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Each practice parameter 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 and approval. The practice parameters 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 parameter and technical standard by those entities not providing these services is not authorized.

Revised 2018 (Resolution 24)*

ACR–AIUM–SPR–SRU PRACTICE PARAMETER FOR THE PERFORMANCE OF THE ULTRASOUND EXAMINATION FOR DETECTION AND ASSESSMENT OF DEVELOPMENTAL DYSPLASIA OF THE HIP

PREAMBLE

This document is an educational tool designed to assist practitioners in providing appropriate radiologic care for patients. Practice Parameters and Technical Standards are not inflexible rules or requirements of practice and are not intended, nor should they be used, to establish a legal standard of care¹. For these reasons and those set forth below, the American College of Radiology and our collaborating medical specialty societies caution against the use of these documents 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 practice parameters, 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 practice parameters 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 practice parameters. However, a practitioner who employs an approach substantially different from these practice parameters 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 practice parameters 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 practice parameters is to assist practitioners in achieving this objective.

¹ *Iowa Medical Society and Iowa Society of Anesthesiologists v. Iowa Board of Nursing*, N.W.2d (Iowa 2013) Iowa Supreme Court refuses to find that the *ACR Technical Standard for Management of the Use of Radiation in Fluoroscopic Procedures* (Revised 2008) sets a national standard for who may perform fluoroscopic procedures in light of the standard's stated purpose that ACR standards are educational tools and not intended to establish a legal standard of care. See also, *Stanley v. McCarver*, 63 P.3d 1076 (Ariz. App. 2003) where in a concurring opinion the Court stated that "published standards or guidelines of specialty medical organizations are useful in determining the duty owed or the standard of care applicable in a given situation" even though ACR standards themselves do not establish the standard of care.

I. INTRODUCTION

The clinical aspects contained in specific sections of this practice parameter (Introduction, Indications/Contraindications, Specifications of the Examination, and Equipment Specifications) were revised collaboratively by the American College of Radiology (ACR), the American Institute of Ultrasound in Medicine (AIUM), the Society for Pediatric Radiology (SPR), and the Society of Radiologists in Ultrasound (SRU). Recommendations for Qualifications and Responsibilities of Personnel, Written Request for the Examination, Documentation, and Quality Control and Improvement, Safety, Infection Control, and Patient Education vary among the organizations and are addressed by each separately.

This practice parameter is intended to assist practitioners performing sonographic studies for detection and assessment of developmental dysplasia of the hip (DDH). Adherence to the following recommendations will maximize the probability of detecting most of the abnormalities that relate to acetabular morphology, position of the femoral head, and stability.

When available, ultrasound is the preferred method for diagnostic imaging of the immature hip [1,2]. It affords direct visualization of the cartilaginous and other components of the hip joint and permits a dynamic examination that can be used to assess hip stability. The value of ultrasound diminishes as the femoral head ossifies, and therefore radiography is preferable for patients 6 months of age or older, unless the relationship of the femoral head to the acetabulum (including the triradiate cartilage) is adequately visualized sonographically.

II. INDICATIONS/CONTRAINDICATIONS AND TIMING

Two of the strongest risk factors for DDH are: a female newborn in frank breech presentation at birth and a history of a parent and/or a sibling with DDH [3].

A. Accepted indications for ultrasound of the infant hip include, but are not limited to:

1. Abnormal or equivocal findings of hip instability on physical examination of the hip
2. Any family history of DDH
3. Breech presentation at birth
4. Neuromuscular conditions
5. Monitoring infants with DDH undergoing treatment

B. Relative indications for ultrasound of the infant hip include, but are not limited to:

1. Oligohydramnios
2. Other intrauterine causes of postural molding

There are no absolute contraindications to ultrasound of the infant hip for DDH but, as discussed above, the study becomes less reliable compared to radiography as ossification of the femoral head progresses. Because of the presence of physiologic laxity, hip sonography is usually not performed on patients younger than 6 weeks of age, unless indicated based on an abnormal finding on physical examination [4].

III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

See the [ACR–SPR–SRU Practice Parameter for Performing and Interpreting Diagnostic Ultrasound Examinations](#) [5].

IV. WRITTEN REQUEST FOR THE EXAMINATION

The written or electronic request for an ultrasound examination for detecting developmental dysplasia of the hip 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 stated scope of practice requirements. (ACR Resolution 35 adopted in 2006 – revised in 2016, Resolution 12-b)

V. SPECIFICATIONS OF THE EXAMINATION [6,7]

Both hips should be examined. The diagnostic examination for DDH incorporates two orthogonal planes: a coronal view in the standard plane at rest and a transverse view of the flexed hip with and without stress. This enables an assessment of hip position, stability, and acetabular morphology.

If position, stability, and/or morphology cannot be assessed when attempting to perform a complete examination, the report should note the portion not performed. It is acceptable to perform the examination with the infant in a supine or in each lateral decubitus position separately.

Morphology is assessed at rest. The stress maneuver (posterior push maneuver) is performed to evaluate for hip instability with the hip and knee flexed and the thigh adducted (Barlow maneuver). If the femoral head is subluxated, subluxable, dislocated, or dislocatable, reducibility can be assessed by abducting and externally rotating the hip (Ortolani maneuver). If the examiner chooses, additional views and maneuvers can be obtained. It is important that the infant be relaxed when hips are assessed for instability. Feeding the infant during the examination can increase comfort and cooperation [8]. Stress maneuvers are not performed when patient is immobilized in a Pavlik harness or splint unless specifically requested by the referring orthopedic surgeon [9].

