



Obstetrics and Gynecology Residency Ultrasonography Program Curriculum

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ABSTRACT

Ultrasound skills—technical and interpretive—are essential to the practice of obstetrics and gynecology. The Accreditation Council for Graduate Medical Education provides guidance, though limited, on what an obstetrics and gynecology residency ultrasonography program curriculum should include. A review of several educational institutions' approaches to the ultrasonography curriculum is presented. A detailed discussion of the Texas Tech University Health Sciences Center, Paul L Foster School of Medicine, obstetrics and gynecology residency ultrasonography program curriculum is provided for additional consideration.

Keywords: Obstetrics and gynecology ultrasound residency curriculum, Accreditation council for graduate medical education, Ultrasound technical skills, Ultrasound interpretive skills.

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INTRODUCTION

Ultrasound skills—technical and interpretive—are essential to the practice of obstetrics and gynecology. Of all modalities available, ultrasonography is the mainstay of diagnostic imaging in the care of women. The safety and diagnostic capability of ultrasonography during pregnancy has been hailed as one of the top technical advances in obstetrics and gynecology.¹ Therefore, it is imperative that residents in obstetrics and gynecology acquire the ability to perform and interpret imaging studies using ultrasonography.

ULTRASONOGRAPHY EDUCATION: THE CHARGE TO RESIDENCIES

The Accreditation Council for Graduate Medical Education (ACGME) has provided guidance, though somewhat limited, on what the ultrasonography curriculum of an obstetrics

and gynecology residency should include.² The obstetrical portion of the educational program should include, 'the full range of commonly employed obstetrical diagnostic procedures, including ultrasonography and other relevant imaging techniques.' The gynecological portion should include, 'the full range of commonly employed gynecologic diagnostic procedures, including ultrasonography and other relevant imaging techniques.' In addition, 'residents must be able to competently perform all medical, diagnostic, and surgical procedures considered essential for the area of practice.' With this basic framework, each residency program is expected to develop and use an ultrasonography educational component that will result in ultrasonography competency of its graduates.

RESOURCES FOR ULTRASONOGRAPHY CURRICULUM DEVELOPMENT

Guidelines are available for the development of the ultrasonography curriculum. The American Congress of Obstetrics and Gynecology (ACOG) have several publications that may be used in the ultrasonography educational curriculum.³⁻⁷ Likewise, the American Institute of Ultrasound in Medicine (AIUM) has set forth guidelines for performance of obstetrical and gynecological scans.⁸⁻¹² AIUM has also suggested that a minimum 300 obstetrical and gynecological scans should be performed by a resident in order to develop competency.¹³ Other organizations that have developed guidelines for training residents in ultrasonography include the International Society of Ultrasound in Obstetrics and Gynecology and the Association of Program Directors in Radiology.^{14,15}

The ACOG and AIUM guidelines have been used to develop an integrated obstetrical ultrasonography curriculum not only for obstetrics and gynecology residents, but also radiology residents and maternal fetal medicine fellows by the Madigan Army Medical Center.¹⁶ Pretests and post-tests were administered to all participants; there were a significant improvement in the scores for all residents and fellows after the completion of the ultrasonography curriculum. The curriculum included structured readings, visual presentations, and hands-on performance of obstetrical and gynecological ultrasound examinations, all within the guidelines of ACOG and AIUM.

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The University of New Mexico has developed a competency-based obstetrics and gynecology residency ultrasound training curriculum based on the guidelines for AIUM accreditation.¹⁷ The curriculum includes didactic sessions, reading assignments, case discussions, written examinations and evaluations of clinical competency. AIUM accreditation guidelines are fully incorporated in the curriculum and the successful candidates should be able to obtain AIUM laboratory accreditation upon establishing their independent practices after residency. The curriculum extends through all 4 years of residency and each resident is expected to perform competently a minimum of 300 hours of supervised obstetrical and gynecological scanning. Competencies are assessed in three areas: first trimester scanning, second and third trimester examinations and gynecological ultrasound examinations.

