ACR–ACOG–AIUM–SPR–SRU PRACTICE PARAMETER FOR THE PERFORMANCE OF ULTRASOUND OF THE FEMALE PELVIS

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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 care[1]. 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 practitioner considering all the circumstances presented. Thus, an approach that differs from the guidance in this document, 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 this document when, in the reasonable judgment of the practitioner, such course of action is indicated by variables such as the condition of the patient, limitations of available resources, or advances in knowledge or technology after publication of this document. However, a practitioner who employs an approach substantially different from the guidance in this document may consider documenting in the patient record information sufficient to explain the approach taken.

The practice of medicine involves the science, and 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 the guidance in this document 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 purpose of this document is to assist practitioners in achieving this objective.

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1 *Iowa Medical Society and Iowa Society of Anesthesiologists v. Iowa Board of Nursing, 831 N.W.2d 826 (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, Specifications of the Examination, and Equipment Specifications) were developed collaboratively by the American College of Radiology (ACR), the American Institute of Ultrasound in Medicine (AIUM), the American College of Obstetricians and Gynecologists (ACOG), the Society for Pediatric Radiology (SPR), and the Society of Radiologists in Ultrasound (SRU). Recommendations for Qualifications and Responsibilities of Personnel, Written Requests for the Examination, Documentation, and Quality Control and Improvement, Safety, Infection Control, and Patient Education vary among the four organizations and are addressed by each separately.

This practice parameter has been developed to assist physicians and other health care providers performing sonographic studies of the female pelvis. Ultrasound of the female pelvis should be performed only when there is a valid medical reason, and the lowest possible ultrasonic exposure settings should be used to gain the necessary diagnostic information. In some cases, additional or specialized examinations may be necessary. Although it is not possible to detect every abnormality, adherence to the following practice parameter will maximize the probability of detecting most abnormalities. For ultrasound of the urinary bladder, see ACR–AIUM–SPR–SRU Practice Parameter for the Performance of an Ultrasound Examination of the Abdomen and/or Retroperitoneum [1].

II. INDICATIONS

Indications for pelvic sonography include, but are not limited to, the following:

1. Evaluation of pelvic pain
2. Evaluation of pelvic masses
3. Evaluation of dyspareunia
4. Evaluation of pregnancy of unknown location or ectopic pregnancy
5. Evaluation of endocrine abnormalities, including polycystic ovaries
6. Evaluation of dysmenorrhea
7. Evaluation of amenorrhea
8. Evaluation of abnormal uterine bleeding (AUB)
9. Evaluation of postmenopausal bleeding
10. Evaluation of delayed menses
11. Follow-up of a previously detected abnormality
12. Evaluation, monitoring, and/or treatment of patients with infertility
13. Evaluation when there is limited clinical examination of the pelvis
14. Evaluation for signs or symptoms of pelvic infection
15. Further characterization of a pelvic abnormality noted on another imaging study
16. Evaluation of congenital uterine, gonadal, and lower genital tract anomalies
17. Evaluation of excessive bleeding, pain, or signs of infection after pelvic surgery, delivery, or abortion
18. Localization of an intrauterine device (IUD)
19. Surveillance for malignancy in high-risk patients
20. Evaluation of incontinence or pelvic organ prolapse
21. Guidance for interventional or surgical procedures
22. Preoperative and postoperative evaluation of pelvic structures

III. QUALIFICATIONS OF PERSONNEL

See the ACR–SPR–SRU Practice Parameter for the Performance and Interpretation of Diagnostic Ultrasound Examinations [2].

IV. SPECIFICATIONS OF THE EXAMINATION

The following section details the examination to be performed for each organ and anatomic region in the female pelvis. All relevant structures should be identified by the transabdominal and/or transvaginal approach. A

transrectal or transperineal approach may be useful in patients who are not candidates for introduction of a vaginal transducer and in assessing the patient with pelvic organ prolapse. More than one approach may be necessary [3,4].

IV. SPECIFICATIONS OF THE EXAMINATION

A. General Pelvic Preparation

For a transabdominal pelvic sonogram a full bladder is typically needed to displace the bowel from the field of view and to provide an optimal acoustic window to better visualize the pelvic structures, particularly if a transvaginal examination cannot be performed. Occasionally, overdistention of the bladder may compromise the evaluation. When this occurs, imaging may be repeated after partial bladder emptying. If any abnormalities of the urinary bladder are detected, these findings should be documented in accordance with the ACR-AIUM-SPR-SRU Practice Parameter for the Performance of an Ultrasound Examination of the Abdomen and/or Retroperitoneum [1].

