

Integration of Point of Care Ultrasound into an existing undergraduate medicine anatomy course

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Implication Statement

Ultrasonography has become a valuable procedural guide and diagnostic tool across many medical specialties. A 2017 descriptive cross-sectional survey at Memorial University of Newfoundland found that there was support to integrate preclinical and clinical applications of point of care ultrasound (POCUS) into the undergraduate medical anatomy curriculum. Unlike previous studies that have focused on scanning a single body system, our group utilized a station-based model that allowed medical students to scan several different body systems throughout the year. Our experience in creating the syllabus, collecting feedback, and creating multiple choice assessment questions will be useful to other educators who may wish to integrate POCUS into their curriculum.

Introduction

Point of care ultrasound (POCUS) can image anatomical landmarks and pathologies.¹ Incorporating ultrasound training in pre-clerkship can improve medical students' physical exam confidence and accuracy.^{2,3} Providing students with hands-on ultrasound practice has been linked to better learning outcomes.⁵ In 2017, a descriptive cross-sectional survey at Memorial University of Newfoundland (MUN) found that 100% of medical students, 97% of residents, and 82% of educators agreed that incorporating an ultrasound syllabus would improve anatomy and physiology comprehension and knowledge.⁴ Unlike previous studies that have focused on scanning a single body system, we introduced a station-based model

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that allowed medical students to perform multi-system scans.

Description of innovation

Using Kern's 6-step approach, a POCUS syllabus was designed by a medical student, emergency physician, anesthesiologist, and the anatomy faculty lead. We utilized cognitive load theory in our design.⁶ The curriculum was designed for first year medical students learning anatomy with no prior ultrasound training (sample syllabus and course objectives available upon request). POCUS was integrated into existing two-hour anatomy labs for each of the following systems: musculoskeletal, nervous system, thorax, abdomen, pelvis, and head and neck. Students were shown a five-minute introduction video

(<https://coreultrasound.com/knobology>) defining POCUS and were given a POCUS lab manual to review at the beginning of each semester.

Each POCUS session took place in a medical laboratory teaching room with two stretchers for the standardized patients, dividers to separate them, and two cart-based ultrasound machines. We had an initial teaching ratio of 10:1, which was reduced to 4:1 when more POCUS devices and faculty became available. Standardized patients were used as live models for students to practice scanning anatomical structures.

Outcomes

In the pilot year, 80 first-year medical students had the opportunity to participate in the labs and provide written feedback on the POCUS curriculum. The response from the students was overwhelmingly positive. In reference to the aorta lab, one student stated: “Great instruction. Made understanding anatomy much easier. Love to see more stations like this.” Regarding the POCUS introduction video, students said they would have preferred an in-person tutorial, and some were still not sure how it differed from a regular ultrasound. Based on this feedback we developed an “Introduction to POCUS” session where the students learn how to use the POCUS device.

After the first year of implementation, multiple choice questions (MCQs) were developed and integrated into the anatomy exam to assess learning. The students performed well on these questions, except for one question on the musculoskeletal system which was modified the following year (See Table 1).

Table 1. Student performance and standard deviation on multiple-choice questions in the musculoskeletal domain over the pilot and first year of implementation.

Year (n = 80)	Subject area	Percent Correct	Standard Deviation	Revised (Y/N)
2019 - 2020	MSK	73%	44%	Y
2019 - 2020	MSK	10%	30%	Y
2020 - 2021	MSK	77%	41%	Y
2020 - 2021	MSK	88%	31%	N

Next steps

Successful integration of POCUS into MUN’s anatomy curriculum began with identifying a gap in our curriculum and proceeding purposefully with curriculum design. Curriculum delivery was initially limited by POCUS device availability, but positive student feedback allowed us to advocate for more funding. Future curriculum development may include studying the best method of

assessment for medical students learning anatomy with POCUS.

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