

Ophthalmology Skills Based Education for Medical Students During COVID-19

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Abstract

Introduction: The decline in ophthalmology pre-clinical education is a concern, as it is essential for diagnoses of ocular emergencies and systemic diseases. Compounding this is the global pandemic which has made specialty skills-based training more challenging.

Objective: To combat these issues, a case-based webinar was created to teach ocular sonography and pathologies.

Methods: Medical and health professional students from the ophthalmology and sonography clubs were recruited to attend an interactive, distance learning 50-minute webinar. The webinar began with a four-question pre-test to establish base-line knowledge regarding ocular anatomy, sonography skills, and diagnosis of ocular pathologies. Next, students were taught how to perform an ocular ultrasound and board licensing relevant clinical cases were reviewed. Six cases were presented by first providing the relevant patient history and then walking students through the diagnostic criteria and how sonography could be used in diagnosis. After the cases, students completed the same four-question test as a post-test and were asked to complete an anonymous modified likert scale feedback survey.

Results: 47 students attended the webinar and 31 participants responded to the feedback survey. The attending students varied in their perspective careers goals with seven students expressing an interest in ophthalmology. Only two students had previously performed an ocular ultrasound. Overall, students' knowledge on the pre and post-test showed a significant increase in knowledge on the post-test ($p < 0.05$) with an average of 44 percent on the pretest and 73 percent on the post-test. The 93.6 percent of students strongly agreed or agreed that these skills would assist them in their future careers while 100 percent requested more of these events in the future. Additionally, students strongly agreed that these cases allowed them to understand the clinical importance of developing ophthalmology sonography skills.

Conclusion: Overall, webinars can expose students to ophthalmology topics early on in the premedical curricula.

Keywords: Ophthalmology; Medical education; Sonography; Pandemic; COVID-19; Knowledge assessment

Introduction

With the expansion of pre-clinical medical curricula, time allotted to subspecialties such as ophthalmology has declined [1]. This decline [1-5] is a concern, as it is essential for care practitioners to have the tools to diagnose ocular emergencies, systemic diseases, and refer patients when necessary [2,6]. Concurrently, there has been a decrease in required clinical rotations for both American and Canadian medical schools. In 2000, 60% of schools required an ophthalmology rotation; this decreased in 2004 to 30%. In 2014, only 18% of medical

schools required an ophthalmology rotation [3]. Although this decline plateaued, there is still a lack of competence in ophthalmology skills [7]. Approximately 70% of medical student graduates are not able to use an ophthalmoscope properly [8]. Additionally, primary care residency program directors reported that most residents are not able to meet the Association of University Professors of Ophthalmology Standards [9]. Most of the current teaching in ophthalmology has shifted to the pre-clinical curricula, with 94.7% of medical schools including some form of exposure accounting for an average of 12.5 hours [7]. Further, the Liaison Committee on Medical Education (LCME), which is responsible for accrediting medical schools, does not provide specific guidelines for ophthalmology training [1,5]. However, ophthalmology topics and examination skills are still tested on medical licensing exams [3]. On the current United States Medical Licensing Exam (USMLE) STEP ONE exam, students are expected to know infection and inflammatory disorders of the eye, orbit neoplasms, and other disorders of the eye including eyelid, structural, pupil, iris, muscles of the eye and the retina [10]. In particular, point-of-care ultrasound has become an invaluable tool for the evaluation of clinical conditions related to the eye [11,12]. As such, several medical schools have point-of-care ultrasound incorporated into the medical curriculum and this effort has been furthered by the creation of the Ultrasound in Medical Education, California group, a group of emergency physicians advocating for further ultrasound training in medical education [13]. However, head and neck sonography in preclinical education is limited [11].

Compounding this challenge in medical education is the global pandemic which has made in-person skills-based training more challenging. As such, webinars have become a growing trend in medical education to improve students' knowledge and skills. Studies suggest that webinars are as effective as asynchronous or face-to-face learning [12]. An added benefit to webinars is the ability to distribute expertise knowledge without geographical restrictions [14]. With respect to ophthalmology education, several studies reported that participants would prefer webinars to in-person lectures [15,16], while others reported a neutral response among participants [17,18].

To combat these challenges, a case-based webinar was created to expose students to ophthalmology skills, evaluate their perception of the utilizing sonography in the field of ophthalmology, and assess if a webinar could provide students with ocular sonography knowledge. To our knowledge, no ophthalmology webinar teaching ocular sonography skills has been studied previously.

Methods

Students from the ophthalmology and sonography clubs were recruited to attend an optional virtual webinar through an email to the clubs. This webinar was held on Blackboard Collaborate and lasted fifty minutes. Participants were asked about their previous ocular ultrasound experience and given a four-question multiple-choice pre-test covering material that would be covered in the webinar to determine baseline knowledge of sonographic ocular anatomy, skills and diagnosis utilizing anonymous polling. Students were then taught how to prepare and conduct an ultrasound on the eye, including a review of ocular anatomy. The webinar followed a case-based format using USMLE STEP relevant content such as retinal and vitreous detachments [19], vitreous hemorrhages [20], ocular traumas [20], idiopathic intracranial hypertension [21,22], and central retinal artery occlusions²³. Each case included a quick video clip from 5 Minute Sono. These were used to detail the techniques of the ocular sonography exam and the differential diagnoses. After the cases, participants were given the same questions as a post-test. The pre and post-test data was evaluated utilizing a welch t-test with

a p value of 0.05. After the webinar, students were asked to complete an anonymous ten question open-ended and modified Likert scale feedback survey. Questions included program information, career interest, and questions regarding the overall effectiveness of the webinar. The pre and post-test as well as the feedback survey was created by the research team. The feedback survey likert data was analyzed by giving each response a value as follows: 1 =strongly disagree, 2 = disagree, 3 = agree, 4= strongly agree. The mean, median, and percentages were calculated to analyze the student feedback. The last question provided an open place for student comments. This project was approved by the Eastern Virginia Medical School institutional review board and deemed non-human subjects research, IRB number 20-03-XX-0058.