For a transvaginal sonogram, the urinary bladder is preferably empty. The patient, the sonographer, or the clinician may introduce the vaginal transducer, preferably under real-time monitoring. Consideration of having a chaperone present should be in accordance with local policy [5,6]. Two-handed technique (one hand on probe and one hand on external lower abdomen) is helpful to assess mobility of structures and may help move bowel away from the adnexa or to stabilize adnexal structures to aid in their visualization. It is recommended that the examiner inform the patient before a dynamic maneuver such as direct manual pressure on the lower abdomen or sliding of the probe is performed.

IV. SPECIFICATIONS OF THE EXAMINATION

B. Uterus

The vagina and uterus provide anatomic landmarks that can be used as reference points for the other pelvic structures, whether normal or abnormal. When examining the uterus, the following should be evaluated: (a) the uterine size, shape, and orientation; (b) the endometrium; (c) the myometrium; and (d) the cervix. In children and adolescents, note should be made whether the uterine configuration is prepubertal or postpubertal. The vagina may be imaged while introducing the transducer and can be a landmark for the cervix [7,8]. Although not part of the standard examination, if evaluation of the vaginal mucosa and rectovaginal septum are desired, instillation of 20 mL of gel into the vagina with distension of the vaginal fornices may be helpful [9].

Overall uterine length is evaluated in sagittal view from the fundus to the cervix (to the external os, if it can be identified). The length can be measured as a straight line from the fundus to the external os using outer-to-outer technique or by measuring from the fundal region along the endometrial lining and endocervical canal (trace method) using outer-to-outer technique [10]. The depth of the uterus (anteroposterior dimension) is measured in the same sagittal view from its anterior to posterior walls, perpendicular to the longitudinal axis of the endometrium. The maximum width is measured in the transverse or coronal view. If volume measurements of the uterine corpus are performed, the cervical component should be excluded from the uterine length measurement. Note is to be made that a volume measurement of the corpus in the nongravid state is an estimate because there is no sonographic anatomic landmark for where the cervix ends and the uterine corpus begins.

Abnormalities of the uterus should be documented [11-13]. The myometrium and cervix should be evaluated for contour changes, echogenicity, masses, and cysts as well as symmetry between anterior and posterior myometrium. The myometrial echogenicity is reported as either homogenous or heterogeneous. If the myometrium is heterogenous due to shadowing or hyperechogenic islands, that should be specified. Myometrial lesions need to be assessed and described. When an abnormality of the myometrium is noted, the objective finding leading to this conclusion must be documented. For example, simply documenting adenomyosis as a subjective finding is insufficient and has poor reproducibility and reliability[14,15]. Note should be made when the uterus is not mobile or tenderness is elicited during the examination. Fixed retroflexion of the uterus, particularly in the presence of posterior adenomyosis, or absence of sliding between the uterus and adjacent rectum or

adnexa, should be recognized as a possible indicator of pelvic adhesion seen in deep endometriosis (DE) in the posterior cul-de-sac [16]. Size and location of clinically relevant lesions should be documented. Masses that may require follow-up or intervention should be measured in at least two dimensions, acknowledging that it is not usually necessary to measure all uterine fibroids.

The endometrium should be evaluated for thickness, focal abnormality, echogenicity and echotexture (homogeneous vs heterogeneous), and the presence and characteristics of fluid or masses in the uterine cavity. The thickest part of the endometrium should be measured perpendicular to its longitudinal plane in the anteroposterior diameter from echogenic to echogenic border, using outer-to-outer technique [10] (see Figure 1). When fluid is present in the cavity, the endometrial thickness should be measured on either side of the fluid in the same plane and the measurements added together to report the total thickness; the fluid should be excluded in this measurement (see Figure 2). In reproductive-aged postmenarchal patients, assessment of the endometrium should allow for variations expected with phases of the menstrual cycle and with hormonal supplementation [13,17,18]. It must be reported if the endometrium is not adequately seen in its entirety or is ill defined; in this circumstance, measurement may not be included in the report. The endometrium should be evaluated using power Doppler to assess the vascular pattern. The location of any areas of focal hypervascularity or feeding vessels should be documented. Sonohysterography may be a useful to further evaluate the patient with AUB, an abnormal appearing endometrium, and to further evaluate or an incompletely visualized endometrium. (See the ACR–ACOG–AIUM–SRU Practice Parameter for the Performance of Sonohysterography [19]). If the patient has an IUD, its location should be documented.