In addition to live patient scanning, many programs have the capability to train residents using high fidelity simulation. This training modality is especially useful when transvaginal imaging techniques are being taught. The emergency medicine residencies at Advocate Christ Medical Center, Oak Lawn, Illinois and Georgetown University/Washington Hospital Center reported enhancement in the educational experience of residents using high fidelity simulation.¹⁸ High fidelity ultrasound simulation may be used to prepare residents before their actual patient encounters and to bolster their ultrasound performance confidence.

Another useful resource for training obstetrics and gynecology residents in ultrasonography is a clinical skills orientation program. First year residents are expected to have basic ultrasonography skills on the first day of residency. However, most first year residents have not completed a rotation in diagnostic obstetrics and gynecology ultrasonography during medical school. Duff reported the educational satisfaction of residents completing a 5-day mini-boot camp at the beginning of the academic year for first year obstetrics and gynecology residents.¹⁹ Nielsen and associates from the Madigan Army Medical Center developed a clinical skills orientation program for first year obstetrics and gynecology residents that included basic ultrasound scanning.²⁰ Pretests and post-tests were given; scores were significantly increased after the orientation program. The participating residents recommended continuance of an annual clinical orientation program.

One tool that have proven useful in training obstetrics and gynecology residents in interpreting sonographic images of adnexal masses is a morphological scoring system. Several morphological scoring systems are available.^{21,22} Lee et al showed that junior obstetrics and gynecology residents were able to fairly evaluate adnexal masses using a morphological scoring system.²³

THE CURRICULUM AT TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER

The obstetrics and gynecology residency ultrasound program curriculum at the Paul L Foster School of Medicine, Texas Tech University Health Sciences Center has been developed to progressively train residents to achieve competency. Each first year resident completes a month-long rotation on obstetrical and gynecological ultrasonography. The resident is directly supervised by a maternal fetal medicine staff member for the obstetrical portion and an obstetrician-gynecologist with special competency in pelvic ultrasonography during the gynecological portion of the rotation. Basic scanning and interpretation skills are taught. Another month-long rotation is required during the second year of residency. Advanced scanning and interpretation skills are taught.

In addition to hands-on training, a required reading list comprised of standard obstetrics textbook chapters on ultrasonography, selected ACOG publications, and the Challenger questions on obstetrical and gynecological ultrasonography is given to each resident on the rotation (see Table 1). Additional reading assignments may be given to supplement the discussion of interesting clinical cases that may present.

After completion of the first year rotation on ultrasonography the resident is expected to perform and interpret basic obstetrical and gynecological ultrasound exams. The training continues after the rotation with hands-on experience, attendance at obstetrical and gynecological case conferences and direct supervision by faculty staff. Upon completion of the second year rotation the resident is expected to have advanced scanning and interpretation skills. Recognition and management of common fetal anomalies, adnexal and uterine masses, and other obstetrical and gynecological disorders are the goals. Table 2 is one of the several evaluation tools that are used to assess the ultrasonography competency skills of residents upon the completion of the rotations. Tables 3 and 4 represent in a matrix form the learning objectives of each rotation, the integration of ACGME's 6 competencies, the teaching techniques, and the evaluation methods that are used in the obstetrics and gynecology residency program at the Paul L Foster School of Medicine, Texas Tech University Health Sciences Center at El Paso, TX. Global and individual evaluations of ultrasound competency of obstetrics and gynecology residents in our program have consistently shown that all residents have performed at or above expectations.

Each first and second year obstetrics and gynecology resident participates in a pelvic ultrasound simulation workshop, which spans two half days. Prior to this workshop, the residents are assigned required readings and expected to

Table 1: Ultrasonography curriculum: reading assignments

Week 1:	Williams Obstetrics (23rd edition), Chapter 16—Fetal imaging Challenger OB—Physics and orientation
Week 2:	Challenger OB—Ultrasound for fetal anomalies Challenger OB—Ultrasound guidance for procedures Challenger—Invasive procedures in pregnancy
Week 3:	Challenger—Amniotic fluid ACOG Practice Bulletin #101—Ultrasound in pregnancy ACOG Practice Bulletin # 88—Invasive prenatal testing for aneuploidy
Week 4:	Challenger—Antepartum testing ACOG Committee Opinion # 9—Antepartum fetal surveillance ACOG Committee Opinion # 545—Noninvasive prenatal testing for fetal aneuploidy
Week 5:	ACOG Committee Opinion #297—Nonmedical use of obstetrical ultrasonography ACOG Practice Bulletin# 77—Screening for fetal chromosomal abnormalities
Week 6:	Challenger—IUGR and Doppler
Week 7:	Challenger—Cervical insufficiency
Week 8:	Complete post tests for all assigned Challenger readings