Results

47 medical, premedical, and physician assistant students attended the webinar which occurred at 5pm on a weekday. Only two students reported previously performing an ocular sonography exam. Overall, an average of 45 students completed all the pre and post-test questions. This number differed as some students joined the event late or had to leave early. Data from the pre and post-test showed an increase in knowledge as the students received an average of a 44 percent on the pre-test and 73 percent on the post-test questions (Table 1). This data was found to be significant with a $p < 0.05$ ($p = 2.2 \times 10^{-16}$).

The feedback survey received a response rate of 31 participants. The majority of the participants were medical students (74 percent or 23 students). Seven students were interested in ophthalmology as a

career, while eight students were undecided. Others had an array of career interests from emergency medicine to oncology.

As presented in Table 2, 93.6 percent of students strongly agreed or agreed that the skills they learned during the webinar would assist them in their future careers. All students enjoyed the case studies presented and found these allowed them to understand the importance of developing ophthalmology sonography skills. Additionally, they agreed that they had a better understanding of each of the specific clinical cases after completing the webinar. 100 percent of survey respondents requested more of these events in the future. An optional question provided a place for students to deliver feedback. Out of the twenty comments positive comments received, only one contained constructive feedback. This comment is listed below.

The event was educational and interesting. There were a few times when the subject matter was advanced compared to my knowledge base but even with that I would recommend hosting future events.

Discussion

The reduction of ophthalmology in medical education [1,3,5,6] is concerning as ophthalmology skills are vital for many physicians [2,6]. This reduction may also lead to a decline in students interested in careers in ophthalmology [4]. Therefore, we developed an ophthalmology sonography skills-based webinar. Specifically, the purpose of this study was to expose students to ophthalmology skills, evaluate their perception of utilizing sonography in the field of ophthalmology, and evaluate if a webinar could provide students with ocular sonography knowledge. Overall, students had an improvement in their anatomical and sonographic knowledge. Students felt like this webinar would assist them in their future careers and that the case studies presented allowed them to understand the importance of developing ocular sonography skills. They also reported having a better understanding of the USLME STEP cases presented and wanted to see more events in the future.

Ophthalmologists aim to improve ophthalmology education in many ways including their continued involvement in licensing examinations [24] and advocating for further curriculum standardization [3]. Additionally, the American Ophthalmological Society created a subcommittee that developed a suggested ophthalmology curriculum (Clarkson). Quillen, et. al, reported that ophthalmology education should be pushed within the already existing medical school curriculum such as incorporating information in pathology and neurosciences. This would provide ophthalmologists the opportunity to improve education without running a full module. They also support more student extracurricular involvement such as with interest groups [4].



Image 1:

Table 1: Pre and Post-test evaluations. The pre and post tests were evaluated with a welch t-test and found to be significant with a $p < 0.05$.

Pre/Post Survey Question	Percent Correct Pre-Test	Percent Correct Post-Test
What part of the eye is marked in this image? (anterior chamber)	59%	89%
How do you measure papilledema on US? (3 mm down and then across the optic nerve sheath)	38%	71
Which of the following images represents a patient with a Vitreous Detachment?	76%	72%
Based on the image, what would be your diagnosis of the patient? (vitreous hemorrhage)	3%	59%

Table 2: Feedback Survey Evaluation utilizing a modified likert scale.

Feedback Survey Question (1 - strongly disagree, 2 - disagree, 3 - agree, 4 - strongly agree)	Mean	Median	Percentage Strongly Agree or Agree
The skills I learned at this event will assist me in my future career	3.51	4	93.6%
I enjoyed learning about the cases presented.	3.74	4	100%
The case studies allowed me to understand the clinical importance of developing ophthalmology sonography skills.	3.83	4	100%
I have a better understanding of Retinal and Vitreous Detachments after this event.	3.77	4	100%
I have a better understanding of Idiopathic Intracranial Hypertension after this event.	3.38	3	96.8%
I have a better understanding of Central Retinal Artery Occlusions after this event.	3.55	4	100%
I would like to see more of these events in the future.	3.87	4	100%

This was a voluntary webinar that only reached two of the clubs on the university campus which limited the amount of people who attended. In the future, we believe this webinar could be placed in the anatomy or neurology curriculum where ocular anatomy and pathologies are covered. This quick activity could provide further exposure to the field of ophthalmology early on in students medical education while reviewing board related material and potentially increased ophthalmology interest. Due to the current pandemic, we were unable to validate if the students could perform the ocular sonography skills presented in the webinar in person.

Overall, this was a relatively quick extracurricular activity that could be provided to a mass audience at a distance. Although there are some pitfalls of webinars such as audio-visual problems or internet connectivity, webinars eliminate geographic barriers and allow for education to be brought to larger audiences. As time for ophthalmology has been cut in the medical curriculum this webinar may be an effective way to increase exposure and knowledge of ophthalmology in the pre-clinical curriculum.

Notes on Contributors

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Conflicts of Interest/Competing Interests

The authors have no conflicts of interest or competing interests

Ethics Approval

This study was approved by the Human Research Ethics committee of Eastern Virginia Medical School (IRB # 20-03-XX-0058).

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