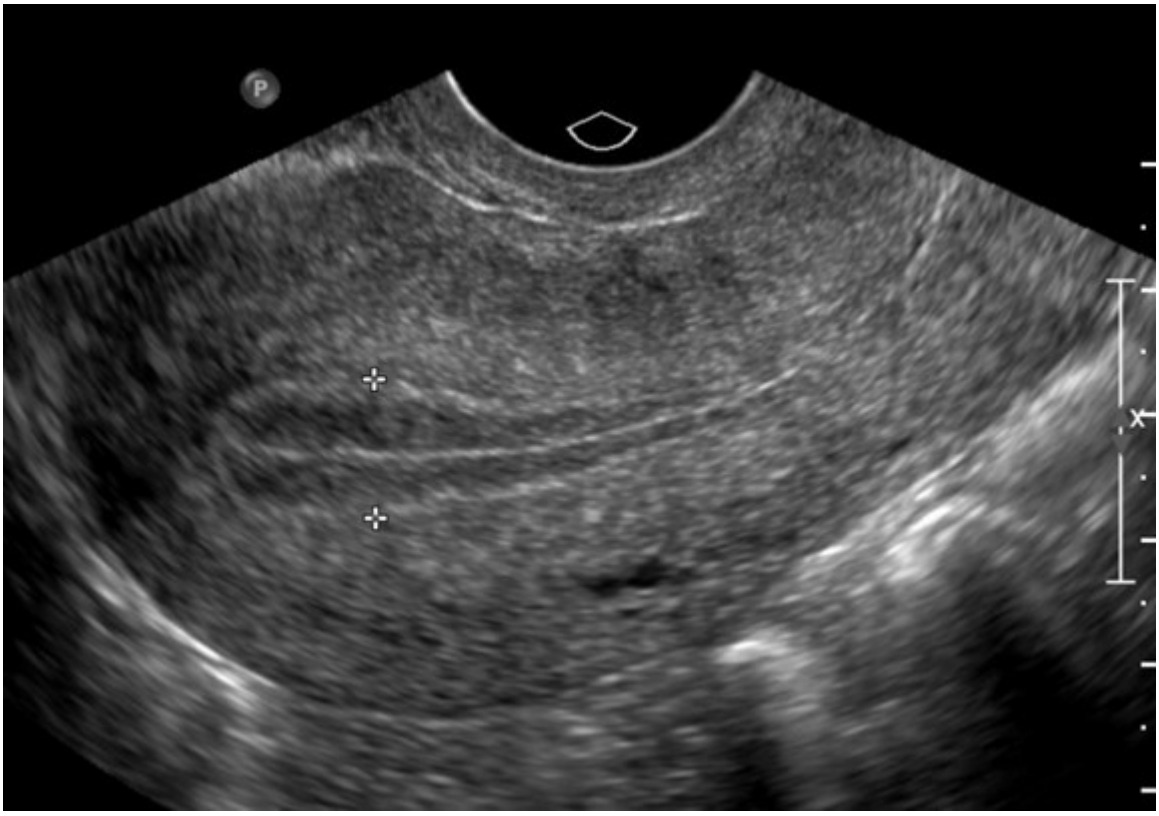

Figure 1. Measurement of endometrial thickness.

The endometrial thickness measured in its thickest portion from echogenic to echogenic border (calipers) perpendicular to the midline longitudinal plane of the uterus.

