

A Near-peer Point-of-care Ultrasound Elective for Medical Students: Impact on Anatomy Knowledge, Perceptions About Ultrasound, and Self-reported Skill Level

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Rationale and Objectives: We aimed to assess the impact of our institution's recently created point-of-care ultrasound (POCUS) course for preclinical medical students by examining its effect on first-year-level medical knowledge, self-reported skill level, and beliefs regarding the importance of ultrasound in future clinical practice.

Materials and Methods: A total of 18 first-year medical students completed a 5-month near-peer-led training program in POCUS consisting of 3-hour teaching sessions (7), 4-hour clinical sessions (10–12), and an independent study. Students completed pre- and postprogram assessments examining (1) student perceptions about ultrasound and its importance to future careers, (2) students' self-reported skill level with ultrasound, and (3) performance on an anatomy and physiology knowledge quiz. Scores and responses were compared to 20 controls.

Results: The majority of students believed that ultrasound was useful for learning anatomy and would be important in their future clinical practice. Students who completed our training program tended to perform better than controls on a test of medical knowledge. Despite reporting far fewer hours of formal ultrasound training, control students rated their skill level comparably to POCUS-trained students.

Conclusions: This study provides evidence that ultrasound is well received by medical students and may be useful for teaching basic anatomy concepts.

Key Words: Medical student education; point-of-care ultrasound; preclinical curricula; near-peer teaching.

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INTRODUCTION

The increasing portability and affordability of ultrasound technology has allowed physicians from a wide range of fields to adopt its uses at the bedside. As point-of-care ultrasound

(POCUS) expands both in clinical practice and in residency training programs in emergency medicine, anesthesiology, obstetrics and gynecology (1–3), and more, there is an increasing interest in teaching basic ultrasound skills to medical students at the earliest stages of training. However, as the popularity of medical student ultrasound education grows, it is important that institutions offering this training continually assess the utility and impact of their programs. Potential concerns include the observation that student-reported benefit of ultrasound as an anatomy learning tool has been shown to be greater than the actual measured improvement in anatomical knowledge (4), as well as the question of whether students with almost no clinical training can appreciate the nuances of this complex clinical tool (5). Nonetheless, several U.S. medical schools that have already developed well-integrated, longitudinal programs generally report a high degree

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of student satisfaction and excellent performance on assessments of basic skills (6–8). To assess the impact of our own recently created elective in POCUS, we undertook the following study.

In the summer of 2014, eight second-year medical students at our institution designed and implemented a faculty-supervised, near-peer-taught ultrasound course for first-year medical students that consisted of seven educational classes, an independent study using course materials, and additional clinical sessions. The primary objectives of this course were to provide training in basic ultrasound skills via a self-sustaining, near-peer education model; to reinforce the anatomy and physiology being taught concurrently in the first-year curriculum; and to instill in students an appreciation for the complexities of POCUS in clinical practice. The design and content of the course were based on programs at other institutions (8–11). A near-peer education model was adopted as it has been shown to benefit the learner and the teacher (12–15) and because of the limited availability of faculty instructors, a common obstacle also encountered at other programs (16–18).

At the conclusion of the course, we assessed our program's impact on (1) student perceptions about ultrasound and its importance to future careers, (2) students' self-reported skill level with ultrasound, and (3) performance on an anatomy knowledge assessment when tested against first-year medical students who did not participate. Next, we describe the structure of our course and report the results of the written examination and survey aimed at evaluating these outcomes.

MATERIALS AND METHODS

Ethical Approval

The study design was reviewed and approved as a minimal risk project by our institution's Committee on Human Research.

Study Design and Population

We conducted a prospective cohort study examining the effects of the near-peer-taught POCUS elective on familiarity with ultrasound, perceptions about ultrasound and its uses, and knowledge of related anatomy and physiology concepts.

The study population was composed of first-year medical students at our institution. The intervention group consisted of 18 first-year medical students (7 female, 39%; 11 male, 61%) who chose to participate in the elective. Students were recruited at a school activity fair and via an email sent to all first-year medical students. The control group consisted of 20 first-year medical students (8 female, 40%; 12 male, 60%) who did not enroll in the POCUS elective but went on to complete the standard first-year curriculum. Controls were selected around the same time that the POCUS participants were recruited, at the beginning of the first year of medical school. Controls were selected at random from students in attendance at a standard curriculum lecture.

Intervention

The POCUS elective was designed in 2014 by eight medical students. The program included an instruction on the applications of ultrasound that were most relevant to core third-year clinical rotations and most important to general medical practice as determined by consensus among faculty from radiology, emergency medicine, internal medicine, anesthesiology, surgery, and family medicine. Previously published curricular guidelines were also consulted (18,19). Learning objectives for the course were finalized by the radiology and emergency medicine faculty who coordinate medical student education in ultrasound for the School of Medicine. The supervisor for the elective was an ultrasound fellowship-trained emergency medicine faculty member with 10 years of experience in performing POCUS.

The POCUS elective consisted of three components: (1) 3-hour educational sessions (7), (2) 4-hour clinical sessions (10–12) in emergency departments or clinics, and (3) an independent study using an iBook.

Seven sessions lasting 3 hours were held on Wednesday evenings over the course of 5 months. The content of the courses was designed to correspond with the standard first-year curriculum; for instance, the cardiac ultrasound examination was taught during the cardiovascular block in the standard curriculum. The sessions included training in the following applications: (1) Introduction to Ultrasound and Knobology, (2) Inferior Vena Cava and Fluid Responsiveness, (3) Measurement of Jugular Venous Pressure and Identification of Pericardial Effusion, (4) Identification of Pleural Effusions and Deep Venous Thrombosis (Part I), (5) Deep Venous Thrombosis (Part II), (6) Renal Ultrasound, and (7) Gallbladder and Common Bile Duct. An iBook with scanning instructions, embedded videos, and clinical pearls was created by second-year student teaching aids and reviewed by the faculty course director. The iBook was distributed to those in the elective so they could prepare for each session and review afterward.

During the structured teaching sessions, two to three first-year students were paired with a second-year student "teaching aid," creating a "pod." Teaching aids were trained by the course director in the summer before the elective. Each pod had a portable ultrasound (SonoSite Edge II; SonoSite, Bothell, WA). All sessions were supervised by the faculty supervisor as well as additional attendings, fellows, and senior residents well versed in POCUS. Each session consisted of a 15-minute lecture presented by one of the teaching aids followed by hands-on practice with the first-year students practicing the examination on each other or the teaching aids as models. At the conclusion of each session, first-year students were also provided with cases and video materials of POCUS scans demonstrating pathologic findings.

In addition, each participating first-year student was matched with a faculty member familiar with POCUS and was given the opportunity to perform or assist with ultrasound studies in a clinical setting such as an emergency department or clinic. Students completed 4-hour shifts (10–12) in their assigned emergency department or clinic throughout their first year.

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