Foundational Telemedicine Workshop for First-Year Medical Students Developed During a Pandemic

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Abstract

Introduction: In response to the COVID-19 pandemic and the need for social distancing, medical education curricula across the country had to be quickly transitioned from in-person experiences to remote sessions. Simultaneously, use of telemedicine in clinical practice skyrocketed. Despite telemedicine expansion and the opportunity afforded to teach these skills virtually, many institutions lacked telemedicine curricula. **Methods:** We developed and evaluated a foundational telemedicine workshop during a pandemic (158 students in 28 groups) guided by principles to maximize learner engagement during remote learning, including use of discrete, time-limited activities (self-assessment, templated group exercises, review of brief multimedia, and active role-play.) **Results:** Students completed pre- and postsession surveys to assess session impact. Of 158 students, 92 (58%) completed the presession survey, and 36 (23%) completed the postsession survey. There was an increase in confidence in all areas, particularly in skills related to starting the encounter, minimizing barriers, and taking the medical history. Learners reported the physical examination content as more useful than any other area and valued the exemplar videos provided. **Discussion:** The pandemic highlighted our own institution's need to develop telemedicine curricula to prepare medical students to provide this increasingly essential service. We developed a foundational telemedicine skills session that increased students' reported confidence in their telemedicine knowledge and skills. The session could be easily adapted by other schools interested in incorporating telemedicine into their preclerkship curriculum. Additional experiences providing opportunities to practice and receive feedback on telemedicine skills with standardized and real patients are warranted.

Keywords
Telemedicine, Telehealth, COVID-19, Clinical Skills, Clinical Competence, Preclerkship, Online/Distance Learning, Virtual Learning

Educational Objectives

By the end of this session, learners will be able to:

1. Define telehealth and synchronous and asynchronous telemedicine and list different examples of how these are applied to collect data and provide care.
2. Demonstrate relationship-centered communication and history skills that are applied during in-person versus telemedicine patient encounters.
3. Demonstrate physical examination using a telemedicine platform, identifying which portions of the examination can be adapted and which require in-person evaluation.
4. Describe how the practice of telemedicine has changed in the setting of COVID-19 and reflect on future implications for patients, providers, and systems.

Introduction

The American Medical Association has long called for telehealth to become a core competency of medical students,[1] but few schools of medicine had responded to the call prior to the COVID-19 pandemic.[2] The slow pace of adoption in medical education mirrored the experience in clinical practice, where integration of telemedicine had been slowed by reimbursement concerns and limitations of the health system, despite there being little doubt that access to telemedicine benefits patients, providers, and systems of care.[3,4]

Recently, the surge in clinical practice of telemedicine in response to COVID-19 combined with the shift to remote learning has catalyzed a more rapid adoption of telemedicine curricula despite there being relatively few published resources available.[5-7] Proposals are emerging to develop longitudinal

curricula mapped to core competencies,[8] but prior to the pandemic, schools of medicine with telemedicine curricula had typically housed them in a more limited fashion within the clerkship phase.[9,10] As a result, the great majority of learners arriving at clerkship had not previously had experience with telemedicine, and clerkship curricula typically included both a didactic portion and skills practice. Skills practice often includes simulated encounters and is therefore ideally positioned to build clinical reasoning related to common telemedicine presentations through clinical cases.[11] It is not clear, however, whether the placement of the didactic portion followed by simulation is optimal for learning or whether an introduction sooner in the preclerkship phase as a part of an introductory skills-building session would be more effective.

Clerkship learners who experience telemedicine training endorse a need for foundational curricula to reduce technologic barriers and improve rapport prior to simulated practice.[12,13] It is likely that technologic challenges not only affect aspects of communication, the so-called webside manner, but also profoundly affect the performance of the physical examination. The telemedicine physical examination is evolving rapidly with the advent of new technologies[14] and requires that the patient and clinician participate in new ways—with the patient moving their lighting and camera to demonstrate findings and the clinician functioning like a movie director to guide the patient in this process. Just as with other components of physical examination, we hypothesized that students would benefit from the opportunity to practice these skills outside of clinical simulation in order to focus on their development. This approach, enabling skills practice prior to simulation, mirrors common approaches to in-person examination in which a student would typically first practice taking a blood pressure as a part of a skills-building session and later in clinical simulation.

