

Oregon Health & Science University
School of Medicine

Scholarly Projects Final Report

Title *(Must match poster title; include key words in the title to improve electronic search capabilities.)*

Case-Based Point-of-Care Ultrasound Education: Utilization of a Novel Educational Tool

Student Investigator's Name

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Date of Submission *(mm/dd/yyyy)*

03/16/2022

Graduation Year

2022

Project Course *(Indicate whether the project was conducted in the Scholarly Projects Curriculum; Physician Scientist Experience; Combined Degree Program [MD/MPH, MD/PhD]; or other course.)*

Scholarly Project

Co-Investigators *(Names, departments; institution if not OHSU)*

Chrissy Schutzer, BA, RDMS Assistant Director, OHSU Point of Care Ultrasound
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Concentration Lead's Name

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Project/Research Question

What would be the perceived value of utilizing a novel case-based educational tool in OHSU point-of-care ultrasound curricula?

Type of Project *(Best description of your project; e.g., research study, quality improvement project, engineering project, etc.)*

Medical education project

Key words *(4-10 words describing key aspects of your project)*

Point-of-care ultrasound case-based education

Meeting Presentations

If your project was presented at a meeting besides the OHSU Capstone, please provide the meeting(s) name, location, date, and presentation format below (poster vs. podium presentation or other).

Andresen, ST. (2021, September 17). The Practical Experience of Teaching Pathology Identification on Point-of-Care Ultrasound to Early Learners During a Global Pandemic [Poster presented]. POCUS World Virtual Conference/Rockville, MD, USA.

Publications *(Abstract, article, other)*

If your project was published, please provide reference(s) below in JAMA style.

N/A

Submission to Archive

Final reports will be archived in a central library to benefit other students and colleagues. Describe any restrictions below (e.g., hold until publication of article on a specific date).

N/A

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Next Steps

What are possible next steps that would build upon the results of this project? Could any data or tools resulting from the project have the potential to be used to answer new research questions by future medical students?

The educational tool that was produced will be utilized in POCUS education at OHSU. Students could potentially use this tool or design a similar tool and assess its effects on learner retention.

Please follow the link below and complete the archival process for your Project in addition to submitting your final report.

https://ohsu.ca1.qualtrics.com/jfe/form/SV_3Is2z8V0goKiHZP

Student's Signature/Date (Electronic signatures on this form are acceptable.)

This report describes work that I conducted in the Scholarly Projects Curriculum or alternative academic program at the OHSU School of Medicine. By typing my signature below, I attest to its authenticity and originality and agree to submit it to the Archive.

X Sean Andresen 3/12/22

Student's full name

Mentor's Approval (Signature/date)

X  03/16/2022

Mentor Name

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Report: *Information in the report should be consistent with the poster, but could include additional material. Insert text in the following sections targeting 1500-3000 words overall; include key figures and tables. Use Calibri 11-point font, single spaced and 1-inch margin; follow JAMA style conventions as detailed in the full instructions.*

Introduction (≥250 words)

As the clinical uses of point-of-care ultrasound (POCUS) continue to develop and evolve, so too must our POCUS education platforms to suit the growing utility of this technology. Many medical schools have recognized this changing environment and have begun to incorporate bedside ultrasound education into their general medical curricula (1, 2, 3). Oregon Health and Science University (OHSU) has not yet incorporated POCUS into its general curriculum, however, OHSU has been gradually expanding access to POCUS education to both pre-clinical and clinical medical students. With the introduction of IMED 705C for preclinical students in the Fall term of 2019, OHSU has opened an additional avenue for medical students to develop skills with this useful technology.

Incorporation of POCUS education into medical school curricula has been increasing for good reason. With the growing body of evidence that suggests the increasing usefulness of this tool, it makes sense to introduce these skills in medical school to provide a strong background in this skillset (4, 5, 6). In fact, in a recent extensive review, Tarique and others have demonstrated that incorporation of ultrasound education into medical school improves numerous learner outcomes in addition to being received enthusiastically by students (2). In another review conducted by Patel, Benninger, and Mirjalili, incorporation of POCUS into undergraduate medical education increases medical student knowledge of structural and functional anatomy (3). Unfortunately, many medical schools are unable to respond to the increased demand for ultrasound education for numerous reasons. Often, as is the case with OHSU, this is due to lack of available dedicated ultrasound units and limited availability of teaching faculty. Various teaching facilities have incorporated POCUS education to various degrees, resulting in heterogeneous knowledge of POCUS technical and interpretive skills of U.S. medical school graduates (7). This is true within the microcosm of OHSU medical school graduates, who must seek out opportunities to learn about POCUS through elective rotations with limited availability.

At OHSU, this limited availability in electives necessitates creative approaches to improving POCUS education. Due to the lack of comprehensive POCUS exposure offered to medical students, particularly in the realm of identifying pathologic states on bedside ultrasound, our learners may not be achieving optimal learning outcomes. OHSU ultrasound electives lacked implementation of case-based or problem-based learning opportunities that demonstrate the role of POCUS in recognizing pathologic states. Instead, pathologic states were typically taught in a lecture-based format (unless identified on a real patient at the bedside) which emphasizes a “conceptual learning” paradigm. Schmidmaier et al have demonstrated that this type of learning does not adequately prepare medical students to employ critical problem-solving skills when faced with clinical decisions. Instead, they posit, a “procedural” style of learning that incorporates case-based learning or team-based learning better prepares medical students to critically assess clinical situations (8). In this context, case-based learning involves presentation of a patient case vignette with questions regarding the patient’s diagnosis and treatment. Numerous studies have demonstrated that the use of case-based learning, when compared to traditional lecture-based approaches, improves the ability of medical students to retain information as well as apply this information to novel clinical contexts (9, 10, 11). In a review targeting the use of case-based learning in healthcare professions, Thistlethwaite et al assessed 104 studies and determined that this teaching approach does appear to be beneficial to learners (12). The use of case-based learning applies specifically to ultrasound education in undergraduate medical education as well. Case-based learning of POCUS-identifiable pathologies has been shown to be associated with

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increased knowledge retention when compared to use of didactic lectures alone (13). Additionally, case-based learning of POCUS has been shown to increase student understanding of the appropriate uses as well as limitations of bedside ultrasound (14).

