
LIMITED SONOGRAPHY IN COLLABORATIVE MIDWIFERY PRACTICE

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ABSTRACT

In 1996, the American College of Nurse-Midwives published guidelines for midwives who wish to incorporate limited third-trimester sonography into their practices. First, however, certain didactic and clinical content needs to be disseminated through basic and continuing midwifery education. To assist the busy practitioner, information is offered related to recommended methods of obtaining learning validation and continuing competency in limited sonography.

This article discusses various clinical situations in which the assessment and management of a patient's condition might be improved by having ultrasonographic information immediately available. In addition, selected data obtained by limited sonography that may necessitate physician collaboration are described through clinical case presentations.

The pitfalls of limited sonography are also discussed by use of case descriptions detailing some of the risks inherent in performing a limited ultrasonogram. The recommendation of performing a complete uterine survey with each limited ultrasonogram is emphasized.

Finally, some of the controversies surrounding routine sonography in pregnancy and sonograms for entertainment are addressed. *J Midwifery Womens Health* 2000;45:508-16
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INTRODUCTION

From its inception, interest in diagnostic sonography has crossed all disciplines of medicine and found applications in many fields. In obstetrics, the technology originated in the perinatal research laboratories with obstetricians becoming the primary sonologists. With time, its evolution brought it into the field of radiology and, eventually, the development of nonphysician sonographic technologists and technicians ensued. Then, as the resolution heightened and the equipment became easier to use and less costly, other health care professionals began incorporating sonography directly into their regular practices.

Concomitant with its widespread use came some genuine concerns about the education and training of the personnel performing the procedure, as well as questions about maintaining the quality of the sonographic examinations. This led to the development of organizations and committees charged with developing recommendations specific to each type of sonogram. One such organization, the American

Institute of Ultrasound in Medicine (AIUM), has developed guidelines for every type of ultrasonographic scan, including examination of the female pelvis (1).

In 1993, the American College of Obstetricians and Gynecologists (ACOG) published a technical bulletin (2) that identified the following three levels of sonographic examinations: 1) the limited scan, which includes amniotic fluid index (AFI) or amniotic fluid volume (AFV), performance of a biophysical profile (BPP), sonography-guided amniocentesis and/or cephalic version, confirmation of fetal life, identification of presenting part, and identification of multiple gestations; 2) the basic scan, which includes a fetal anatomic survey, biometry for fetal age and weight, placental location, and amniotic fluid assessment; and 3) the comprehensive scan, which is generally performed by a perinatologist, sonologist, or radiologist and is an evaluation targeted at one specific anatomic feature suspected of having an anatomic defect (2). When performed in the first trimester, a basic scan identifies the presence or absence of intrauterine gestational sac(s), locates the embryo(s) or fetus(es), measures the crown-rump length, ascertains the presence or absence of cardiac activity, and then evaluates the uterus and adnexal structures, particularly in determining the presence or absence of an ectopic pregnancy (2).

In 1993, the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) published guidelines for nurses performing sonography, which were updated in 1998 (3). In addition to defining the type of sonography practice included in "limited sonography," AWHONN also clearly defined the components of minimum didactic education that should precede the clinical application of sonography.

The American College of Nurse-Midwives (ACNM) published guidelines specific to nurse-midwifery practice of sonography in 1996 (4). The ACNM Clinical Bulletin No. 1, *Limited OB Ultrasound in the Third Trimester* (4), delineates the specific educational prerequisites for certified nurse-midwives (CNMs) and certified midwives (CMs).^{*} These guidelines address the third trimester of pregnancy only.

^{*} CNMs/CMs and midwives as used herein refer to those midwifery practitioners who are certified by the American College of Nurse-Midwives (ACNM) or the ACNM Certification Council, Inc.; midwifery refers to the profession as practiced in accordance with the standards promulgated by the ACNM.

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Determining competency in the performance of sonography is a complicated issue for any health care provider, including ultrasound technicians or sonographers. Although a certification process began in 1975 when the American Registry of Diagnostic Medical Sonographers (ARDMS) conducted the first voluntary registry examination for sonographers, certification is still not mandated. At this time, the ARDMS remains the only certifying agency for sonographers in the United States, and voluntary certification is available to all allied health professionals, physicians, and sonographers. In some instances, insurance companies will only reimburse for ultrasonographic examinations performed by sonographers certified as registered diagnostic medical sonographers (RDMS).

