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Letter to the Editors

Formal Clinical Coaching of Our Anesthesiology Trainees in Point-of-Care Ultrasound: Time to Move Beyond Neuraxial Blocks

Marianne David, MD *Eric R. Heinz, MD, PhD*

To the Editors:

We would like to highlight the importance of incorporating point-of-care ultrasound (POCUS) in obstetric anesthesia training. For decades, ultrasonography has been the imaging modality of choice in obstetrics to monitor the development and well-being of the fetus due to its noninvasive and nonionizing properties. However, its utility has expanded to nonobstetric indications and is increasingly finding its way into the hands of obstetric anesthesiologists. Its more common uses in perioperative medicine have been adapted to the obstetric anesthesia practice, for instance, to evaluate the airway, measure gastric contents, assess cardiopulmonary function, and identify deep vein thromboses as well as facilitate neuraxial block placement. POCUS has the benefits of safety, cost-effectiveness, ease of use, and accessibility. Moreover, POCUS is particularly attractive in obstetric anesthesia where patient acuity can change rapidly, and clinical deterioration or emergencies can arise anytime, including off-hours when diagnostic services may not be readily available.

Because pregnancy results in numerous physiological changes and unique pathologies that can complicate anesthesia care, a POCUS study performed at the patient's bedside is especially useful to help guide anesthesiologists in making real-time critical assessments. The following are ways in which POCUS can be applied in the modern obstetric anesthesia practice.

Predicting a Difficult Airway

Upper airway narrowing from edema has been shown to occur during prolonged labor, especially in patients with pre-eclampsia, and airway ultrasonography may provide useful information for predicting a difficult airway.[1] In addition, if a life-saving surgical airway is required, it can effectively image airway anatomy by identifying the position and depth of the cricothyroid membrane and tracheal rings, which is especially helpful in obese pregnant patients for whom external anatomical landmarks may not be easily appreciated.[2] Finally, airway ultrasonography can be used to visualize proper endotracheal tube placement during tracheal intubation.

Assessing Gastric Contents

Pregnant patients are known to have a higher aspiration risk from increased intragastric pressure and decreased lower esophageal tone. Contraction pain and the use of narcotics during labor can further decrease gastric motility. Although pulmonary aspiration is rare, published guidelines for fasting are limited to healthy patients undergoing elective surgery. Gastric POCUS can qualitatively identify and quantitatively measure the contents of the gastric antrum. Various algorithms, including adaptations in pregnancy, have been proposed to calculate gastric content.[3] A major limitation of using gastric POCUS in pregnant patients, especially those at term, include potential difficulty obtaining adequate images due to the gravid uterus displacing the antrum. In addition, painful contractions may limit a parturient's ability to fully participate in the examination, which is performed in both the supine and lateral decubitus positions. Finally, information obtained from the examination must be used in conjunction with other clinical tools when assessing an individual patient's aspiration risk.

Evaluating Cardiac Function and Pulmonary Status

Cardiovascular disease remains the leading cause of maternal death, and focused cardiac ultrasound (CUS) can quickly identify pathologies that can lead to major obstetric morbidity and mortality. CUS can be used to assess ventricular volume status or cardiovascular responsiveness to fluid therapy in critically ill obstetric patients. Distention of the left atrium can identify pulmonary hypertension, which carries a high mortality rate in pregnant patients. In postpartum cardiomyopathy, left ventricular diastolic dysfunction and a concomitant dilated left ventricle can be identified by common CUS views.

The presence of B-lines within basal lung segments during thoracic ultrasound can be used to detect pulmonary signs of volume overload, which is particularly helpful in patients with pre-eclampsia. A recent meta-analysis showed that thoracic ultrasound can detect subclinical pulmonary edema in patients with severe pre-eclampsia before symptoms worsen.[4]

continued on next page

continued from previous page

Diagnosing Deep Vein Thrombosis

Pregnancy results in a hypercoagulable state that extends into the postpartum period, and venous thromboembolism is one of the leading preventable causes of maternal morbidity and mortality. Venous thromboembolism can be fatal if not diagnosed and treated early. Unfortunately, patients are often not evaluated until symptoms develop, and these symptoms are often nonspecific and unreliable. The gold standard for diagnosing a deep vein thrombosis is contrast venography, which is expensive, invasive, and not recommended in pregnant patients due to the unknown effects of the contrast dye to the fetus. As such, complete duplex ultrasound is used as a reasonable alternative but still requires a trained technician to perform and a radiologist to evaluate, potentially resulting in a delay in diagnosis; moreover, the study is generally indicated only after symptoms develop. Most venous thromboembolisms originate from deep vein thromboses in the lower extremities and can be easily evaluated by POCUS using bedside compression ultrasonography. A complete duplex ultrasound is the preferred modality in making the diagnosis, but an extended compression ultrasound, a more limited POCUS examination consisting of compression from thigh to knee, is an appropriate alternative when complete duplex ultrasound is not readily available.[5]

POCUS is quickly becoming an essential tool in the anesthetic care of pregnant patients. However, despite the growing literature supporting its usefulness in obstetric anesthesia practice and the desire of most anesthesia providers to gain proficiency, barriers to high-quality training exist, including the perceived length of time necessary to develop and maintain procedural competence. Nonetheless, the American Board of Anesthesiology has placed an increased focus on ultrasonography as part of the board certification process for its new diplomates. In its Objective Structure Clinical Examination, successful candidates will need to demonstrate proficiency in heart, lung, and abdominal POCUS examinations starting in 2022, 2023, and 2024, respectively. To support this goal, the American Society of Anesthesiologists now offers an enhanced diagnostic POCUS certification program designed to align with the new American Board of Anesthesiology content guidelines. In response, academic programs are starting to formally include a POCUS curriculum in their resident training. Obstetric anesthesiologists should strive to do the same by developing proficiency in POCUS so that they may incorporate this technique in their own educational programs.

Ultrasonography has moved beyond facilitating neuraxial block placement in obstetric anesthesia. In a short amount of time, POCUS has been adapted to address the parturient's unique pathophysiology and, in the process, has revealed its potential as an effective clinical tool for the obstetric anesthesiologist. Therefore, we must begin training our future anesthesiology colleagues these skills now.

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The authors are in the Department of Anesthesiology and Critical Care Medicine at George Washington University School of Medicine and Health Sciences in Washington, DC. ***Marianne David*** *is an Assistant Professor;* ***Eric R. Heinz*** *is an Associate Professor.*

Corresponding author: *Eric R. Heinz, MD, PhD, Department of Anesthesiology and Critical Care Medicine, 2300 M Street NW, 7th Floor, George Washington University School of Medicine and Health Sciences, Washington, DC 20037. Telephone: (202) 715-4750*

Email address: *Eric R. Heinz: eheinz@mfa.gwu.edu*

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