watch an educational video on pelvic masses and pain. On the first day, the residents are given a precourse assessment as a group and then rotated through simulation stations. The stations include three low or high fidelity pelvic exam stations with ultrasound correlation and individual

feedback, abdominal ultrasound station with 3 standardized patients, and pelvic ultrasound on UltraSim, an ultrasound simulation program. Each station is proctored by Texas Tech faculty from both obstetrics and gynecology and Radiology departments. A postcourse assessment and survey is then conducted at the end of the workshop.

On the second day of the workshop, standardized patients are scanned by each resident. This portion of the simulation emphasizes proper ultrasound technique, identification of pelvic structures, and preparation of the ultrasound report. The residents are proctored by faculty from the Obstetrics/Gynecology and Radiology departments. The pre and post test results are also provided to the program directors for feedback and review with individual residents. The residents are required to take the simulation course during their first and second years and their scores are assessed for educational progression.

DISCUSSION

Most ultrasonography program curricula in obstetrics and gynecology residency programs are adequate in ensuring competency for the graduating resident. A recent CREOG survey of 136 ultrasound program directors in accredited obstetrics and gynecology residency programs assessed fetal ultrasound training as adequate.²⁴ However, the same survey revealed that only 2/3 of the residents believes that their training would be adequate by graduation. Another survey of former residents from an accredited obstetrics and gynecology residency program revealed that many of them

Table 2: Ultrasound rotation individual evaluation of resident

Please assess the performance of the resident using the following rating scale:					
5 = Exceptional	Performs at a level far above the typical resident.				
4 = Superior	Performs at a level above the typical resident				
3 = Competent	Performs at a level of a typically competent resident				
2 = Marginal	Performs below the level of the typical resident.				
1 = Deficient	Performs well below the level of the typical resident				
NA = not applicable	Not applicable or unable to evaluate.				
<i>History taking/counseling:</i>					
1. Obtains pertinent history including history of genetic problems	5	4	3	2	1 NA
2. Explains to the patient in common lay terms all concepts of evaluation	5	4	3	2	1 NA
3. Counsels patients in an unbiased and informative manner	5	4	3	2	1 NA
4. Describes the options of care accurately; description of procedures	5	4	3	2	1 NA
5. Shows sensitivity to patients cultural and religious believes	5	4	3	2	1 NA
<i>Procedural performance:</i>					
6. Can perform a complete obstetrical ultrasound	5	4	3	2	1 NA
7. Can perform a fetal surveillance evaluations	5	4	3	2	1 NA
8. Shows appropriate technique in invasive diagnostic procedures	5	4	3	2	1 NA
9. Integrates knowledge and skill effectively	5	4	3	2	1 NA
10. Responds appropriately to untoward findings or events	5	4	3	2	1 NA
11. Summarizes procedures and asks for patient feedback	5	4	3	2	1 NA
<i>Comments on strengths:</i>					
Describe areas needing improvement:					
Signature of Evaluator: _____					
Date: _____					



