

# Virtual Shadowing: An Effective Approach to Gaining Exposure to the Field of Emergency Medicine

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**Purpose:** Shadowing is an important part of medical student education. The COVID-19 pandemic limited medical students' hospital access. At the same time, virtual access to learning experiences has expanded greatly. In response, we implemented a novel virtual shadowing system to provide students with convenient and safe exposure to the Emergency Department (ED).

**Patients and Methods:** Six EM faculty hosted 2-hour virtual shadowing for up to 10 students per experience. Students registered via signugenius.com. Virtual shadowing was conducted using a HIPAA-compliant ZOOM account on an ED issued mobile telehealth Monitor/iPad. The physician would bring the iPad into the room, obtain consent from patients, and ensure students were able to see the encounter. Between visits, students were encouraged to ask questions using the chat function and microphone. A short de-briefing followed each shift. Each participant received a survey about the experience. The survey consisted of 4 questions for demographics, 9 Likert style questions to assess efficacy, and 2 free response sections for comments and feedback. All survey responses were anonymous.

**Results:** In total, 58 students participated in 18 virtual shadowing sessions with an average of 3–4 students per session. Survey responses were collected between October 20, 2020 and November 20, 2020. The overall response rate was 96.6% (56/58 surveys completed). Of respondents, 46 (82.1%) rated the experience as “effective” or “very effective” at providing exposure to Emergency Medicine. Fifty-three (94.6%) said they would participate in virtual shadowing in the ED again, and 48 (85.7%) would do virtual shadowing in another specialty were it available.

**Conclusion:** We found virtual shadowing to be an easy to implement and effective way for students to shadow physicians in the ED. Even in post-pandemic times, virtual shadowing should be explored as an accessible and effective way to expose students to a broad array of specialties.

**Keywords:** medical education, virtual teaching, career exploration, emergency medicine

## Introduction

Shadowing typically involves a student following a physician in-person, allowing the student to see the physician's role in medical care such as performing interviews, physical exams, procedures, etc.<sup>1,2</sup> However, during the beginning of the COVID-19 pandemic, our institution's emergency department deemed in-person shadowing too dangerous given the high risk of viral exposure. Although the suspension of in-person shadowing was justified, our institution worried the lack of exposure to the field of Emergency Medicine (EM) may limit students' ability to make informed decisions about choosing clinical experiences, picking a career path, and networking.

Physician shadowing is often utilized by medical students for career development to help foster relationships, explore different fields of medicine, gain patient exposure, and improve clinical skills.<sup>3–9</sup> The COVID-19 pandemic severely restricted availability of shadowing for medical students, thereby potentially impeding their career exploration and access to potential mentors. Thus, supplemental exposure to the field of EM was needed. Furthermore, very little literature exists about the use of virtual shadowing in the ED and the few pilot studies that are published have very small sample sizes.

As a result, the purpose of this study was to evaluate a novel virtual shadowing program in the emergency department (ED) for medical students.

With the suspension of in-person shadowing, our team of faculty and students at a major academic medical center developed a virtual shadowing experience for pre-clinical students in the ED with the hypothesis that a structured virtual shadowing experience could supplement or replace the in-person shadowing experience. Our team designed and implemented a virtual shadowing pilot program and assessed the efficacy of the program through participant surveys.

## Materials and Methods

With the University of Utah Institutional Review Board approval, the team designed a virtual shadowing program that would allow for the prospective study of the the following goals: 1.) introduce students to EM 2.) encourage mentoring relationships between students and faculty 3.) foster peer-to-peer relationships. An online schedule was made using “signupgenius.com” for six ED physicians to be virtually shadowed by small groups of medical students for 2-hour sessions from October to November of 2020. Up to 10 first- and second-year medical students were allowed to register for each session. Virtual shadowing was conducted using a HIPAA compliant “ZOOM” account on an ED issued telehealth monitor/iPad. Prior to each session, students were asked to read Chapter 1 of the Emergency Medicine Residents Association (EMRA) and Council of Emergency Medicine Residency Directors (CORD) student advising guide as an overview of the field of EM. Students were also supplied with a documentation template to fill out during each patient interaction to help organize the patient’s history and develop a differential diagnosis. During each session, the physician brought the telehealth monitor to the patient interaction, obtained permission from the patient, and proceeded to provide care while the students observed through the camera of the monitor. Students were able to ask questions using their microphones or the chat feature within the ZOOM app.

