

**MEDICAL EDUCATION: PART III**

INTEGRATION OF POINT-OF-CARE ULTRASOUND CURRICULUM IN THE INTERNAL MEDICINE CLERKSHIP

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Ultrasound is rapidly being integrated into undergraduate medical education. A survey of medical schools accredited by the Liaison Committee on Medical Education found that 62% and 50% of medical schools in the United States and Canada, respectively, reported an integrated ultrasound curriculum.^{1,2} Unlike traditional ultrasound applications, to which medical students are more likely to be exposed during their clinical training in radiology and obstetrics/gynecology, exposure to point-of-care ultrasound (POCUS) is likely to happen during the emergency medicine clerkship. However, POCUS is increasingly used in internal medicine as well, to a degree that may necessitate instruction of POCUS skills during the internal medicine clerkship.^{3,4} Integration of POCUS training into internal medicine clerkships remains relatively new, and curriculum strategies are undefined. Thus, the aim of this article is to describe how two different internal medicine clerkships at the University of Washington School of Medicine (UWSOM) in Spokane and the University of South Carolina (UofSC) in Columbia have operationalized POCUS training, and how trainees have responded to the curriculum.

At UWSOM in Spokane, an integrated POCUS curriculum during the internal medicine clerkship was established in 2017. During the 12-week internal medicine clerkship, medical students now have two three-hour sessions focusing on the application of point-of-care ultrasound in general internal medicine. Instructors are often faculty experts and senior residents who are considered POCUS champions, and the instructor to learner ratio is usually 1:4—approximately one-third of session time is didactic while two-thirds is hands-on training.

A cart-based ultrasound machine and one or two

handheld ultrasound machines are used for the hands-on portion, which is conducted in teams with designated roles to enhance team-based learning. For example, student #1 scans, student #2 optimizes the image, and students #3 and #4 describe normal and pathological findings as well as identify surrounding anatomical structures.

Two major areas are emphasized during the UWSOM POCUS curriculum. First, limited cardiac and pulmonary ultrasound are taught to answer focused clinical questions. Students are instructed to obtain the following windows: parasternal long axis view, anterior apical lungs, right/left upper quadrant views, and subcostal/IVC views. While these views provide valuable clinical information, they are combined to form a framework to the cardiopulmonary limited ultrasound examination, which is a systematic and hypothesis-driven approach of using POCUS to evaluate dyspneic patients.⁵ The second area of emphasis is utilizing POCUS as a tool to augment the traditional physical exam. As students learn specific cardiac and pulmonary ultrasound views, instructors highlight opportunities to use the immediate feedback POCUS provides to enhance the physical examination. Formal evaluation of a student's performance during the POCUS portion of the curriculum does not contribute to a student's clinical grade.

At UofSC in Columbia, ultrasound training begins in the first year of medical student education. By the time students reach the internal medicine clerkship as third-year medical students, they have completed two years of ultrasound training integrated into the basic sciences curriculum, mainly anatomy, physiology, and pathology. All of the hands-on scanning in preclinical years is done

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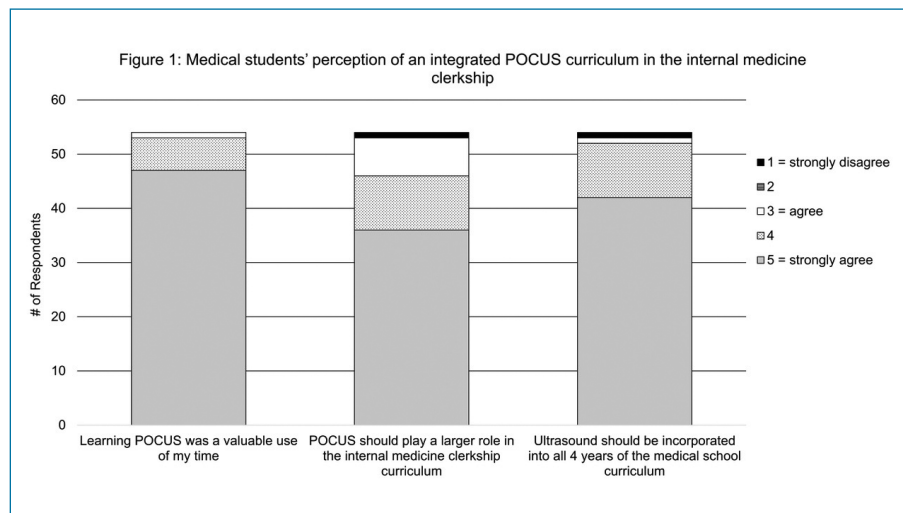


