



Leadership and Medical Education

POCUS Oversight for All: A Pathway for Non-Expert Educators

Cynthia Zheng, MD¹, Michael Houghan, MD², David W. Staudt, MD³

¹ Department of Internal Medicine, Warren Alpert Medical School of Brown University,

² University of Wisconsin School of Medicine & Public Health,

³ Department of Medicine, University of Rochester School of Medicine and Dentistry

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Abstract

Point-of-care ultrasound (POCUS) is increasingly used in internal medicine residency programs. Despite this increase in trainee experience and desire for education, faculty development lags behind due to a variety of factors including time constraints and institutional support. As such, a cognitive framework using “key questions” was created to provide faculty who are not POCUS-trained with a method of assessing trainee POCUS findings. This does not replace formal POCUS training but rather serves as an adjunct for supervising trainees and providing safer patient care.

“I took a look with an ultrasound before rounds, and...”

– Anonymous Resident Physician

Trainees’ point-of-care ultrasound (POCUS) use can prompt different reactions from internal medicine educators: enthusiastic support, outright hostility, or a quiet unease about using information they can’t independently verify. Many expert medical educators are not trained in POCUS. However, POCUS use by medical students and residents is increasing.^{1,2} While using POCUS to guide clinical decision-making, residents may inconsistently document their findings in electronic health records. With this trend comes uncertainty: do programs allow trainees to make decisions based on POCUS without direct supervision? A narrow majority of internal medicine (IM) residency programs either allow it or have not addressed the issue.² While POCUS use can improve diagnostic accuracy and aligns with multiple IM society position statements,³ unsupervised use introduces risks, and as POCUS educators we frequently encounter mistakes as trainees build this skillset. In this article, we aim to illustrate shortcomings of our common POCUS faculty development approaches and introduce a framework for cognitive POCUS skills to facilitate faculty engagement, trainee oversight, and ultimately enhanced patient safety.

Many POCUS faculty development programs hemorrhage participants. In recent studies, 3-13% of faculty POCUS training program participants in well-resourced settings complete image portfolios and achieve independent practice.^{3,4} Barriers to proficiency include the time required to build this skillset, limited access to portfolio systems that allow for competency development and as-

essment, and minimal administrative support.³⁻⁵ With this level of faculty attrition, a strategy built solely on this pathway risks being unable to provide adequate supervision for trainees interested in developing this skill set.

Underlying the difficulty in developing IM POCUS practitioners is that, unlike many diagnostic processes that internists routinely employ (beyond the physical examination), POCUS is a complex psychomotor skill. While image acquisition requires motor skills, other components—identifying an appropriate POCUS indication, interpreting images, and making medical decisions—are purely cognitive.⁶ These cognitive elements closely parallel processes internists use regularly. For example, internists regularly identify indications for an electrocardiogram or chest radiograph, assess the quality of and interpret the study, and incorporate their interpretation into medical decisions. Most do not obtain an EKG themselves. A training paradigm that focuses purely on building knowledge without time-intensive image acquisition parallels these already familiar processes, can build participant knowledge,⁴ and, if implemented thoughtfully, may enhance our ability to supervise trainee ultrasound use.

Different streams for faculty development can enhance POCUS training and patient safety. While independent POCUS “champions” play critical educational roles and can provide quality assurance, most are not available in real-time, and image review typically occurs well after medical decisions have already been made. As noted, relatively few faculty participants will achieve this level of proficiency. A parallel pathway—appropriate for a broader population of IM physician educators—might build cognitive skills for supervising trainees and provide

Table 1. Cardiac example of using a cognitive-only approach through “Key Questions”