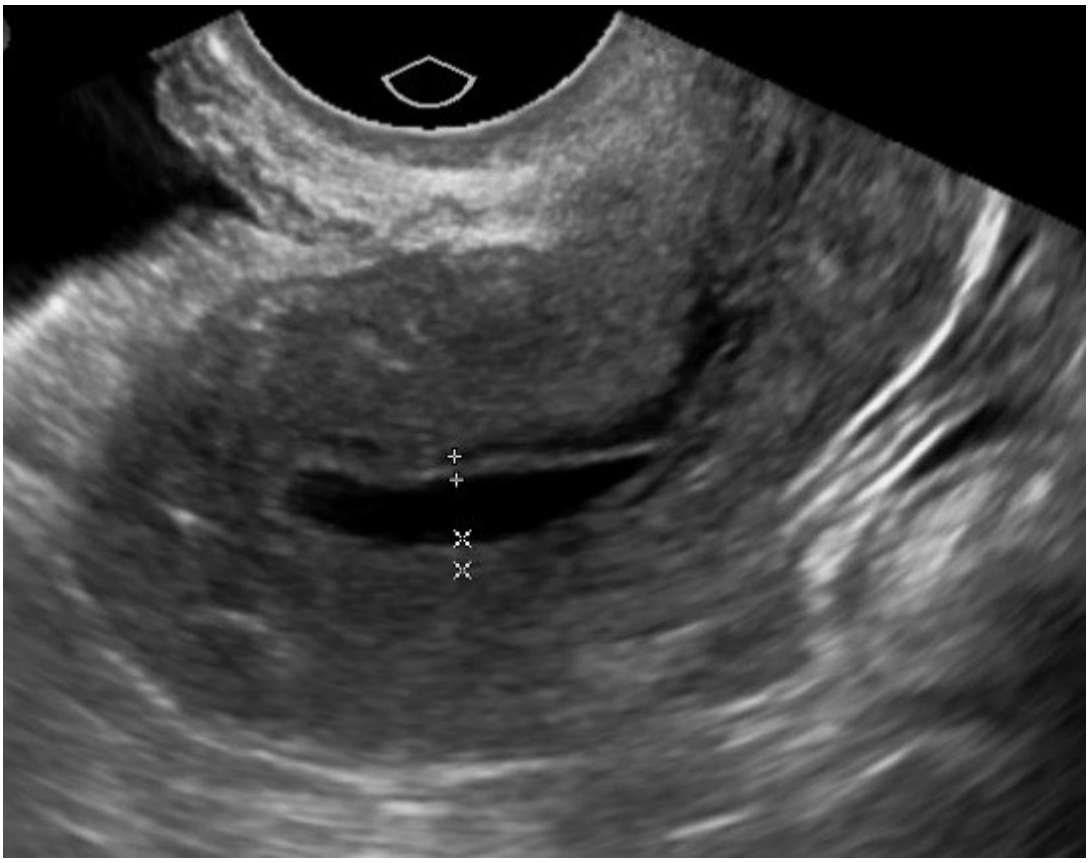

Figure 2. Measurement of endometrium with fluid in cavity.

In the presence of endometrial fluid, the measurement of the two separate layers of the endometrium (calipers), excluding the fluid, are added to determine the endometrial thickness.

The addition of 3-D ultrasound (transabdominal, transvaginal, transperineal, and/or transrectal) can be helpful in many circumstances, including, but not limited to, evaluating the relationship of masses to the endometrial cavity, identifying uterine congenital anomalies and thickened and/or heterogenous endometrium, identifying uterine synechia, and evaluating the location and orientation of an IUD and the integrity of the pelvic floor [16,20-27]. Performing 3-D ultrasound of the uterus may be enhanced if done in the luteal phase because the endometrium is hyperechoic and enables visualization of uterine cavity abnormalities.

IV. SPECIFICATIONS OF THE EXAMINATION

C. Adnexae Including Ovaries and Fallopian Tubes

When evaluating the adnexa, an attempt should be made to identify the ovaries first because they can serve as a major point of reference for assessing the presence of adnexal pathology. Ovarian size may be determined by measuring the ovary in three dimensions (longitudinal, transverse, and anteroposterior diameters) on views obtained in two orthogonal planes [28,29] with calculation of ovarian volume as necessary. Any ovarian abnormalities should be documented [30-35].

The ovaries may not be identifiable in some individuals . This issue occurs most frequently before puberty and after menopause when the ovaries are smaller and/or follicles are not consistently present to serve as a landmark [36]. The adnexal region should be surveyed for abnormalities, particularly masses and dilated tubular structures.

If an adnexal abnormality is noted, its relationship to the ovaries and uterus should be assessed. The size and sonographic characteristics of adnexal masses should be documented. Any ovarian lesion should be fully documented with both gray scale and color; gray scale alone cannot determine solid versus debris containing cystic mass. The addition of 3-D to 2-D ultrasound can be helpful to differentiate multilocular ovarian cysts from hydrosalpinges. The use of the sliding organ sign technique can demonstrate the presence or absence of mobility

of the adnexal structures [37,38]. Abnormal ovarian location, such as in the posterior cul-de-sac with adhesion, particularly to the uterus, pelvic side wall, or contralateral ovary, should be documented because this may indicate endometriosis, other sources of adhesions, or displacement of the ovary in the setting of adnexal torsion (ovarian torsion, isolated tubal torsion, or both ovarian and tubal torsion). Asymmetrical enlargement of the ovary and peripheral location of the follicles are suggestive of ovarian torsion. Identifying the twisted vessel ("whirlpool" sign) is also helpful in making this diagnosis [39]. The presence of Doppler signal does not exclude ovarian torsion.