Here, we detail the development and evaluation of a preclerkship telemedicine workshop introducing learners to telemedicine communication, history, and physical examination techniques. The workshop includes skills-building opportunities outside of simulation and was delivered for the first time in a virtual environment in the midst of the pandemic. The session emphasizes didactic introduction to telemedicine, provides video communication and examination exemplars, and enables the opportunity to practice physical examination skills with peers out of role-play, then in facilitated small groups, and finally with peers in role-play. The session provides a basis for subsequent telemedicine clinical skills practice with standardized patients and could be easily adapted for use as a core curricular component

for preclerkship learners at other institutions developing curricula for this essential pillar of practice.

Methods

We designed the Introduction to Telemedicine workshop as a 2.5-hour session offered in the spring of the first year of medical school. The workshop took place as a part of our foundational doctoring course, the Clinical Microsystem Clerkship, a longitudinal curriculum delivered to groups of six students 1 day per week over the first 18 months of medical school. Student groups were paired with a single faculty coach who facilitated their early small-group learning experiences in both clinical skills and health systems improvement. At the time of this workshop, students had been working in their coaching groups for 7 months and had already had the opportunity to practice relationship-centered communication, history taking, and physical examination in both in-person simulation and small-group role-play.

We solicited input on the session from key content experts who practiced telemedicine at our institution and had previously published on aspects of communication and physical examination in telemedicine, amongst them authors Brook Calton and Jeffrey M. Gelfand. Our development team included those with expertise in telemedicine communication, history, and examination techniques. The team met weekly for 1 hour in the 6 weeks leading up to the session. We conducted a review of the literature, defined learning objectives for the session, and applied best practices for remote learning instructional design. Based on a review of available resources, we chose to develop new learning tools, including exemplar videos and telemedicine encounter checklists. We used constructivist learning theory as a conceptual framework and aimed to create hands-on practice opportunities for learner engagement that would build on prior skills, foster active engagement, and provide opportunities for practice.

Two weeks prior to the session, the team provided faculty facilitators (a.k.a. coaches) with a detailed facilitator guide (Appendix A) including 1 hour of presession reading and multimedia resources. Students received a session guide (Appendix B) that included the same presession reading. We provided the students with a list of optional references, including a link for the Academy of Communication in Healthcare online telehealth resources[15] and other relevant literature. In the week prior to the session, the team provided 1 hour of faculty development to the coaches during which we reviewed the session outline and materials and answered faculty questions.

In order to host the session, students and faculty required access to laptops, Zoom, and Google Docs. Surveys were delivered via Qualtrics.

After a 10-minute initial group check-in, the next half hour of the session included self-assessment of telemedicine knowledge and skills (via a less-than-3-minute presession survey; Appendix C), interactive discussion of telemedicine examples and COVID-19 expansion, and an interactive activity drafting the advantages and disadvantages of telemedicine as experienced by patients, providers, and health care systems. To enable best practices for student engagement in virtual learning, the student guide was provided as a Google document that students were able to edit together during the session.

The next half hour included a review of best practices for communication during in-person visits and consideration of how those practices would be applied during clinic to in-home telemedicine encounters, highlighting both how similar many skills would be and also the unique skills necessary for successful rapport building by telemedicine (a.k.a. webside manner). The session highlighted new skills for preparing for and starting a telemedicine encounter (such as preparing one's space, focusing on eye contact relative to the camera, acknowledging technologic barriers, and consenting the patient for the encounter) and included review of an exemplar video (Appendix D) followed by debrief. Learners were given a telemedicine encounter checklist that we had developed internally after a literature review; the checklist included skills for future practice (Appendix E).

Then, for another half hour, students engaged in a group activity in which they reviewed a list of in-person physical examination skills they had learned in the course and considered how these skills might be adapted to telemedicine, as well as which ones would require in-person evaluation. Students then reviewed another exemplar video we developed for the session (Appendix F) highlighting specific techniques, such as lighting and camera angles, to optimize data collected from the physical examination. After video review, learners practiced physical exam skills with peers, focusing on applied techniques to optimize observation of findings.

In the final portion of the session, groups discussed their experience with skills practice; reviewed how various components of the exam could be adapted to telemedicine; and, in virtual breakout rooms, engaged in a final role-play (Appendix G) with peers for integrated practice of skills learned to date. Students then returned to debrief their experiences as well as to discuss the future of telemedicine in terms of technologic advancement, impact on access to care, and impact on their own development and practice. Students were asked to complete a postsession survey within 10 days following the session (Appendix H).