A. Coronal View

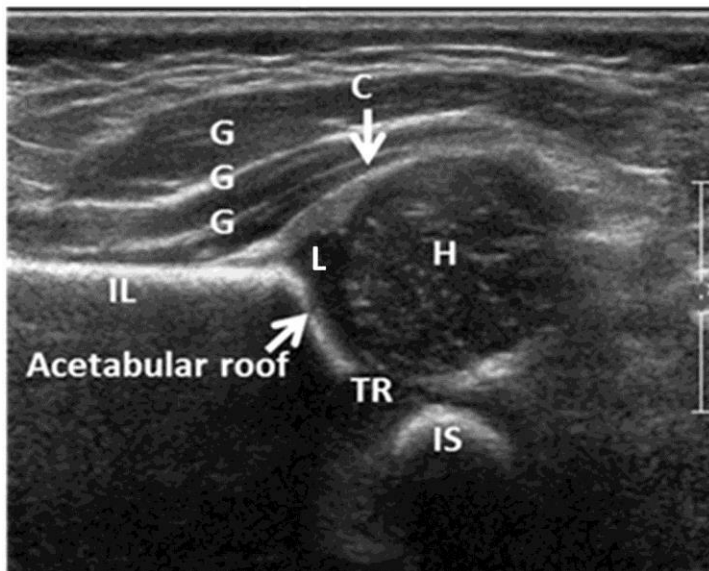
The anatomic coronal plane is approximately parallel to the infant's body. If the superior edge of the transducer is rotated 10 to 15 degrees (usually posteriorly) into an oblique coronal plane, the ilium will appear straight. After adjustment to assure that the imaging plane extends through the deepest part of the acetabulum (including visualization of the triradiate cartilage and the ischium), the resulting image will be a coronal view in the standard plane.

The standard plane is defined by identifying a straight iliac line, the tip of the acetabular labrum, and the transition from the os ilium to the triradiate cartilage (see Fig. 1). The coronal view in the standard plane can be obtained with the hip in the physiologic neutral position (15- to 20-degree flexion) or in the flexed position. Femoral head position and displacement are noted. Acetabular morphology is assessed in the coronal neutral view and may be validated by measuring the acetabular alpha angle (normally ≥ 60 degrees). Validation by angle and femoral head coverage measurement is optional. Performance of stress in this plane is also optional.

Figure 1–a. Coronal view: US transducer is placed parallel to the lateral aspect of the baby’s hip



Figure 1-b. Coronal ultrasound image



C	Capsule
G	Gluteus muscles
H	Cartilaginous femoral head
IL	Ilium
IS	Ischium
L	Labrum
TR	Triradiate cartilage

B. Transverse Flexion View

The examination is performed with the hip flexed at 90 degrees. The transverse plane is the anatomic transverse or axial plane with respect to the body, similar to the plane of an axial computed tomography (CT) image (Fig. 2). With the transducer nearly parallel to the femoral shaft, the femoral shaft is seen anteriorly, terminating in the femoral head, which rests on the ischium. The hip is tested for position at rest with passive abduction and adduction. The transducer is kept parallel to the femoral shaft placed in a posterolateral position so that imaging can be accomplished while the hip is abducted and adducted (Ortolani and Barlow maneuvers). Next, gentle stress is applied to assess stability. If the relationship of the femoral head to the posterior acetabulum changes with gentle stress, the hip is unstable. Again, application of stress is omitted when hips are being examined in a Pavlik harness or splint device unless otherwise requested by the orthopedic surgeon.

Figure 2–a. Transverse flexion view: the hip and knee are flexed 90 degrees, and the US transducer is placed perpendicular to the lateral aspect of the baby’s hip nearly parallel to the femoral shaft



Figure 2–b. Transverse ultrasound image



G	Gluteus muscles
H	Cartilaginous Femoral Head
L	Labrum
IS	Ischium
FM	Femoral metaphysis

C. Modification of the Diagnostic Examination

The supervising physician may modify the examination depending on clinical circumstances, such as during or following treatment for DDH.

VI. DOCUMENTATION

Adequate documentation is essential for high-quality patient care. There should be a permanent record of the ultrasound examination and its interpretation. Comparison with prior relevant imaging studies may prove helpful. Images of all appropriate areas, both normal and abnormal, should be recorded. Variations from normal size should generally be accompanied by measurements. Images should include the patient identification, facility identification, examination date, hip being imaged, image orientation, and whether stress is being applied. An official interpretation (final report) of the ultrasound examination should be included in the patient’s medical record, indicating acetabular morphology, position of femoral head, and stability [9]. Retention of the ultrasound examination images should be consistent both with clinical need and with relevant legal and local health care facility requirements.

Reporting should be in accordance with the [ACR Practice Parameter for Communication of Diagnostic Imaging Findings](#) [10].

VII. EQUIPMENT SPECIFICATIONS

Hip ultrasound for detecting DDH should be performed with a high-frequency linear transducer that permits penetration of the soft tissues. Total ultrasound exposure should be kept as low as reasonably achievable (ALARA), while optimizing diagnostic information.

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 website(<https://www.acr.org/Clinical-Resources/Practice-Parameters-and-Technical-Standards>).

Equipment performance monitoring should be in accordance with the [ACR-AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Real Time Ultrasound Equipment](#) [11].

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