


Advocating for an Advanced Cardiac POCUS Curriculum Among Internal Medicine Residents

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ABSTRACT: Advocating for integrating a cardiac point-of-care ultrasound (POCUS) curriculum into Internal Medicine residency, this letter emphasizes the unique advantages of cardiac POCUS, particularly its rapid utility and safety, while highlighting existing knowledge gaps among trainees. This perspective research letter underscores the need for a structured advanced cardiac POCUS elective to address the knowledge and skill gaps among internal medicine trainees who have taken the introductory POCUS elective, providing a career preparatory course for internal medicine residents interested in cardiology, critical care, hospital medicine, primary care, and rural medicine. The perspective research paper also underscores the feasibility and benefits of such training, ultimately supporting the implementation of an advanced cardiac POCUS elective in the United States Internal Medicine residency programs.

KEYWORDS: advanced cardiac POCUS, curriculum, internal medicine

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Introduction

Point-of-care ultrasound (POCUS) has transformed diagnostic approaches, enabling rapid assessments and expedited patient care in the ever-evolving healthcare professions.^{1,2} This perspective letter advocates for integrating a cardiac POCUS curriculum into Internal Medicine residency programs, recognizing resident physicians' growing utilization of POCUS.^{3,4} The demonstrated safety and expanding availability of cardiac POCUS presents a unique opportunity to address the nuanced challenges associated with its use, specifically in Internal Medicine training.^{3–5} By proposing the creation of a standardized advanced cardiac POCUS elective, this initiative aims to bridge existing knowledge and skill gaps, offering a career preparatory course for residents interested in cardiology, critical care, hospital medicine, primary care, and rural medicine.

Body

The growing use of POCUS among healthcare providers is underlined by its relatively fast application and availability in making rapid assessments and expediting care.^{1,6} While POCUS is often used to assess vascular, pulmonary, abdominal, and trauma-related conditions, cardiac ultrasonography remains one of its core components.^{7–9}

The use of cardiac POCUS by resident physicians, its demonstrated safety, and its growing availability create a unique opportunity to incorporate an advanced cardiac POCUS elective into Internal Medicine residency curricula.⁵ Given the necessary training required to safely and effectively use cardiac POCUS, an elective could address this among Internal Medicine residents through advanced cardiac POCUS training.^{4,5}

A standardized advanced cardiac POCUS elective would serve as a career preparatory course, introducing trainees to higher-level cardiac ultrasonography and providing a foundation for more advanced echocardiography training. The intended audience would be residents interested in cardiology, critical care, hospital medicine, primary care, and rural medicine who have already taken an introductory POCUS course that includes basic cardiac POCUS. This training would advantage residents as they leverage these skills in their careers, either as independent medical providers or in further medical training, by applying the skills gained in cardiac image acquisition and interpretation in improving rapid diagnostics and bedside assessment of cardiac functions and structures. Skills explored in this elective will include evaluation of ejection fraction, systolic & diastolic function, ventricular wall thickness, atrial & ventricular cavity size, Doppler assessment of cardiac valve structure and function, and pericardial assessment.

Although data on advanced cardiac POCUS training among Internal Medicine residents is limited, available data shows that with optimal training, Internal Medicine residents can rapidly learn the necessary skills and achieve competence in advanced cardiac POCUS, including the evaluation of left ventricular ejection fraction (LVEF), pericardial effusions, right ventricle (RV) dilation, and significant left-sided valve disease, in addition to an increase in overall resident satisfaction among those who undergo the training.^{10–14} Nonetheless, a separate pilot of the clinical impact of hand-carried ultrasound in the medical clinical by Croft et al^{2,15} showed that internal medicine trainees still commonly missed critical cardiac pathologies, including left ventricular (LV) dysfunction, valvular dysfunction, pericardial effusion and LV hypertrophy in mild range,



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as well as global wall motion abnormalities, indicating a gap in knowledge and competence in these critical areas despite the currently available focused cardiac ultrasound curricula available across some internal medicine residency programs in the United States. We opine that a standardized advanced cardiac POCUS curriculum, which this paper advocates for, will aid in filling this gap through competency-based learning from both didactic and hands-on curriculum components.