CNMs and CMs may take the ARDMS certifying examination by fulfilling certain prerequisites, including 12 months full-time, or its equivalent, clinical experience in sonography. A two-part examination is administered; the first part tests knowledge of physics and instrumentation, and the second part tests knowledge of obstetrics (OB) and gynecology (GYN).

An overview of the use of sonography in midwifery* practice and indications for this technique have recently been reviewed (5). Therefore, the purpose of this article will be to review the issues in acquiring sonographic skill and how sonographic findings determine collaboration with other health care providers.

APPLICATION TO MIDWIFERY PRACTICE

Midwives* who plan to incorporate the advanced practice skill of sonography into their practice should follow the ACNM document, *Guidelines for Incorporating a New Procedure into Practice* (6). For those CNMs and CMs with hospital privileges, application may need to be made to the institution's Committee on Interdisciplinary Practice to add this new procedure to midwifery practice within the hospital setting; clinical guidelines or protocols also need to be amended to include this new skill in outpatient antepartal settings.

The ACNM's Clinical Bulletin, *Limited Obstetrical Ultrasound in the Third Trimester* (4), is very thorough and addresses all aspects of performing third trimester scans. A prerequisite to clinical practice is the acquisition

of didactic information covering such topics as the physics and instrumentation of sonographic equipment, professional accountability, technical components, clinical learning experiences, and evaluation.

No specific guidelines exist as to the number of scans a midwife needs to perform to become proficient, because proficiency in this skill is learner-dependent. Some acquire sonographic skills quite rapidly; others require more practice. Different learning styles have been identified and applied to sonography education and curriculum; when students are permitted to learn according to their own individual styles, it has proven to be beneficial (7). Regardless of the techniques or styles used, clinical practice should take place under the supervision of skilled sonographers or sonologists, who can then determine when the midwife is ready for independent practice.

The ACNM's definition of a limited third trimester scan includes the assessment of AFV, performance of a BPP, determination of placental localization, and identification of fetal number, cardiac activity, and presentation. Emphasized within the organization's guidelines is the necessity for performing a complete survey of the uterus each time a limited sonogram is performed. For instance, if a scan is being done to determine the presenting part, the midwife should identify the placental location, the presence of cardiac activity, the number of fetuses, and the quantity of amniotic fluid. By doing this each time, it is unlikely that the midwife will commit errors of omission by missing such things as the presence of a placenta previa or an intrauterine fetal demise. With practice, performing a full uterine survey can be accomplished in less than 5 minutes. The more times a complete uterine survey is done, the faster it becomes.

It should be kept in mind that limited sonography is indicated for women with a specific issue who have already had a prior basic ultrasonographic examination that included estimation of gestational age and weight, placental location, AFV, and an anatomical survey. If one has not been done, it is recommended that a basic scan be performed at the earliest convenience after the limited scan. A limited scan is not intended to replace or substitute for a basic scan (2).

Ongoing competency validation as recommended in the ACNM guidelines is another important component in the practice of sonography. This can be achieved in many ways. Computer programs can be used on a yearly basis as a way of testing the ongoing sonography competency of the midwife. The same type of testing can be accomplished by directly observing the midwife perform an examination. In addition, continuing education credits specifically pertaining to OB ultrasonography are granted on local, regional, or national levels and can be easily obtained. The midwifery practice guidelines pertaining to ultrasonographic skills should address requirements for competency validation.

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SCOPE OF MIDWIFERY PRACTICE

Independent Practice

Once competency has been achieved, the CNM/CM can begin an independent use of sonography skills in certain situations. Midwives can perform BPPs and measure the AFI or AFV. In both the antepartum and intrapartum periods, identification of the presenting part by ultrasonography can be used to verify abdominal and/or pelvic findings. In situations of size/dates discrepancies, ultrasonography can be used to identify multiple gestations; and, in the case of vaginal bleeding, limited sonography can be used to determine placental localization.

