

Graduating Surgical Residents Lack Competence in Critical Care Ultrasound

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OBJECTIVE: Ultrasound provides accessible imaging for bedside diagnostics and procedural guidance, but may lead to misdiagnosis in untrained users. The main objective of this study was to determine observed and self-perceived competence with critical care ultrasound in graduated general surgery residents.

DESIGN: The design of this study was a retrospective review. Ultrasound training program records were reviewed for number of prior ultrasound examinations performed, self-perceived competence, observed competence on faculty examinations, and intended future use of individual critical care ultrasound examinations.

SETTING: This study was undertaken at the R Adams Cowley Shock Trauma Center, which is a tertiary care center in Baltimore, MD.

PARTICIPANTS: Graduated general surgery residents were identified at the beginning of their surgical critical care fellowship at our institution, and were included if they participated in our critical care ultrasound education program. Fifteen graduated general surgery residents were included.

RESULTS: Prior ultrasound experience ranged from 100% for focused assessment of sonography for trauma (FAST) to 13.3% for advanced cardiac assessment. Self-perceived competence ranged from 46.7% with FAST to 0% for advanced cardiac assessment. Observed competence ranged

from 20.0% for FAST examinations to 0% for basic cardiac assessment, advanced cardiac assessment, and inferior vena cava (IVC) assessment. All participants intended to use ultrasound in the future for FAST, pneumothorax detection and basic cardiac assessment, and 86.7% for IVC assessment and advanced cardiac assessment. Of participants with self-perceived competence, 28.6% had observed competence with FAST, 0% with IVC assessment, and 100% with pneumothorax detection.

CONCLUSIONS: Graduated general surgery residents are not competent in multiple critical care ultrasound examinations despite universally planning to use critical care ultrasound in future practice. Current exposure to ultrasound in residency may give a false sense of competency with ultrasound use. A standardized ultrasound curriculum is an urgent need for general surgery training. (J Surg Ed 1:1111-1111. Published by Elsevier Inc on behalf of the Association of Program Directors in Surgery)

KEY WORDS: surgical education, resident education, ultrasound education, point of care ultrasound, critical care ultrasound

COMPETENCIES: Patient Care, Medical Knowledge

INTRODUCTION

Point of care ultrasound (POCUS) encompasses ultrasound examinations that can be performed by nonradiology clinicians, and has become an increasingly prevalent tool for surgeons. Many individual ultrasound examinations encompass POCUS, including cardiac assessment with echocardiography, pulmonary assessment for pneumothorax or effusions, abdominal assessment with the focused assessment for sonography in trauma (FAST) examination,

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vascular assessment for aortic dissection or aneurysm, renal assessment for hydronephrosis with renal stones, gynecologic assessment for pregnancy or other gynecologic pathology, fluid status assessment, and guidance of bedside procedures. This is by no means a comprehensive list of the broad applications of POCUS, and the commonly used POCUS examinations grow as clinician experience with POCUS increases.

A key component of POCUS as a whole is critical care ultrasound. There are multiple important purposes for using critical care ultrasound. Foremost, ultrasound is an immediately available diagnostic imaging modality, and can drastically decrease time to diagnosis and allow rapid intervention on life-threatening pathology. Ultrasound is also portable, and can travel to critically ill patients who can be too unstable for transfer to the radiology suite. Ultrasound examinations can be performed in a serial fashion to evaluate for change over time, such as with repeated echocardiography or fluid status assessment. When ultrasound is used for procedural guidance, this should increase the safety of the procedure.

However, if surgeons are not properly trained, patient safety may become compromised. There is no required training in POCUS for general surgery residents, and no minimum number of POCUS examinations required before residency completion. Standardized resources do exist for POCUS education for general surgery residents, such as the curriculum developed by the National Ultrasound Faculty (NUF) of the American College of Surgeons (ACS).¹ However, without a required ultrasound curriculum or credentialing process, it is difficult to discern the level of POCUS competency among graduating general surgery residents.

This study focused on a specific set of critical care ultrasound examinations within the broad spectrum of POCUS examinations, including: FAST examination, pulmonary ultrasound for pneumothorax detection, basic cardiac assessment, advanced cardiac assessment, and inferior vena cava (IVC) assessment. This specific set of critical care ultrasound examinations was chosen for multiple reasons. Foremost, these ultrasound examinations are commonly used in our own clinical practice and are a focus of our surgical critical care fellowship education program, enabling assessment of these examinations by reviewing our educational records. Additionally, these critical care ultrasound examinations encompass examinations in which a general surgery resident would be expected to have trained (FAST, pulmonary ultrasound for pneumothorax detection, and basic cardiac assessment) and examinations in which general surgery residents may have trained (advanced cardiac assessment and IVC assessment), allowing stratification of the breadth of critical care ultrasound skills gained in general surgery residency.

In this review we aimed to describe the experience of graduated general surgery residents with critical care ultrasound through number of examinations performed, their

self-perceived competence with critical care ultrasound upon completion of residency, and their observed competence with critical care ultrasound upon completion of residency through our faculty proctored examination. We hypothesized that recently graduated general surgery residents would have high self-perceived competence but low observed competence with critical care ultrasound.

MATERIAL AND METHODS

Approval was obtained from the Institutional Review Board (IRB) at the University of Maryland before beginning this study. A retrospective review was then performed of prospectively collected ultrasound education records of incoming surgical critical care fellows at the R Adams Cowley Shock Trauma Center from 2015 to 2016. This encompassed 2 years of our educational program and incoming fellows. The population of graduated general surgery residents included in this study were all pursuing a surgical critical care fellowship at our institution, and observed competency testing was performed before beginning fellowship but after completion of general surgery residency during a 1-day course provided to our incoming fellows. All participants included in this study had completed a general surgery residency before inclusion in this study.

Overall, competence with critical care ultrasound includes the ability to perform specific scans and the ability to actually operate the ultrasound machine, both of which were assessed in this study. Specific critical care ultrasound examinations in this study included: FAST examination, pulmonary ultrasound for pneumothorax detection, basic cardiac assessment, advanced cardiac assessment, and IVC assessment. For the purposes of this study, FAST assessment was defined as obtaining 4 windows: pericardial, splenorenal space, hepatorenal space, and pouch of Douglas. Basic cardiac assessment was defined as ability to perform 4 common cardiac views: parasternal long, parasternal short, apical 4 chamber, and subxiphoid views. Advanced cardiac assessment was measured by ability to obtain velocity time integral and stroke volume variation as measured through the aortic valve. Pulmonary ultrasound for pneumothorax detection included evaluation for lung sliding. IVC assessment represented visualization of the suprarenal IVC and IVC diameter measurement. It should be noted that the subxiphoid view (a component of basic cardiac assessment) and IVC assessment were recorded as a single measure. Measurement of ability to operate an ultrasound machine included observation of machine set-up, selecting the proper patient, selecting proper machine settings, selecting the correct transducer, adjusting the depth of field, adjusting the gain, acquiring video, and saving and ending the examination.

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