Table 3: Ultrasound curriculum matrix for PGY-1 obstetrics and gynecology

Training level	PGY-1							
Rotation	Ultrasound							
Educational purpose	To understand basic principles of ultrasound technology, perform and interpret basic ultrasound for both obstetrics and gynecological patients. To counsel patients on abnormal findings and procedures							
Learning objectives	MK	PC	PBLI	IPS	PROF	SBP	Teaching techniques	Evaluation methods
1. Perform and interpret ultrasound evaluation of the following: <ul style="list-style-type: none"> • Early pregnancy • Multiple pregnancies • Fetal viability • Early pregnancy failure • Ectopic pregnancy • Fetal biometry • Fetal growth/weight • Fetal anatomy • Fetal lie • Amniotic fluid • Biophysical profile • Cervical length shape • Uterine, size and shape • Endometrial thickness • Ovarian morphology • Uterine abnormalities 							Simulation Direct supervision	Direct supervision Global evaluations
2. Demonstrate understanding of basic ultrasonic principles							Didactics Simulation Direct supervision	CREOG Global evaluations Direct feedback
3. Demonstrate understanding of Doppler and imaging and signal processing							Didactics Simulation Direct supervision	CREOG Global evaluations Direct feedback
4. Counsel patients on first and second trimester screening							Didactics Simulation Direct supervision	CREOG Global evaluations Direct feedback
5. Obtain consent for amniocentesis and use of vaginal probe							Didactics Simulation Direct supervision	CREOG Global evaluations Direct feedback
6. Counsel patients on any abnormal finding							Didactics Simulation Direct supervision	Global evaluations

MK: Medical knowledge; PC: Patient care; PBLI: Practice based learning and improvement; IPS: Interpersonal and communication skills; Prof: Professionalism; SBP: System based practice

had low confidence in gynecologic ultrasound.²⁵ Another area of concern is the safety of obstetric ultrasound. An electronic survey was submitted to all ACGME-accredited obstetrics and gynecology residencies and maternal fetal medicine fellowship programs from 2008 to 2010.²⁶ The great majority of the respondents indicated that their knowledge of obstetric ultrasound safety was low.

Altogether, these surveys show that there is still much work to be done in the ultrasonography curricula of obstetrics and gynecology residency programs. We believe that our program offers a reasonable paradigm for training obstetrics and gynecology residents in ultrasonography. The other ultrasound programs that were discussed also offer methods

that might be adapted to meet the needs of specific obstetrics and gynecology residency programs.

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Table 4: Ultrasound curriculum for PGY-2 obstetrics and gynecology

Training level	PGY-2								
Rotation	Ultrasound								
Educational purpose	To understand basic principles of ultrasound technology and use appropriately for diagnosis and surveillance of normal and complicated pregnancies, gynecology disorders and infertility.								
Learning objectives	MK	PC	PBLI	IPS	PROF	SBP	Teaching techniques	Evaluation methods	
1. Perform basic obstetrics and gynecology sonograms as outlined in PGY-1 objectives							Simulation Direct supervision	Direct feedback Global evaluations	
2. Assess and document fetal anatomy 18-22 weeks: • Head • Chest • Abdomen • Spine • Extremities • Sex • Amniotic fluid and abnormalities • Cord morphology • Nuchal translucency and cystic hygroma							Simulation Direct supervision	Direct feedback Global evaluations	
3. Assess with ultrasound the following: • Uterus and its abnormalities • Ovaries and morphology							Simulation Direct supervision	Direct feedback Global evaluations	
4. Perform infertility assessment							Simulation Direct supervision	Direct feedback Global evaluations	
5. Identify gynecological emergencies by TVS and TAS							Simulation Direct supervision	Direct feedback Global evaluations	
6. Perform sonohysterogram							Simulation Direct supervision	Direct feedback Global evaluations	
7. Demonstrate basic ultrasound principles as outlined in PGY-1							Simulation Direct supervision Didactics Assigned reading	Direct feedback Global evaluations CREOG	
8. Understand and perform Doppler studies for normal and complicated pregnancies							Simulation Direct supervision Didactics Assigned reading	Direct feedback Global evaluations CREOG	
9. Counsel patients on suspected ectopic pregnancy, ovarian cysts or pelvic abnormalities							Simulation Direct supervision	Direct feedback Global evaluations	
10. Counsel patients with fetal anomalies or fetal demise							Simulation Direct supervision	Direct feedback Global evaluations	
11. Obtain informed consent for genetic amniocentesis and use of vaginal probe							Simulation Direct supervision	Direct feedback Global evaluations	
12. Develop a legible, descriptive detailed and comprehensive ultrasound report							Simulation Direct supervision	Direct feedback Global evaluations	

MK: Medical knowledge; PC: Patient care; PBLI: Practice based learning and improvement; IPS: Interpersonal and communication skills; Prof: Professionalism; SBP: System based practice

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