Ultrasonographic skill is imperative for all practitioners assuming triage responsibilities, because limited sonography can provide immediate information in clinical situations that might otherwise experience a delay in treatment. For example, an immediate ultrasonographic examination would be indicated to determine placental location and to rule out placenta previa in a pregnant woman seen in the triage unit with heavy vaginal bleeding. In some situations, the availability of immediate, limited sonography may be considered the standard of practice (8,9), and in many settings midwives have become the front line providers of triage services.

Midwives who desire to use limited sonography for GYN care and/or the first two trimesters of pregnancy practice should adhere to the guidelines written by AWHONN (3). These guidelines identify the components of a gynecologic scan, which include: 1) the identification of uterine position, 2) measurement of the uterine size, 3) measurement of the endometrial thickness, and 4) measurement of ovarian follicles. AWHONN further defines a first trimester OB scan to include 1) the recognition and measurement of gestational sac(s), 2) the identification and measurement of embryonic pole(s), 3) the presence or absence of early cardiac activity, and 4) the fetal number.

Neither the AWHONN guidelines nor the ACNM guidelines include fetal biometry as part of nursing or midwifery limited sonography. Biometry is the means by which measurements are taken of the fetal head, abdomen, and femur to determine an estimated fetal weight (EFW) and gestational age. Should a midwife decide to incorporate this skill into practice, the appropriate education and clinical training as stated in the ACNM guidelines need to be achieved. In addition, the new skill needs to be incorporated into the practice guidelines for the institution or site of clinical practice as described in the *Guidelines for Incorporating a New Procedure into Nurse-Midwifery Practice* (6).

TABLE 1

Sonographic Conditions Necessitating Consultation or Collaborative Management

<i>Recommendations Specific to Ultrasonography Findings</i>
1. Inability to visualize an intrauterine gestational sac with double decidual ring in the first trimester.
2. Inability to visualize the adnexa in the first trimester.
3. Inability to visualize fetal cardiac activity in any trimester.
4. Inability to determine placental location in antepartum or intrapartum bleeding.
5. Decreased amniotic fluid volume.
6. Increased amniotic fluid volume.
7. Biophysical profile score of 6 or less.
8. Presence of multiple gestation.
9. Nonvertex presentation at term.
10. Suggestion of an anatomical anomaly.
11. Evidence of a chronic abruption.
12. Any unusual, unexplained finding.

(Disclaimer: These recommendations are based on the author's opinion and do not represent guidelines put forth by any professional organization. This does not represent an exhaustive list and should be tailored to each individual type of midwifery practice.)

Collaborative Practice

Midwifery expertise includes the management of essentially normal situations and recognition of deviations. One of the greatest skills associated with midwives is their ability to anticipate when deviations from normal might arise and to detect findings indicating the need for consultation or collaboration with a physician. The same must be applied to sonography; indeed, the expectation exists that the midwife will be able to differentiate that which is normal on an ultrasonogram from those findings that may indicate a pathologic condition. In the event that something appears abnormal, a basic ultrasonogram must be obtained.

Once the results are available that support any type of pathologic condition, the physician must be consulted and a plan developed for collaborative care or transfer to medical management. For example, if a woman in the first trimester is seen with vaginal bleeding, but the sonogram demonstrates an appropriately growing fetus with the presence of cardiac activity, joint management would be appropriate. Another example would be the sonographic identification of oligohydramnios at 34 weeks' gestation; once the diagnosis is made, the midwife would then consult with the consulting physician and jointly determine a plan of management. See Table 1.

Referral

Certain clinical situations in midwifery practice mandate referral of a patient for medical management and/or

TABLE 2
Conditions for Referral to Medical Management

1. Multiple gestation of three or more gestational sacs.
2. The presence of an ectopic pregnancy.
3. Absence of fetal cardiac activity in the first trimester with active bleeding.
4. The presence of a placenta previa.*
5. The presence of a major fetal anomaly.*
6. Significant placental abruption.

* Comanagement possible in some midwifery service situations.

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further sonographic evaluation that is beyond the midwife's scope of practice. See Table 2.

CLINICAL EXEMPLARS OF COLLABORATIVE PRACTICE

At Women and Infants Hospital (WIH) in Providence, Rhode Island, a group of nurse-midwives are employed by the hospital and work for the Department of OB/GYN, providing several services such as teaching third-year medical students during their intrapartum rotation and providing direct patient care to women both antepartally and intrapartally (10).