To measure students’ perceptions of their shadowing experience, our team used an iterative process via email, to develop an online survey. We drafted, piloted, revised and/or deleted possible items, based on our study questions until we had a survey with 15 questions. Four questions were about demographics. Six questions used 5-point Likert scales designed to evaluate the student’s perception of the virtual shadowing experience with each scale best suited to the perceptions being solicited (level of agreement, yes-no, level of satisfaction). Three questions asked students to rank the likelihood of three different outcomes with virtual shadowing compared to in-person shadowing: (1) finding a mentor (2) strengthening rapport with a fellow student with similar career interests (3) connecting with a more senior student with whom they could ask questions about the field. Two questions asked for free responses. We created the survey for online administration using Google Forms. We sent the survey via email within 24 hours after students completed their shadowing experience. All survey responses were anonymous.

We computed descriptive statistics for all quantitative responses. Given the nature of free responses (ie, less than 230 words on average), we choose not to use rigorous qualitative methods. Rather, we grouped the comments into like themes and identified a representative comment for each theme.

## Results

In total, 58 students participated. Survey responses of students were collected between October 20, 2020, and November 20, 2020. The overall response rate was 96.6% (56/58).

Of respondents (N=56), 13 (23.2%) were second-year medical students, 43 (76.8%) were first-year medical students. All participants had previously completed at least 3 in-person shadowing experiences.

As noted in Table 1, of the respondents, 46 (82.1%) rated the virtual shadowing experience as “effective” or “very effective” at providing exposure to EM. Fifty-three participants (94.6%) said they would participate in virtual shadowing in the ED again, and 48 (85.7%) would do virtual shadowing in another specialty were it available. When compared to in-person shadowing, 34 (60.7%) were somewhat less satisfied and 15 (26.8%) were equally as satisfied. Forty-nine (87.5%) participants would “absolutely” or “probably” recommend virtual shadowing to other medical students.

When asked to rank the likelihood of each: (1) finding a mentor (2) strengthening rapport with a fellow student with similar career interests (3) connecting with a more senior student with whom they could ask questions about the field for each type of shadowing experience, Twenty-three (41.1%) students rated scenario 1 as less likely, 25 (44.6%) rated scenario 2 as less likely, and 24 (42.9%) rated scenario 3 as less likely.

**Table I** This Table is a Summarization of the Theme of Each Survey Question with the Respective Participant Response Rate for Each Theme. The 5-Point Likert Scale Used for Each Theme is Listed Above the Survey Response Rates

	Survey Responses				
Focus of Question	Response Frequencies Across 5-point Scales				
	Very Effective	Effective	Not Sure	Ineffective	Very Ineffective
Effectiveness as exposure to EM	10.7%	71.4%	10.7%	5.4%	1.8%
	Much more satisfied	More satisfied	Equally satisfied	Less satisfied	Much less satisfied
Satisfaction with virtual compared to in-person	1.8%	1.8%	26.8%	60.7%	8.9%
	Definitely yes	Likely yes	Unsure	Likely no	Definitely no
Would participate again?	71.4%	23.2%	3.6%	1.8%	0.0%
Participate in another specialty?	66.1%	19.6%	10.7%	3.6%	0.0%
Recommend to others?	41.2%	47.1%	5.8%	5.8%	0.0%
Would choose virtual over in-person?	0.0%	0.0%	11.7%	29.4%	58.8%
	Much more likely with virtual	More likely with virtual	Equally likely	Less likely with virtual	Much less likely with virtual
Find faculty mentor	1.8%	10.7%	26.8%	41.1%	19.6%
Build rapport with peers	10.7%	19.6%	17.9%	44.6%	7.1%

**Abbreviation:** EM, Emergency Medicine.

We ended up with 6 groups of themed comments as shown in [Box 1](#): 1- Convenient with exposure to wide variety of cases 2- Real time discussion about cases 3- Easy first introduction to EM 4- Various technology issues (audio, video, etc.) 5- Meaningful relationships 6- Extra work for physicians.

**Box 1** This Box Has Grouped the Most Common Themed Feedback from Students in the Post-Survey Free Response Section

Themed Student Feedback
Convenient with exposure to wide variety of cases Getting to see some of what goes on in the ED while avoiding COVID exposure; small time commitment. – Student
Real time discussions about cases We were able to ask questions and get prompt answers. - Student
Easy first introduction to EM I thought that the virtual shadowing was helpful to get a better feel for what it is like to work in the ED, which I greatly appreciated. - Student
Various technology issues (audio, video, etc.) It was a bit difficult to hear during the experience when we were not in a patient room.[maybe] the attending physician could use a microphone. - Student
Meaningful relationships I wish I could have connected more with the people on the Zoom as well as with personnel in the ED. - Student
Extra work for physicians ...to have someone worrying about a laptop every second... isn't realistic, so I understand why at times the [iPad] was pushed to the side. - Student

**Abbreviations:** EM, Emergency Medicine; ED, Emergency Department.

## Discussion

The evaluation of our virtual shadowing program found it to be a feasible, easy to implement, and positively reviewed program for pre-clinical medical students. The program was utilized as an alternative to in-person shadowing during the COVID-19 pandemic but could also be utilized as a supplement to in-person shadowing in non-COVID times. We are hopeful this virtual interaction with the physicians and other team members will help students feel more comfortable contacting them in the future.