The presession and postsession surveys were developed internally by the authors and designed to align with the learning objectives for the session. Both surveys included measures of self-efficacy for telemedicine knowledge (three questions) and telemedicine clinical skills (eight questions). Self-efficacy was measured on a 5-point Likert scale (1 = not at all confident, 5 = very confident). A rating of 4 (moderately confident) or 5 (very confident) was categorized as confident for the purpose of our analysis. In the preworkshop survey, students were also asked to rate, on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), the extent to which they agreed with three statements regarding telemedicine training in the preclerkship years of medical school. Students who agreed (4) or strongly agreed (5) were categorized as agree for the purpose of our analysis.

In the postworkshop survey, students were asked to report what they viewed as the strengths of the workshop and to suggest areas for improvement. Responses to these two open-ended questions were reviewed by the authors, who together identified themes from the narrative comments. One author (Brook Calton) coded the comments by thematic area, and a second author (Susannah Cornes) verified coding. The third author (Jeffrey M. Gelfand) was available to resolve any differences in coding, but no discrepancies were identified.

Results

One hundred fifty-eight first-year medical students participated in the workshop. Ninety-two students (58%) completed the preworkshop questionnaire; 36 students (23%) completed the postworkshop questionnaire. Pre- (Appendix G) and postworkshop surveys (Appendix H) were designed by the telemedicine workshop design team and distributed to all first-year medical students electronically using Qualtrics. The preworkshop survey was completed by students directly before the workshop. The postsurvey was completed within 10 days of workshop completion. Pre- and postsession surveys were not paired for analysis.

Medical Student Attitudes Towards Telemedicine Education Students felt strongly that telemedicine should be formally integrated into the preclerkship medical school curriculum:

- Eighty-four students (92%) agreed the preclerkship medical school curriculum should introduce students to the skills necessary to take a history by telemedicine.
- Eighty-four students (91%) agreed the preclerkship medical school curriculum should introduce students to the skills necessary to perform a physical exam by telemedicine.
- Eighty-five students (92%) agreed the preclerkship medical school curriculum should introduce students to how to communicate effectively by telemedicine.

The vast majority of students anticipated they would provide care by telemedicine in their future career (51% felt they were very likely and 32% felt they were likely to use telemedicine in the future).

Knowledge and Skills Self-Efficacy Assessment
The workshop increased the percentage of students who reported feeling confident in their knowledge of telemedicine background material (Table 1).

The percentage of students who reported feeling confident performing all eight telemedicine skills shown in Table 2 was higher 1 week after the workshop. The highest percentage change was seen for the following three skills: making a plan for ongoing care in the face of getting disconnected (60% increase), acknowledging and minimizing technologic barriers to communication by telemedicine (57% increase), and taking a medical history by telemedicine (51% increase).

Open-Ended Response Themes
All 32 students who responded to the postworkshop survey replied to the open-ended questions on workshop strengths and suggested areas for improvement.

We asked students to report one to three of the most useful aspects of the workshop for improving their telemedicine knowledge and skills. They most frequently reported that the most useful aspect of the workshop was learning and practicing the physical exam by telemedicine (21 student comments). One student commented that practicing the physical exam "really allowed me to see the barriers and strengths of the technology in action." Another said, "I simply was not aware how you would do an effective physical exam over a video call, but now I feel more confident that it is possible." There were 16 comments that learning telemedicine history-taking and communication skills was a very useful aspect of the workshop, 11 comments regarding telemedicine systems issues and use during COVID-19, nine comments regarding setting up a telemedicine visit, and seven comments regarding defining telehealth/telemedicine. In addition to these themes, seven students spontaneously noted how helpful the sample telemedicine videos were regarding starting the encounter and arranging lighting and camera angles for physical examination.

We also asked students to list one to three recommendations for improving the telemedicine workshop. Comments about wanting more detail and concrete examples on how to complete a physical exam by telemedicine were most prevalent (14 comments). At least five students said they wanted more practice on conducting visits by telemedicine in general, with several mentions of a desire to practice with standardized patients. Two students reported wanting to hear from patients and clinicians about their experience using telemedicine, and two students recommended a stronger focus in the session on possible disparities in telemedicine usage and implementation.

Discussion

Our workshop for preclerkship learners provides a foundation in telemedicine knowledge and clinical skills that serves as a strong initial session for early learners. The workshop offers practice opportunities to foster the development of communication, history, and physical exam skills relevant to telemedicine encounters that should be administered prior to telemedicine simulation with standardized patients or clinical encounters. The workshop is designed to be delivered virtually and includes multimedia activities delivered over a video-conferencing platform. Delivery requires faculty facilitators for small-group learning, but our facilitators did not have telemedicine experience as a prerequisite for teaching. The student surveys indicated that our students believed learning to provide care by telemedicine was important to prepare them for their future careers, and