WIH midwives are first-line practitioners in the OB/GYN triage area, evaluating both private and clinic patients, often in consultation and collaboration with either a private attending physician or an OB/GYN chief resident. The following case situations have been taken from the WIH model of midwifery practice and illustrate how clinical collaboration works around the use of sonography.

Case 1

ND was a 28-year-old gravida (G) 1 para (P) 0 at 8 weeks gestation by last menstrual period (LMP), who was seen to the triage unit complaining of cramping and brown discharge. She was evaluated by a midwife who initially ordered a qualitative serum human chorionic gonadotrophin (hCG) and a complete blood count (CBC). Vital signs were stable. Physical examination was normal with her abdomen being nontender and bowel sounds present. Speculum examination revealed a cyanotic nulliparous cervix that was slightly dilated with dark brown blood in the os. On bimanual examination, she was noted to have a 6–8 week size uterus that was midline and nontender. The right adnexa was slightly tender, but no masses were palpated.

The serum hCG was positive and the CBC was within

normal limits. A limited transvaginal sonogram was performed by the midwife. What appeared to be a gestational sac was seen, but no fetal pole could be identified. The adnexae appeared clear with no masses and no fluid collection. The differential diagnosis included 1) an earlier gestation than that which was determined by LMP, 2) a threatened abortion, 3) an incomplete abortion, or 4) an early ectopic pregnancy.

A consultation was obtained with the chief resident. It was agreed that either this was a very early gestation, less than 5 weeks, or that it was a nonviable pregnancy. However, because the fetal pole was not identified, it was decided to obtain an immediate basic OB ultrasonogram to rule out ectopic pregnancy. Ectopic pregnancies can exist even when what appears to be an intrauterine gestational sac is present. If the ectopic pregnancy does exist, the intrauterine sac that was seen would be identified as a “pseudosac” and not a true gestational sac.

The basic ultrasonogram was performed by a registered diagnostic medical sonographer in the department of radiology and interpreted by the radiologist. It was determined that an ectopic pregnancy most likely did not exist. With this information, it was decided that ND would be followed with serial β -hCGs every other day and a repeat ultrasonogram in 1 week. If the β -hCG level doubled every 48 hours, a viable pregnancy should be visualized by ultrasonography in a week. If the β -hCGs did not double every 48 hours, an incomplete abortion would then be diagnosed. If the β -hCG levels remained flat, an ectopic pregnancy would have to be reconsidered. See Tables 3 and 4.

Over the course of the next 4 days, the β -hCGs began dropping, indicating that ND had an incomplete abortion. She was notified of these findings by the midwife after discussion with the consulting physician and was then scheduled for a return visit to be evaluated by the midwife and chief resident in OB/GYN.

On ND's return to the hospital, the midwife and resident jointly explained the risks and benefits of medical versus surgical management of an incomplete abortion. She opted for conservative management rather than a surgical dilation and curettage. The midwife continued to stay in contact with her. Approximately 4 days later, ND experienced cramping and bleeding and was reevaluated in the triage unit. Her cervical os was dilated and the products of conception were in the os. They were gently removed with a ring forceps by the CNM. ND continued to have cramping and minimal bleeding during the next hour of observation and then was released from the hospital in stable condition. She was reassured that her chances of conceiving again were no different from before and that she could attempt pregnancy after her next menstrual cycle. There was also discussion concerning the normal grieving process after a fetal loss. She

TABLE 3
Clinical Management for Bleeding in the First Trimester in the Low-risk Pregnant Woman

Obtain Maternal Blood Type and β -hCG* (Administer Rhogam if indicated) History and Physical Examination Limited Sonogram†			
(+) Intrauterine gestational sac Quantitative β -hCG >2,000 mIU/mL ↓ Repeat β -hCG 24–48 h, which should continue to increase ↓	(–) Intrauterine gestational sac Quantitative β -hCG <2,000 mIU/mL (Medical consultation and collaboration and basic radiology ultrasonogram) ↓ Repeat β -hCG 24–48 h, which should be increasing or doubling ↓		
	↓	↓	↓
	Repeat ultrasonogram to confirm viability	Falling β -hCG	β -hCG plateau
	↓	↓	↓
	Possible Ab	Nonviable pregnancy Determine location of pregnancy	Increasing or doubling β -hCG Repeat scan and β -hCG

* β -hCG levels may be laboratory dependent and may have interhospital or interlaboratory variation.