All ovarian lesions should be documented according to a validated standardized risk stratification system. A lesion is defined as a finding judged to be inconsistent with normal physiologic function. The size of the ovary and the lesion are measured in mm as the largest 3 diameters in 2 perpendicular planes. If using the Oviarian-Adnexal Imaging Reporting Data System (O-RADS), lesions are described as unilocular, unilocular-solid, multilocular, multilocular-solid, or solid. Internal contents of cysts should be described as anechoic, low level internal echoes, ground glass internal echoes, or mixed internal echoes. Papillary projections are solid projections at least 3 mm in height when measured from the cyst wall. Papillary projections and/or the largest solid portion should be measured in 3 planes. Color score is measured subjectively: 1 is no vascular flow, 2 is minimal, 3 is moderate, 4 is highly vascular. If the mass has typical features which suggest a specific diagnosis, such as an endometrioma or teratoma, this information should be provided [35,40,41]. If sonographic characteristics are suggestive of a specific diagnosis, such as hemorrhagic cyst, endometrioma, mature teratoma, hydrosalpinx, peritoneal inclusion cyst or pedunculated fibroid, this information should also be provided [40-44, 54-55].

Spectral, color, and/or power Doppler ultrasound may be useful to evaluate the vascular characteristics of pelvic lesions [45-48].

IV. SPECIFICATIONS OF THE EXAMINATION

D. Cul-de-Sac

The cul-de-sac and bowel posterior to the uterus should be evaluated for the presence of free or loculated fluid, or mass. If a mass is detected, its size, position, shape, sonographic characteristics, and relationship to the ovaries and uterus should be documented. Differentiation of normal loops of bowel from a mass may be difficult if only a transabdominal examination is performed. The rectosigmoid colon wall may be imaged from the posterior vaginal fornix [49]. Special attention to the posterior cul-de-sac should be made in women with pelvic pain, with fixed retroflexion of the uterus, with sonographic evidence of posterior adenomyosis and with known or clinically suspected endometriosis [16,49]. Hypoechoic masses with tapering ends in the rectosigmoid wall may be seen in DE [49,50]. The presence of adhesions in the cul-de-sac may be inferred in the absence of a normal uterine sliding sign [49,51] during dynamic imaging. Any tenderness during the ultrasound is helpful to be documented.

V. DOCUMENTATION

Reporting should be in accordance with the ACR Practice Parameter for Communication of Diagnostic Imaging Findings [52].

Adequate documentation is essential for high-quality patient care. There should be a permanent record of the ultrasound examination and its interpretation. Cine clips may be useful. Comparison with prior relevant imaging studies should be made and is helpful when available. Images of all appropriate areas, both normal and abnormal, should be recorded. Variations from normal size should generally be accompanied by measurements. Images should be labeled with the patient identification, facility identification, examination date, anatomic landmarks, and image orientation. An official interpretation (final report) of the ultrasound examination should be included in the patient's medical record. Retention of the ultrasound examination images should be consistent both with clinical need and with relevant legal and local health care facility requirements.

VI. EQUIPMENT SPECIFICATIONS

Equipment performance monitoring should be in accordance with the ACR–AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Real Time Ultrasound Equipment [53].

The sonographic examination of the female pelvis should be conducted with a real-time scanner, preferably using sector, curved linear, and/or endocavitary transducers. The transducer should be adjusted to operate at the highest frequency appropriate for clinical circumstances, realizing that there is a trade-off between resolution and beam penetration.

VII. QUALITY CONTROL AND IMPROVEMENT, SAFETY, INFECTION CONTROL, AND PATIENT EDUCATION

All transducers should be cleaned after use. Any transducer in contact with mucosa should be covered by a protective sheath prior to use. Following the examination, the sheath should be disposed of and the transducer cleaned with high-level disinfectant. The method of high-level disinfection may depend on manufacturer's specifications and infectious disease recommendations.

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/Advocacy-and-Economics/ACR-Position-Statements/Quality-Control-and-Improvement).

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