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on standardized patients or simulators. The third-year IM clerkship takes advantage of this prior experience by simply providing online video tutorial reviews on the basics of ultrasound, such as machine operation and exam techniques. This allows faculty to spend more time scanning real patients in the clinical setting. The clerkship itself lends well to an extended ultrasound curriculum, as it is 12 weeks in duration. The most intense ultrasound training of the rotation takes place during the four weeks that each student spends on the inpatient medicine teaching service, which is where most of the hands-on experience takes place.

Students on the inpatient portion of the rotation are assigned a portable, handheld ultrasound device, allowing uninterrupted access to scan patients as indicated. Additionally, during these four weeks, on one day per week, the students spend up to one hour on “gel rounds” with trained faculty or ultrasound fellows. These sessions provide students the opportunity to scan patients with pathological findings under close supervision, strictly for educational experience. Students may ask questions and receive feedback on exam technique and image interpretation.

At the end of the rotation, ultrasound skills are assessed in two ways. Each student is required to submit both normal and abnormal ultrasound clips focusing on the exams that are practiced during the gel rounds sessions: parasternal long axis, longitudinal IVC, anterior apical lungs, and bilateral upper quadrants. Although these images can be obtained during any portion of the 12-week rotation, they are usually submitted after completion of the four-week inpatient block. Included in the end-of-rotation Observed Standardized Clinical Exam (OSCE), one standardized patient station involves obtaining these same views under direct observation from ultrasound institute staff or faculty who



assesses the image technique and quality in real time. Both the submitted exams and the OSCE utilize the same grading scale for image acquisition and contribute a small percentage of the student’s overall clerkship grade.

To assess trainees’ responses to the UWSOM and UofSC POCUS curriculums, an anonymous survey was administered to trainees who had completed internal medicine clerkships at either institution. On a 5-point Likert Scale (1= strongly disagree, 5 = strongly agree), 100% of students agreed that learning POCUS was a valuable use of their time (see figure). Only one respondent did not agree that POCUS should play a larger role in the internal medicine clerkship. It was not surprising to see that all but one of the medical students surveyed agreed that ultrasound should be integrated into the four-year medical school curriculum.

These two clerkships illustrate different ways of successfully incorporating POCUS training into the internal medicine clerkships. Both clerkships focus the training on high-yield topics that a student might encounter in the clinical setting while on an internal medicine clerkship. The UWSOM pro-

vides both didactic and hands-on learning in extended sessions and UofSC focuses solely on scanning real patients, benefited mostly by a robust hands-on training during the first and second years of medical school. Despite differing amounts of ultrasound training prior to the rotations, trainees from both institutions found value in POCUS training during the internal medicine rotation and reported that POCUS training should play a larger role in the clerkship. Even students who are not applying for positions in internal medicine acknowledge the importance of POCUS training during the rotation. Interestingly, in our survey, students indicated a strong preference for incorporating ultrasound into all four years of the medical school curriculum. Given the emphasis on POCUS in GME programs and internal medicine, incorporating POCUS during internal medicine clerkships will become a critical component of training. Results from these two programs, which have used different strategies to expose students to POCUS during the rotation, suggest that both brief lecture-based training and extended hands-on training are successful and well-received by trainees.

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