† It is generally recommended that all limited ultrasonographic examinations be followed by a radiology ultrasonogram examination in a timely fashion.

lived with a supportive partner, but was given telephone numbers for support groups. Her discharge instructions included the necessity to return to the hospital in the event of an elevated temperature, heavy bleeding, and/or cramping not controlled with ibuprofen. She did well and resumed her normal cycle the following month. Her well-woman care was then transferred to the appropriate GYN clinic.

TABLE 4
Correlation of β -hCG Levels with Anatomical Findings

β -hCG mIU/mL (IRP)	Transvaginal Anatomic Findings	Transabdominal Anatomic Findings
<2,000	± Chorionic sac – Yolk sac – Embryo/heartbeat	
2,000–7,200	+ Chorionic sac ± Yolk sac ± Embryo/heartbeat	+ Chorionic sac – Yolk sac – Heartbeat
7,200–10,800	+ Chorionic sac + Yolk sac ± Embryo/heartbeat	+ Chorionic sac + Yolk sac
>10,800	+ Chorionic sac + Yolk sac + Embryo/heartbeat	± Embryo with heartbeat

Note: Serum β -hCG levels may be laboratory dependent and recognition of anatomical findings can be user and equipment dependent.

Case 2

RO was a 29-year-old G3, P1 at 38 weeks gestation when she was seen in the office complaining of decreased fetal movement for 2 days. She was placed on the external fetal monitor for a nonstress test (NST). Within 10 minutes, the tracing was clearly reactive with accelerations in response to fetal movement that was audible. However, RO denied feeling any of the fetal movement.

It was decided at that point to perform a limited sonogram to allow the woman to see the fetal activity. Under direct visualization, the fetus was seen to be very active with good flexion and extension of the limbs and gross body movement. It was also noted, however, that the amniotic fluid appeared increased, a possible reason for the perception of decreased fetal movement. A diagnosis of polyhydramnios was made after an AFI of 35 mm was ascertained (the normal range is approximately 8–20 mm).

The prenatal chart indicated that at 18 weeks gestation, a basic ultrasonogram had shown an anatomically normal fetus with adequate amniotic fluid. It also revealed that at her last visit, the uterine size was equal to her gestational age of 36 weeks. At this visit, however, the uterine size was 4 cm greater than her gestational age. A physician consultation was requested, and the recommendation was for RO to have a repeat basic scan to rule out fetal anomalies that are associated with polyhydramnios, such as esophageal atresia. If the basic scan was suspicious for

an anomaly, that scan would be followed with a comprehensive scan.

The basic ultrasonogram was done and showed no anatomical defects, but confirmed the presence of polyhydramnios. The physician determined that no intervention was indicated at that point, but continued to manage the patient with the midwife. Fundal heights and NSTs were monitored closely. At the onset of labor, spontaneous rupture of membranes occurred revealing clear fluid. Labor was managed by the midwife and resulted in a spontaneous vaginal delivery of a newborn with Apgar scores greater than 7 at 1 and 5 minutes. An explanation for the polyhydramnios was never found.

Case 3

SR was a G8, P5207 who was seen in the triage unit at 38 weeks gestation by an uncertain LMP complaining of abdominal pain and bleeding. She had not received any prenatal care during this pregnancy. She reported no medical or surgical problems and she denied substance abuse, although she smoked two packs of cigarettes per day. She stated that she had delivered two preterm infants at approximately 32 weeks gestation; both of these children were alive and well. Her initial evaluation and assessment was performed by a midwife.

The midwife ordered an intravenous (IV) line, and blood was immediately obtained for a CBC, clotting studies, blood type and screen, and a red clot tube was drawn and timed for the formation of a clot. A urine specimen with patient consent for toxicology studies was obtained. She was placed on the external fetal monitor, which revealed a stable baseline heart rate, late decelerations, and contractions every 60–90 seconds with minimal uterine relaxation between contractions. The chief resident was contacted for immediate consultation.