Cardiac			
Clinical Case	A 77-year-old male with a history of congestive heart failure, chronic bilateral lower extremity edema, and chronic obstructive pulmonary disease presents to the emergency department with increasing shortness of breath. The patient notes he has not missed any doses of diuretics and is unsure regarding his weight. On exam, the admitting resident notes significant bilateral pitting edema, and decreased breath sounds on exam. To gather more information, the resident performs a point-of-care ultrasound (POCUS) exam to “evaluate the patient’s volume status” and notes that the inferior vena cava (IVC) looked “plethoric” with no inspiratory variation. Given this information, the resident is worried about heart failure exacerbation and starts diuresis on the patient.		
Key Questions	Evaluate the Learner	Evaluate the Patient	Evaluate the Clinical Context
Description	<i>Assess the trainee’s knowledge of anatomy and image interpretation</i>	<i>Assess if there are patient confounders that can affect image interpretation</i>	<i>Assess whether this image interpretation fits with other clinical signs</i>
Example Questions: IVC	Q: “Why use POCUS to evaluate the IVC?” A: Because we can evaluate the size and collapsibility of the IVC as a proxy for central venous pressure Q: “How do you know the structure scanned was the IVC and not the aorta?” A: I saw the connection of the IVC to the hepatic vein as well as the connection to the right atrium Q: “Did you visualize the hepatic vein and right atrium?” A: This image was taken 2-3 cm from the right atrium, just proximal to the hepatic vein	Q: “Are there any patient factors that could complicate our image?” A: No history of tricuspid regurgitation or chronic right heart failure Q: “Is there any aspect of this patient’s care that could complicate our image?” A: The patient is not on any positive pressure ventilation, is not tachypneic, and has no reason to have increased intra-abdominal pressure	Q: “What other signs and symptoms and findings correlate with your image interpretation?” A: In conjunction with the patient’s presentation and labs/imaging findings, I think my POCUS findings align with the clinical context
Trainee Feedback and Case End	After evaluating the three domains, it appears that 1) the resident appropriately performed and interpreted the imaging results, 2) the patient does not have any known confounders that would limit interpretation, and 3) the interpretation makes sense in the clinical context. Thus, it would be appropriate to agree with the resident’s assessment and opt for diuresis.		

additional guardrails for how we use findings from trainee-performed POCUS. While such cognitive approaches ideally involve building basic image interpretation skills, a minimalist approach involves providing faculty with basic knowledge and indication-specific “key questions” that allow them to judge the reliability of trainee-provided POCUS information and offer trainees feedback.

Tables 1 and 2 exemplify this “just-in-time” approach for two common indications (see Tables S1–S3 for more examples). By probing a learner’s technical knowledge, ensuring patient comorbidities do not confound POCUS, and leveraging their existing medical decision-making expertise, POCUS non-experts can make more informed judgments about what to do with POCUS information. If trainees cannot answer the “key questions” for an indication, we would not trust their interpretation to inform our patient care decisions. This “key questions” approach requires relatively few resources and can engage faculty and trainees in the educational process.

A member of our team implemented this strategy at the institution through brief faculty development conferences covering common indications in hospital medicine (inferior vena cava [IVC] obstruction, left ventric-

ular function, lung ultrasound, pleural effusions, ascites, and bladder ultrasound). These sessions included cases with example images and introduced indication-specific key questions. Following these, participants were given handouts covering the key questions, designed as “just in time” references for trainee POCUS review. This approach did engage faculty who were not otherwise involved in POCUS education, and similar interventions elsewhere have yielded comparable results.⁴ The “key questions” not only allow non-experts to judge whether to use trainee-performed POCUS but also prepare them to educate trainees. For example, if a trainee is unable to explain how they know the plethoric vessel they saw was the IVC and not the aorta, a faculty member might say “While I can’t help you find these structures, I know we need to see the IVC connecting to the right atrium and the hepatic vein to make sure it isn’t the aorta.” Rather than leaving faculty to navigate their uncertainty alone, similar approaches can provide a roadmap to navigate trainee-performed POCUS.

