Critical Care Explorations

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Deciphering the Effects of Performing Ultrasound on Critically Ill Emergency Department Patients

To the Editor:

We read with great interest the work by Mosier et al (1) published in a recent issue of *Critical Care Explorations* and commend the authors for undertaking this large-scale retrospective cohort study to examine potential associations between point-of-care ultrasound (POCUS) and outcome in adults with sepsis. The authors concluded from their study that performing POCUS in two academic emergency departments was associated with delays in care and increased mortality in critically ill patients with hemodynamic instability. However, a number of factors are not described that would facilitate adequate interpretation and translation of the data.

In the article, the types of POCUS studies performed are not described and this information is crucial. If a considerable number of studies were for vascular access procedures, this could explain the delay to fluid administration and other care. As more POCUS cohort patients had sepsis, this is conceivable and may have also delayed care after hemodynamic POCUS examinations. If a significant number of studies were not hemodynamic studies, and instead examinations of the lungs or abdomen, there is a different inference to make about performing nonhemodynamic studies in this population. If the studies were hemodynamic, then were they interpreted correctly and performed to institutional standards? In this sense, a better understanding of the POCUS program is needed to understand how similar/dissimilar it is to others in practice. Although the authors raise the question of whether quantitative cardiac measures are warranted, either a records search for completed study interpretations or qualitative review by an expert in cardiac imaging should be possible with extant institutional records. The Methods section briefly mentions general aspects of the POCUS programs, but it would benefit the reader to know how much cardiac ultrasound is performed at the institutions and by whom, and what degree of direct supervision, professional certification, faculty credentialing, cardiac education, or collaboration with cardiac imaging specialties is present given the wide variance in these aspects between programs.

More patients who received POCUS had a concomitant diagnosis of sepsis or automated sepsis alerts than those who did not. There were proportionally more patients who experienced cardiac arrest in the preintervention POCUS cohort than in the other cohorts combined. The preintervention POCUS group was sicker in multiple respects that may have required pressors earlier at the expense of fluid, and likely had other multiple organ effects not assessed as well. The propensity for use of POCUS at the bedside in patients who fared poorly could potentially primarily reflect increased total resource use in this population. The authors performed an exhaustive and commendable statistical analysis; however, additional variables evaluating multiple organ system dysfunction's influence on outcome seem warranted for propensity scoring. As the authors mention that there are likely unknown confounders, and additional organ dysfunction from sepsis or postarrest physiology seem to be good potential candidate reasons. With mortality from septic shock being such an important part of this study, wouldn't it benefit from broader metrics to assess and compare mortality in these nonrandom cohorts such as the Emergency Severity Index as the authors mention or Serial Organ Failure Assessment score? Although the authors question the independence of severity of illness indices from a hypothetical effect of POCUS, the same speculation could be said of the other physiologic variables assessed. Given the differences in sepsis and cardiac arrest frequency, and nonrandom use of POCUS, an assessment of illness severity seems relevant especially if the data are present.

Crucially, the authors raise the important point that there are no evidence-based thresholds guiding the use of inotropes and vasopressors based on critical care ultrasound. POCUS in the critical care arena is certainly a field in development. The enthusiasm in using ultrasound for this application brings to light the chasm in our understanding regarding how to titrate cardiotonic agents with ultrasound. Perhaps, this study does as well but requires information on the POCUS studies and their veracity to understand that.

The study is certainly thought-provoking. In the interest of applying this information toward improving POCUS delivery, knowing what flavor of POCUS was performed is necessary for evaluating whether the findings are translatable to all settings. As POCUS has become ingrained in the fabric of the emergency department and critical care for clear positive patient impact from a procedure standpoint, a more fundamental understanding of workflow interactions between the different applications of POCUS and the patient bedside seems most productive.

The authors have disclosed that they do not have any potential conflicts of interest.

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REFERENCE

1. Mosier JM, Stolz U, Milligan R, et al: Impact of Point-of-Care Ultrasound in the Emergency Department on Care Processes and Outcomes in Critically Ill Nontraumatic Patients. *Crit Care Explor* 2019; 1:e0019

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