The physical examination was delayed until a rapid, limited ultrasonogram was performed by the midwife to rule out placenta previa while waiting for the consulting resident. The placenta was found to be fundal with no obvious evidence of abruption, the fetus was actively moving and in a vertex presentation, and the amniotic fluid was deemed grossly adequate. The midwife also performed fetal biometry with the measurements estimating a gestational age of 36–38 weeks and estimated fetal weight of 3,200 gms.

Once placenta previa was ruled out, a cervical examination was done, which revealed a cervix 6 cm dilated and 100% effaced, a vertex presentation at –2 station, and intact membranes. SR was transferred immediately to the labor room, where she was collaboratively managed by the midwife and chief resident. The differential diagnosis included a possible abruption of the placenta or preterm or term active labor. The plan was to give her 0.25 mg of terbutaline subcutaneously.

Within 2 minutes of the terbutaline administration, the contractions stopped. The fetal heart rate returned to a stable baseline rate without decelerations. Artificial rupture of the membranes was performed by the midwife revealing clear fluid. A direct fetal scalp electrode was inserted and indicated average variability. A fetal blood sample drawn by the chief resident confirmed a well-oxygenated fetus with a pH of 7.28 and a base excess of –0.3 mEq/L. With this reassuring fetal information, it was decided to allow her labor to continue with close monitoring of both maternal and fetal condition.

A limited scan was repeated by the resident to reevaluate the placenta. There was an hypoechoic area behind the placenta, indicating a possible partial abruption. When contractions resumed, the fetal heart rate remained reassuring. Within 1 hour, SR progressed to full dilation, and the midwife attended a spontaneous vaginal delivery of a 3,000-gm infant with Apgar scores of 8 and 9 at 1 and 5 minutes, respectively, and an arterial cord pH of 7.34, base excess 0.3 mEq/L. The placenta delivered rapidly and was followed by a gush of approximately 500 mL of fresh blood. Oxytocin was added to the IV fluids and the uterus quickly contracted with no further bleeding. Mother and infant were both stable.

Shortly after the delivery, SR admitted to having inhaled cocaine approximately 30 minutes before arrival at the hospital. The social service department was notified so that appropriate follow-up could be obtained for both the mother and the infant. The pediatric and nursery staff were also notified. Ultimately, the urine toxicology screen confirmed the presence of cocaine in the maternal circulation. The infant was discharged from the hospital into the custody of the Department of Youth and Family Services.

Case 4

ME was a 34-year-old G1, P0 at 37 weeks gestation by LMP and an 18-week scan who telephoned her private physician's office reporting a decrease in fetal movement since arising that morning 4 hours earlier. An NST was performed in the physician's office and was persistently nonreactive for 40 minutes. She was then sent to the hospital for a contraction stress test (CST).

Within the first 5 minutes of electronic monitoring of the fetus and contractions at the hospital, but before the beginning of the CST, the fetus had a spontaneous deceleration in response to a spontaneous contraction. The midwife who was at the hospital reviewed the tracing, canceled the CST, and performed a BPP. The final score was a 2 of 10 possible points. The amniotic fluid volume was adequate, but there were no gross fetal body movements, no flexion/extension, and no fetal respirations. The attending physician was immediately

consulted and ME was transferred to medical management.

On vaginal examination, it was noted that the cervix was closed and 3 cm long; thus, the consulting physician recommended that an immediate cesarean section be performed. This was done within the next 20 minutes. A male infant was delivered with Apgar scores of 2 and 6 at 1 and 5 minutes, respectively, and a cord pH of 7.18 with a base excess of -18 mEq/L. At the time of the surgery, there were no remarkable findings to explain the loss of fetal movement and tone. The infant did well in the normal newborn nursery and was discharged home from the hospital with his mother 2 days later.

PITFALLS OF LIMITED SONOGRAPHY

The major concerns related to sonography include 1) misreported information, such as reporting the absence of placenta previa when one was present or failure to detect a fetal abnormality, 2) a missed abnormality that is seen when films are later reviewed, 3) invented lesions (reported but not there), 4) failure to perform ultrasonography when indicated, and 5) resultant injuries when used as an adjunct to another procedure such as amniocentesis. The most frequent cause of litigation is that of failure to diagnose an ectopic pregnancy. This is an area of considerable concern for all practitioners performing limited sonography, because it has the potential for a tragic outcome.