The elective would involve a review of basic cardiac ultrasonography and its interpretation, including understanding the planes for image acquisition, cardiac anatomy, assessment of ventricular function, and the presence or absence of cardiac pathology using simulations and, subsequently, image acquisition on real patients during echocardiographic image acquisitions together with the echocardiography technicians following which an opportunity would be provided for image interpretation with an attending cardiologist. This model is similar to that of Wilkinson et al and Gopal et al,^{2,16} which combine didactic (with video simulations) and hands-on sessions in image acquisition.

As a prerequisite to the elective, residents will have completed the introductory POCUS elective, which also includes both didactic and hands-on sessions on other ultrasound areas led by core POCUS faculty, which includes subsections in thoracic, abdominal, and vascular POCUS, in addition to a pretest on basic POCUS in ensuring prior competency as well as consolidation of skills and knowledge in developing advanced cardiac POCUS skills through the elective. Following the elective's completion, a postelective knowledge assessment will be provided through multiple choice questions assessing various competencies in advanced cardiac POCUS. Hands-on competency will be evaluated through a longitudinal assessment of residents' cardiac POCUS skills over PGY levels similar to prior models,^{5,12} which evaluate competency in assessing structures in the parasternal short, apical and subcostal axes, as well as the internal vena cavae (IVC), left ventricle (LV), right ventricle (RV), volume status, and pericardium and subsequently evaluation of archived cardiac ultrasound images using a wireless archival for cardiac POCUS and scored using the Rapid Assessment of Competency in Echocardiography (RACE) score. This scoring system will assess competency in identifying and evaluating structures in the parasternal long, parasternal short, apical, and subcostal axes scored between 0 and 5, as well as the IVC (0-5), LV (0/1), RV (0/1); evaluation of volume status (0/1), and the pericardium (0/1), in addition to a total score assessing the various global components (0-25).⁵ Rather than an absolute score to grade competency, we will similarly evaluate the progression of the total score across PGY levels as used in the model by Prenner et al.⁵ The elective will also be open to faculty interested in advancing their advanced POCUS skills after the introductory POCUS elective, including basic cardiac POCUS. These components of the elective will then be standardized into a curriculum that may be presented as a workshop across Internal Medicine

conferences, such as the Alliance for Academic Internal Medicine (AAIM), and then potentially lead to broader adoption by Internal Medicine residency programs across the United States and included as part of the curricula for ultrasound electives across Internal Medicine residency programs, after a period of trialing the elective at our local institution to test its feasibility and fine-tune it further if needed, which proactively facilitates the elective's wider adoption.

While an elective will not provide mastery of these skills, learning the basics of advanced cardiac POCUS would still benefit residents who frequently order echocardiograms and relay results to patients while laying the foundation for advanced echocardiography that may be taken in advanced training or individual practices. One potential challenge includes the competing demands of the echocardiography staff, including technicians and readers, who need to attend to the training demands of the trainees within areas of their primary expertise with those of the Internal Medicine residents taking the elective. However, this could be mitigated by increasing the protected time of faculty involved with the curriculum and elective to ensure buy-in by staff and dedicated time that provides for a high-quality elective experience by all.

Conclusion

In summary, we advocate for creating, adopting, and implementing a standardized advanced cardiac POCUS elective in IM residency programs in the United States. Such curricula will aid in knowledge and skill acquisition in cardiac POCUS, supported by the increasing use of POCUS in healthcare settings, its rapid application, and the demonstrable benefits of focused training. This endeavor aligns with the evolving demands of healthcare, ensuring that Internal Medicine residents are equipped to navigate the complexities of POCUS and its advanced applications in their professional journey, ultimately giving them leverage in their future careers.

Abbreviations

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| POCUS | point-of-care ultrasound |
| ICU | intensive care unit |
| FAST | focused abdominal ultrasonography in trauma |
| LVEF | left ventricular ejection fraction |
| RV | right ventricle |


Author Contributions

Oseiwe B. Eromosele, MD, conceived and designed the analysis, contributed data or analysis tools, and wrote the paper. Alexandra Pipilas, MD, conceived and designed the analysis, contributed data or analysis tools, and wrote the paper. Jason A. Sherer, MD, conceived and designed the analysis and wrote the paper. Michael C. Schwartz, MD, conceived and designed the analysis, contributed data or analysis tools, and wrote the paper.

Consent

None required

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