Table 1. Pre- and Postworkshop Telemedicine Knowledge Self-Efficacy Assessment

Knowledge Self-Efficacy Item	% of Confident Learners		
	Preworkshop (N = 92)	Postworkshop (N = 36)	% Improvement
Describe how different types of telehealth are applied to collect data and provide patient care.	10	75	65
Describe how the practice of telemedicine has changed in the setting of COVID-19.	20	83	63
Describe how telemedicine impacts care for vulnerable populations.	25	67	42

Table 2. Pre- and Postworkshop Telemedicine Skills Self-Efficacy Assessment

Skills Self-Efficacy Item	% of Confident Learners		% Improvement
	Preworkshop (N = 92)	Postworkshop (N = 36)	
Prepare your workspace to create a supportive clinical environment.	29	78	49
Obtain verbal consent for the visit.	42	89	47
Acknowledge and minimize technologic barriers to effective communication.	32	89	57
Make a plan for ongoing care should you be disconnected.	21	81	60
Take a medical history.	35	86	51
Apply relationship-centered communication skills.	44	86	42
Conduct a problem-focused physical exam.	4	39	35
Utilize camera angles and lighting to observe physical examination findings.	8	42	34

the session was associated with an increase in students' reported confidence in their telemedicine knowledge (range of improvement from 42% to 65%) and telemedicine clinical skills (range of improvement from 34% to 60%).

Our results highlight the overall lack of comfort that learners experience with telemedicine physical examination relative to communication skills. Few students reported confidence in performing a telemedicine physical exam before the workshop (4%) or using camera angles and lighting to observe physical exam findings (7%), in stark contrast to relationship-centered communication, with which more students (44%) expressed comfort prior to the session. While confidence with physical exam skills remained lower than other skills in our postsession survey, many more students expressed confidence in these skills following the session, with 39% expressing confidence conducting a problem-focused physical exam and 42% expressing confidence with camera and lighting. We also expect that learners' postsession confidence in telemedicine physical exam telemedicine skills was negatively impacted by their not yet having had their session on the neurologic exam, which was one focus of the workshop demonstration. In fact, student comments indicated that the opportunity to learn telemedicine physical exam skills was a highlight of the session, with multiple students requesting further opportunities to practice these skills. Finally, it is notable that students reported the value of brief exemplar videos for demonstrating best practices that supported their skills development. These data support the approach of providing introductory materials, including exemplars and practice opportunities, prior to simulated encounters in clerkship.

Limitations of the session include those associated with virtual learning, such as the need to set pacing to avoid Zoom fatigue. We found that the length of the session was at the limits of what remote learning would allow; in the future, we plan to split the workshop into two separate sessions focusing on communication and history in part 1 and the physical exam in part 2, followed by the introduction of simulated telemedicine encounters in the second year of the curriculum. In addition, we note that there was attrition in survey respondents. This was likely due in part to there being no dedicated curricular time in which learners could complete the postsession survey, whereas the presession survey was completed during curricular time at the start. It is also possible that students who saw little or no value in the session were less likely to complete the postsession survey, and so, the increase in confidence measures may be overestimated. Finally, it will be helpful to measure confidence at subsequent time points when learners have been able to apply these skills in simulation or clinical practice. The development of longitudinal curricula should include additional outcomes assessment.

Now more than ever, thoughtful curricula preparing trainees to provide medical care by telemedicine are needed for medical students, as well as for trainees from other disciplines and across educational levels. During the COVID-19 pandemic, trainees have frequently participated in telemedicine visits as part of their clinical training and in an attempt to limit virus transmission. Looking into the future, it is highly likely trainees will be expected to conduct telemedicine visits once they are in independent practice. We anticipate that this workshop session can be swiftly and easily adopted by medical and graduate programs that are developing a foundational preclerkship curriculum prior to additional practice opportunities. Moreover, we believe the opportunity to practice the technical aspects of the physical examination is an important aspect of the session that mirrors the approach to physical exam learning in other parts of the curriculum. By valuing the telemedicine exam, we aim to avoid a hidden curriculum that undermines its importance. Given that patients will increasingly rely on providers to evaluate their findings via telemedicine, it is important that learners have the

opportunity develop and optimize a technical foundation best introduced through skills building outside of simulation.

Appendices

A. Facilitator Guide.docx

B. Student Guide.docx

C. Student Presurvey.docx

D. Starting a Telemedicine Encounter.mp4

E. Encounter Checklist.docx

F. Physical Examination Techniques.mp4

G. Role-Play.docx

H. Student Postsurvey.docx

All appendices are peer reviewed as integral parts of the Original Publication.

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