After reviewing the legal literature, Isaacson (10) identified the following complaints as potentially litigious: 1) failure to perform a sonographic evaluation, 2) failure to perform ultrasonography in a timely fashion, 3) wrongful birth, and 4) failure to report sonogram results. Examples of failure to perform a sonographic evaluation include fetal size/dates discrepancy, advanced maternal age, and abnormal α -fetoprotein (AFP) results. An example of wrongful birth would be the failure to detect a fetal anomaly in a pregnancy that would have been terminated had the parents known before the birth that the defect existed.

One pitfall specific to limited sonography is the tendency for a nurse, midwife, or physician to casually use the ultrasound machine for a "quick check" of the presenting part when Leopold's maneuvers or a vaginal examination is inconclusive. This places the practitioner in a tenuous position by having gathered incomplete information. The risk of this quick check can be considerable. For example, a woman was having twice weekly nonstress tests (NSTs) and fluid evaluation performed by a nurse within the hospital setting because of gestational diabetes. She did not have a basic ultrasonogram during her pregnancy. During six consecutive evaluations, she was determined to have reactive NSTs and ample amniotic fluid. During the seventh evaluation, the fetus

experienced a prolonged bradycardia, and an emergency cesarean section was performed. An anencephalic infant was delivered. The question posed by the woman and her family was how could so many ultrasonograms be performed and the anencephaly missed. In this case, had a complete uterine survey been performed when measuring the amniotic fluid, the nurse would have been unable to identify a presenting part and would have notified the attending physician. A basic sonogram would have then been performed.

In another situation, a woman was seen at the hospital at 42 weeks of gestation for induction of labor. Although other limited scans had been done previously, she had never had a basic scan. An NST and AFI were done to evaluate fetal well-being. The AFI showed an adequate amount of amniotic fluid; however, during the NST, the fetal heart rate dropped to 60 with no sign of recovery.

A vaginal examination was done by an OB resident to rule out a cord prolapse; unfortunately, the examiner placed her fingers through a 3-cm dilated cervix with a complete placenta previa. Hemorrhaging began, and an emergency cesarean section was done. Both mother and infant did well. However, after the cesarean section, the parents questioned why the placenta previa was not seen when the limited ultrasonogram was performed for the AFI.

Once again, the limited sonogram should have included a complete uterine survey before or along with the assessment of amniotic fluid volume; this would have revealed the placental location and the cesarean birth could have been scheduled electively.

Other missed diagnoses that have occurred during limited sonography in the third trimester include missing a second twin and missing a breech presentation. In each of these cases, the limited scan that was done was performed simply to locate the fetal heart so that external fetal monitoring could be better accomplished, and a complete uterine survey was neglected.

A systematic sonographic approach should be taken so that no aspect is missed. See Table 5. It is generally recommended to begin suprapubically to determine the presenting part; then, by following the spine superiorly, the fetal heart can be located and observed for cardiac activity and, continuing up to the fundus, the lie can be determined. Throughout the scan, observation for fetal movement can be made. While the rest of the uterus is scanned in search of a multifetal pregnancy, the placenta can be located and the amount of amniotic fluid determined. All of this can be accomplished in less than 5 minutes with practice. By scanning the entire uterus every time a limited scan is done, it will be highly unusual to miss a breech presentation or a major anomaly, such as an anencephalic fetus.

In the first trimester, the greatest risk is that of missing an ectopic pregnancy. It is not sufficient to simply

TABLE 5

Systematic approach to limited sonography in the first trimester.

1. Identify uterine position.
2. Identify gestational sac, yolk sac, fetal pole, and/or crown-rump measurement.
3. Identify cardiac activity.
4. Assess the adnexae for fluid collection in the cul-de-sac and/or masses.

Systematic approach to limited sonography in the second or third trimester.