Based on the student responses, virtual shadowing appears to be a viable supplement to the career development of first- and second-year students. Incorporation into the career development curriculum could enhance a student's ability to make educated decisions regarding what type of medicine they want to practice.<sup>5</sup> With most medical school programs requiring career development,<sup>7</sup> there is potential for required virtual or in-person shadowing experiences. Virtual shadowing may help to ensure students have a large breadth of exposure prior to rotations and residency selection. It also appears the goals of shadowing such as mentorship, clinical experience, and enhanced medical reasoning<sup>2,3</sup> can still be achieved through the virtual setting.

At the time of our literature review, we found few reports of other virtual shadowing experiences for pre-clinical medical students.<sup>10,11</sup> Both of the known pilot programs used similar methods and showed similarly positive results with their post surveys. Tanouye et al's experience was specific to emergency medicine however they had a small sample size of only six. Saini et al's experience involved multiple specialties but only had a post-survey completion of 54% for students (26/48 students).

## Recommendations

To further evaluate this program, we recommend increasing student and physician participation in virtual shadowing. While student evaluation responses were overwhelmingly positive, long-term implementation with greater student and preceptor participation, in EM and other specialties, is still needed. The participation should preferably come from multiple academic centers to increase diversity. Our pilot program proved to be an accessible and effective way to allow a considerable number of students to gain exposure in a small amount of time. It also required relatively little commitment and demands from both the attending and the students. These characteristics of the program will allow for easy implementation at other institutions without significant investment of time or resources.

Further application of this study is the potential for virtual shadowing in other specialties. The ease of access for students could be an attractive primer for other specialties even in the post-pandemic setting. Using a virtual shadowing shift calendar, as with our pilot, it is very easy for students to gain access to shadowing experiences, with little additional work required for the physician or the student. This could also be helpful for students at schools that may not have specialties such as emergency medicine. Another exciting application of the program is the use of virtual shadowing for student exposure to rural, international, and otherwise difficult to access areas of medicine. This has the potential to foster more interest and career development in areas of medicine that desperately need more physicians.

## Limitations

In terms of our methods to study virtual shadowing, this was a single center study. Ideally, future studies will involve multiple centers with greater number of participants and increased ethnical and geographic diversity. This was also a short term study of only 1 month. Long term evaluation is needed to evaluate virtual shadowing in the ED.

In terms of our use of virtual shadowing as an alternative to in-person shadowing, several limitations were manifest. Certain aspects of the shadowing experience are poorly portrayed virtually, such as the workplace atmosphere. This lack of atmospheric comprehensiveness could lead the student to perceive the field of medicine which they are virtually shadowing to be less interesting than they would have perceived it if they were shadowing in-person. Additionally, some students felt a lack of personal interaction with the physician and patient during the virtual shadowing experience. In total, these findings suggest that virtual shadowing may be an effective supplement for in-person shadowing but should not be considered as a replacement at this time.

The most commonly expressed limitation for the use of virtual shadowing was regarding audio and video quality. These limitations could be addressed by having the physician wear a portable microphone or equip the monitor with a higher quality microphone and ensuring the camera is angled correctly. The use of portable mobile camera stands made visualization of patient interviews and procedures easier. However, if camera angle changed during the physical exam or

procedure the student's view was often disrupted for the entirety of the exam or procedure. One possible solution is to have an in-person shadowing student manage the camera angle and video quality during the session. Another solution is the incorporation of technology such as "smart glasses" with forward-facing cameras for the physician to wear.<sup>12</sup>

## Conclusion

Virtual shadowing utilizing mobile telehealth monitors in the ED is an easy to implement, positive experience for pre-clinical medical students. Though challenges arose regarding video, audio, and the interactiveness of the virtual shadowing, we have outlined various recommendations on how to remedy these challenges in future studies. In conclusion, virtual shadowing may be a viable supplement to help students gain exposure to the field of Emergency Medicine and other specialties.

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## Disclosure

The author reports no conflicts of interest in this work.

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