acr.org/guidelines>).

Equipment performance monitoring should be in accordance with the [ACR Technical Standard for Diagnostic Medical Physics Performance Monitoring of Radiographic and Fluoroscopic Equipment](#).

## ACKNOWLEDGEMENTS

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Principal Reviewer: Mark W. Anderson, MD

### Society for Pediatric Radiology

Susan D. John, MD

J. Herman Kan, MD

### Society of Skeletal Radiology

David A. Rubin, MD, Chair

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Comments Reconciliation Committee

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Amy B. Kirby, MD, Co-Chair, CSC  
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Julie K. Timins, MD

**Suggested Reading** (Additional articles that are not cited in the document but that the committee recommends for further reading on this topic)

1. American College of Radiology. *Shoulder trauma*, 2005. Available at: [http://www.acr.org/s\\_acr/bin.asp?](http://www.acr.org/s_acr/bin.asp?)

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\*Guidelines and standards are published annually with an effective date of October 1 in the year in which amended, revised, or approved by the ACR Council. For guidelines and standards published before 1999, the effective date was January 1 following the year in which the guideline or standard was amended, revised, or approved by the ACR Council.

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