1. Begin suprapubically by identifying the presenting part.
2. Visualize the entire skull.
3. Find the fetal neck and follow the spine to the sacrum.
4. Identify cardiac activity.
5. Determine location of the small parts.
6. Measure the amniotic fluid volume by either amniotic fluid index (AFI) or by the presence of a 2×2 pocket.
7. Determine placental location.
8. Determine number of fetuses.
9. Determine fetal status by observing for fetal movement.
10. If unable to visualize an intrauterine gestational sac and/or pregnancy, a follow-up basic scan should be obtained.

identify a fetus within the uterus; the adnexae must also be examined for a multifetal pregnancy, which might be lodged in the fallopian tube. In many cases, this is a difficult examination, even for experienced sonographers; thus, it is important to follow limited scans done in the first trimester with a basic scan as soon as it is feasible (3).

When performing a limited scan, it is important to inform the woman that the scan being done is for a specific purpose and is not a scan to evaluate the fetus for anomalies or other pregnancy-related problems. In some practices, consents are obtained, which explain the limitations of a limited scan so that parental expectations are not inflated.

CONTROVERSIES IN SONOGRAPHY

An area of sonography that has been getting a great deal of governmental attention of late is that of the entertainment aspect of sonography. At present, some companies advertise and perform and produce video tapes of scans as keepsakes for the family. The issues surrounding this aspect of sonography is multifaceted.

Those in favor of entertainment videos propose that it promotes early bonding of the family members to the fetus (9). The opponents, such as the Food and Drug Administration (FDA), have issued warnings to businesses, manufacturers, and organizations that the use of ultrasonography for keepsake videos is an unapproved use of a medical device and that they are prepared to take regulatory action (12,13). The primary concern is that the long-term effects of exposure to the fetus have yet to be determined (14). Therefore, sonography should be done

when indicated and not simply for curiosity, entertainment, and indiscriminate sex determination (14).

A second area of controversy is the use of routine sonography in all pregnancies. The current recommendations set forth by the National Institutes of Health and Human Services cites specific maternal, fetal, and obstetric indications for the performance of ultrasonography. Although a large prospective, randomized trial of routine sonography showed that routine sonography did not have an impact on perinatal morbidity and mortality (15), the current standard of practice is to obtain a basic ultrasonogram only when indicated and not as a part of routine prenatal care.

RECOMMENDATIONS FOR OBTAINING CLINICAL SKILLS

Becoming didactically prepared in sonography is not as big a challenge for midwives as is obtaining the appropriate clinical practicum under the supervision of a qualified practitioner. Unfortunately, there are not sufficient sites that allow practitioners to gain that skill. Thus, after acquiring the didactic content, most practitioners attempt to apply the theoretic information under no or minimal supervision.

One recommendation as to how this clinical skill can be obtained includes approaching the radiology department at the home institution and requesting a mentorship. In some hospitals, this is a sensitive situation. Many are of the opinion that sonography should be done only by sonographic professionals who are formally educated and trained. Some, however, may be amenable to aiding other clinicians in obtaining the necessary clinical skills.

As with any skill, continuing education is another concern. Again, the didactic content is easily obtained on a local, regional, or national level through continuing medical education courses and lectures and by way of the internet. In addition, educational video tapes (16) and computer CD ROM programs (17) are available and can be used by those in need of beginning skills in ultrasonography, as well as for continuing competency validation.

Practitioners who wish to maintain their skills, despite infrequent sonographic opportunities, might voluntarily seek performance appraisals by a qualified sonographer on a regular basis.

Some midwifery education programs have begun to include sonography as part of the curriculum, although it is not part of the core content required by the ACNM Division of Accreditation (5). Some programs provide didactic content only, whereas others provide clinical experience as well.

CONCLUSION

As technology continues to improve, midwives will continue to expand their clinical skills into advanced practice areas such as sonography (18). As previously described, the addition of these new skills should follow the ACNM's *Guidelines for Incorporating Skills into Clinical Practice* (6). Appropriate didactic and clinical education can then be obtained. Once this occurs, a guideline for continuing competency needs to be established.

In addition, individual settings will need to develop practice guidelines that designate several parameters, including how sonography will be applied to specific clinical settings; who will be designated to interpret the scans; a description of the clinical situations when consultation, collaboration, and referral are indicated; and the means by which all of this can be achieved. Unless the appropriate basic education level and clinical competence is achieved, limited sonography should not be used within any midwifery practice.

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