

Education

IMPLEMENTATION OF TRANSVAGINAL ULTRASOUND IN AN EMERGENCY DEPARTMENT RESIDENCY PROGRAM: AN ANALYSIS OF RESIDENT INTERPRETATION

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Abstract—Background: Emergency physicians are increasingly performing transvaginal ultrasound (TVUS) to rule out ectopic pregnancy. However, little is known about appropriate educational pathways to train emergency medicine residents in TVUS. **Study Objectives:** To evaluate the ability of Emergency Medicine (EM) residents who underwent a training program in TVUS to detect the presence or absence of an intrauterine pregnancy (IUP) in patients of < 13 weeks gestation with vaginal bleeding or abdominal pain, as compared to the final interpretation of each study as determined by the Emergency Department (ED) Director of Ultrasound. **Methods:** This was a prospective, observational study in a single residency program. Training included a lecture, competency examination, and 10 supervised TVUSs. The EM residents then performed TVUSs with the goal of determining the presence or absence of an IUP without input from an attending physician. **Correlation with the ED Director of Ultrasound** was assessed for the cohort, and stratified by year of training. **Results:** There were 22 residents who performed 75 TVUSs over 17 months. **Correlation with the ED Director of Ultrasound** was 93.3%. Differences in correlation with the ED Director of Ultrasound were noted when compared by year of training: post-graduate year (PGY)-3 (93.3%), PGY-2 (92.1%), and PGY-1 (100%); $p < 0.001$. **Conclusion:** Residents were able to perform TVUSs to determine the presence or absence of an IUP in patients in whom the diagnosis of ectopic pregnancy was being considered with a high degree of correlation with the ED

Director of Ultrasound after a brief training program. Correlation with the ED director of ultrasound was influenced by year of training. © 2012 Elsevier Inc.

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INTRODUCTION

Approximately 20% of all pregnant women experience vaginal bleeding in the first 20 weeks of pregnancy. Although half of these patients will go on to have a normal pregnancy, ectopic pregnancy must be considered in women presenting to the emergency department (ED) for evaluation. Ectopic pregnancy occurs in 2% of all pregnancies in the United States. However, the incidence of ectopic pregnancy is much higher among pregnant patients presenting to the ED, with the exact incidence ranging between 7% and 13% (1–3). Ectopic pregnancy is potentially life-threatening, and a timely diagnosis is critical to reducing morbidity and mortality. Transvaginal ultrasound (TVUS) is an essential tool in the work-up of ectopic pregnancy, as the presence of an intrauterine pregnancy (IUP) without other concerning symptoms or a history of fertility treatment considerably lessens the possibility of ectopic pregnancy.

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Traditionally, the ED evaluation of a pregnant patient with vaginal bleeding or abdominal pain includes a TVUS performed by a radiologist or obstetrician. These comprehensive TVUS examinations evaluate the presence or absence of an IUP, as well as adnexal pathology. However, the comprehensive TVUS is limited by the lack of 24-h ultrasonography coverage and increased length of stay. With the broadening skill set of the emergency physician in the field of focused ultrasound, some hospitals, including our institution, have credentialed emergency physicians to perform bedside TVUS to assess the presence or absence of an IUP.

Significant literature supports the accuracy of focused TVUS performed by emergency physicians (4–7). Emergency medicine (EM)-performed, focused TVUS is cost-effective and associated with decreased length of stay due to reduced need for consultation (7–10). However, there is less research on appropriate educational pathways to train emergency physicians who wish to learn and perform focused TVUS.

This study was intended to evaluate a potential model for EM residency programs that do not yet offer training in TVUS. We sought to demonstrate the ease and efficacy of implementing a focused, reproducible training curriculum. Additionally, this study may serve as a model to teach focused TVUS to community-based emergency physicians.

There were two objectives for this investigation. The first objective was to develop and describe an educational program for EM residents learning TVUS. The second objective was to evaluate the ability of EM residents with limited training in TVUS to detect the presence or absence of an IUP in pregnant patients of < 13 weeks gestation with vaginal bleeding or abdominal pain. We further hoped to determine whether post-graduate year (PGY) of training had an impact on the residents' performance and interpretation of TVUS.

MATERIALS AND METHODS

Methods

This was a prospective, observational study. The Maine Medical Center Institutional Review Board approved the study protocol, data forms, and informed consent documents.

Residents in a 3-year EM residency program at an ED with approximately 60,000 annual visits completed the training program and participated in the study. Residents performed TVUS on pregnant patients of < 13 weeks gestation without a previously documented IUP who had vaginal bleeding or abdominal pain. A convenience sample of patients presenting to the ED when it was staffed by attending physicians credentialed in focused TVUS was

enrolled. When patients presented during times the ED was not staffed with credentialed attending physicians, patients were referred to Radiology for TVUS. Patients who had undergone fertility treatments were excluded from ED TVUS and study participation, per department protocol.

Apparatus

The didactic lecture and competency examination were written by the ED Director of Ultrasound. Residents performed training transvaginal scans within the hospital and at a local facility with credentialed sonographers. A Sonosite Micromaxx with a 5–8-mHz transducer was used to obtain all study images. An IUP was defined as a minimum of a gestational sac in addition to a yolk sac or fetal pole with cardiac activity.

Procedures

Residents with experience in ultrasound but no prior exposure to TVUS underwent a limited training program in TVUS. The training program included a didactic lecture followed by a competency examination. The didactic lecture was a 1-h lecture led by the ED director of ultrasound that included still images and video clips of normal female anatomy, as well as examples of IUPs and ectopic pregnancies. After this lecture, residents took a paper-based, 10-question competency examination of video clips demonstrating both normal IUPs and images that would not meet the previously defined criteria for an IUP. Residents were required to demonstrate 90% or greater accuracy on the examination and were given only one attempt to pass the test. Residents were subsequently required to perform a minimum of 10 focused TVUSs supervised by trained sonographers in a clinic with a high volume of TVUS. Residents scanned independently and were given immediate feedback by the sonographers to improve their technique.

After completing the training requirements, residents performed TVUS on pregnant patients presenting to the ED with vaginal bleeding or abdominal pain as outlined in the ED protocol (Figure 1). All scans were supervised by EM attending physicians who are credentialed in focused TVUS according to the standards outlined in the American College of Emergency Physicians Ultrasound Guidelines, 2001 (11). Residents made a determination of the presence or absence of an IUP without any assistance in technique or interpretation of images from the attending physician and recorded this on the study data form. The supervising physician then was asked to make an assessment of presence or absence of an IUP by completing a study data form. Resident and attending physicians were then permitted to collaborate and obtain

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