Cognitive-only approaches to faculty POCUS development could provoke several reasonable critiques. This approach might discourage faculty from building toward full POCUS proficiency. Cognitive-only programs

Table 2. Lung example of using a cognitive-only approach through “Key Questions”

Lung			
Clinical Case	A 65-year-old male with a past medical history of interstitial lung disease and heart failure with preserved ejection fraction presents increased cough and dyspnea. He notes the cough is intermittently productive but otherwise has no fever or chills. He is unsure regarding weight changes and notes no known sick contacts. The exam is notable for velcro-like crackles throughout all lung fields. The resident was unable to perform a JVP assessment due to body habitus and did note trace lower extremity edema. On the resident’s lung POCUS exam, they note significant B-lines throughout the bilateral lung fields. Labs show elevation in white blood cell count, slight elevation in BNP compared to baseline, and elevated troponin. Based on all the findings, the resident is most concerned for a heart failure exacerbation and would like to diurese the patient.		
Key Questions	Evaluate the Learner	Evaluate the Patient	Evaluate the Clinical Context
Description	<i>Assess the trainee’s knowledge of anatomy and image interpretation</i>	<i>Assess if there are patient confounders that can affect image interpretation</i>	<i>Assess whether this image interpretation fits with other clinical signs</i>
Example Questions: lung	Q: “How many lung fields did you scan?” A: I scanned 3 lung fields on each side from the apex to the axilla Q: “What are B-lines?” A: B-lines are artifacts that show up as bright vertical lines that start at the pleura and go to the bottom of the screen. They will also cover A-lines, which are considered normal lung artifact Q: “What is considered a pathologic number of B-lines?” A: At least 3 Q: “What is the differential for 3+ B-lines?” A: Pulmonary edema	Q: “Are there any patient factors that could complicate our image?” A: After our discussion about the broader differential of B-lines, the patient does have a history of ILD, which can cause B-lines. With the elevated white count and increased cough, there could be an aspect of developing pneumonia as well	Q: “What other signs and symptoms and findings correlate with your image interpretation?” A: In conjunction with the patient’s presentation and labs/imaging findings, the POCUS findings may not align fully with a heart failure exacerbation.
Trainee Feedback and Case End	After evaluating the three domains, it appears that 1) the resident has scanned an appropriate number of lung fields and correctly identified B-lines. However, the resident does not list other causes of pathologic B-lines including ILD and pneumonia 2) the patient has multiple confounders that could create the same POCUS findings 3) the interpretation does not make sense with the clinical context Thus, it would be appropriate to disagree with the resident’s leading differential of heart failure exacerbation causing the patient’s symptoms, hold on empiric diuresis, and pursue further work-up		

should only target faculty who are unlikely to achieve competency otherwise, as POCUS champions continue to play essential roles. While some might raise patient safety concerns or desire additional evidence for cognitive-only curricula, such approaches should largely enhance patient safety by addressing the status quo of unsupervised POCUS use.² Outcomes of such programs are an opportunity for future research. Finally, critics might reasonably note that such approaches may run afoul of institutional policies governing POCUS use. While institutions with stricter POCUS governance policies may not be amenable to cognitive-only approaches, those with less restrictive policies could implement them to enhance education while providing guardrails for trainee POCUS.

The key questions framework also empowers supervisors to discuss trainee POCUS in their documentation. Controversy exists around POCUS documentation best practices, particularly in non-emergency medicine specialties without widespread image archiving and reporting infrastructure.⁷⁻⁹ However, experts generally agree that POCUS should be described in the performing physician’s note. In the case of trainee-performed POCUS, the “key questions” allow supervisors to docu-

ment that they “reviewed available images, discussed image interpretation, and guided POCUS-informed medical decision making” in a meaningful manner. Work continues to standardize documentation, as in Schnittke et al., who have implemented a documentation protocol with pre-established macros for smart phrases related to POCUS exams.⁹

In conclusion, we see cognitive POCUS pathways as an important adjunct to traditional faculty development programs that allow for faculty and trainee education while enhancing patient safety. By using indication-specific “key questions” to assess 1) the learner, 2) patient-level confounders, and 3) the clinical context, POCUS non-experts can provide indirect supervision and education. While not a panacea, such frameworks may at least partially ameliorate sinking stomachs or quiet anxiety, allowing educators to more confidently and safely navigate trainee POCUS use.

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Corresponding author

Cynthia Zheng, MD
Chief Resident, Department of Internal Medicine
593 Eddy St, Room 0100, Providence, Rhode Island
02903

Email: czheng@brownhealth.org



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SUPPLEMENTARY MATERIALS

Supplementary material

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