Given the above evidence, incorporation of case-based learning into POCUS education at OHSU may ultimately improve learner retention of POCUS-identifiable pathologic states in OHSU ultrasound students. This improved literacy of the uses of POCUS pertaining to pathologic states would likely translate into more effective use of ultrasound when assessing patients in future practice. Thus, I sought to develop a case-based resource to be incorporated into POCUS education platforms at OHSU as well as exploring its perceived value to medical students.

Methods (*≥250 words*)

I designed a series of case vignettes that utilize POCUS clips and images to help students narrow a differential diagnosis. Specifically, a case vignette that is intentionally somewhat vague and yields a range of possible diagnoses is presented. Next, there is facilitated discussion regarding the possible diagnoses and the expected POCUS findings for each considered diagnosis. Following this discussion, a POCUS clip or still image that demonstrates a critical finding is presented – the goal being for students to recognize the pathology demonstrated in the POCUS clip and combine this information with the information presented in the case vignette to arrive at a diagnosis. There is then a discussion regarding pearls of the presented POCUS clip prior to beginning the next case. The series of cases was designed to be presented over a three-hour session with two five-minute breaks. This resource was utilized in each available POCUS elective rotation at OHSU from Spring of 2020 to Fall of 2022 and will continue to be used indefinitely. The cases were presented towards the end of each elective rotation so that students had prior knowledge to rely on when considering the POCUS findings. Following each session, all students who participated were sent an optional survey. Students were asked to rate the perceived value of case-based education in medical school and more specifically in POCUS education, their perceived confidence in recognizing similar pathologies as those presented in the cases in the future, and about medical education preferences in general.

Results (*≥500 words*)

All survey respondents (N=68) felt as though this case-based learning session was valuable for their POCUS education, 57/68 reported as “very valuable” and 62/68 felt that case-based education is “very valuable” in medical school in general. 21/68 respondents reported they would prefer to learn about POCUS findings of pathologic states using only cases like those presented, whereas the remaining respondents preferred a mix of both cases and lecture. No respondents preferred a “lecture only” format. Following the session, 30/68 respondents felt “strong” improvement and 35/68 respondents felt “moderate” improvement in their confidence in recognizing pathologic states using POCUS. 35/68 respondents reported a “much better understanding” of the contrasting appearances of pathologic states identifiable using POCUS and 29/35 reported a “moderately better understanding.”

Discussion (*≥500 words*)

Overall, most students felt that the case-based session was both valuable and, based on comments included in the survey, enjoyable as well. Prior education research has demonstrated the utility of case-based resources in bridging the gap from “conceptual” to “procedural” learning styles. Thus, the ultimate goal of the current project was to help bridge this gap with OHSU’s POCUS curriculum. Nearly all students who responded to the survey felt that this was a “very valuable” session for their POCUS education.

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Surprisingly, over 30% of students reported that they would prefer to learn about the appearance of diseased states on POCUS from cases alone, as opposed to both cases and lecture. None of the 68 respondents preferred a “lecture-only” approach, which had been the predominant approach to teaching pathologic states on POCUS.

In the pre-clinical years at OHSU, students are able to scan their peers to practice developing their POCUS techniques. Students thus glean a thorough understanding of what “normal” healthy findings are using POCUS. This resource demonstrates numerous common pathologic states and shows them in a way that utilizes case vignettes similar to what students may see on rotations and as residents. It could be that students find value in these cases for this reason, i.e. that they are given the opportunity to learn about abnormal POCUS findings in the setting of clinical cases. The strong preference over lecture-based education could also arise from an innate preference to feel more engaged in their education. The session was intrinsically interactive and students were frequently asked to analyze the POCUS clip at hand and offer their interpretations. Most students seemed to be able to easily interpret the images and may have gleaned satisfaction from their work.

Importantly, learner retention was not assessed following these case sessions, so it is possible that educational outcomes were not improved. Based on prior research, however, case-based POCUS education has been found to improve learner outcomes and so the same could be argued in this setting. Additionally, with the general enjoyment of these sessions it could be argued that the increased level of engagement in and of itself could lead to improved learner retention. Ultimately, additional research would be needed to assess the ability of this tool to improve learner retention within the specific population at hand.

Conclusions (2-3 summary sentences)

The case-based resource generated for this project can hopefully be utilized long into the future to aid in POCUS curriculum at OHSU. Prior research has demonstrated the utility of case-based POCUS education and, in general, students enjoyed putting their skills to the test with this resource. Further case-based resources incorporated into POCUS education at OHSU will likely be well-received.

References (JAMA style format)

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14. Afonso N, Amponsah D, Yang J, et al. Adding new tools to the black bag—introduction of ultrasound into the physical diagnosis course. *J Gen Intern Med*. 2010;25(11):1248-1252.