A Telesimulation Elective to Provide Medical Students With Pediatric Patient Care Experiences During the COVID Pandemic

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Objectives/Introduction: The Association of American Medical Colleges suggested that medical students not be involved in direct patient care activities in the United States because of the COVID pandemic. Our objectives are to (1) describe the rapid creation and implementation of a fully online simulation-based pediatric emergency medicine training intervention for medical student learners using existing simulation center staff (faculty, technicians, actors) and resources (simulation technology, scenario files) and (2) report student and faculty feedback on the intervention.

Methods: The sessions involved the use of our existing simulation center faculty, staff, and resources. Feedbacks on the sessions were collected via a survey from faculty and students at the end of each session.

Results: Sixteen simulation sessions were conducted (8 febrile infant, 8 anaphylactic toddler). Forty-eight students, 2 technicians, 2 actors, and 10 faculty participated. Ninety percent of the students agreed with the statements, "I am more comfortable with pediatrics after this session," "participating improved my pediatric knowledge/skills," "this session was more useful than other learning activities I am involved in at this time." Seventy percent of the students agreed with the statement, "I learned as much from observing as when I was actively involved." All faculty agreed with the statement, "this was an effective educational strategy compared to other distance learning." Most faculty (60%) disagreed with the statement, "virtual simulation was equal to or superior to in-person simulation." All students and faculty strongly agreed with the statement, "I would highly recommend this to others."

Conclusions: A telesimulation intervention involving all medical students, staff, and facilitators interacting remotely for pediatric emergency training during COVID was associated with high levels of satisfaction by the majority of learners and faculty.

Key Words: simulation, medical students, telesimulation, faculty

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On March 30, 2020, the Association of American Medical Colleges suggested that medical students should not be involved in direct patient care activities in the United States because of the COVID pandemic.[1] In response, the Yale University School of Medicine Center for Medical Simulation implemented telesimulation to provide authentic patient care experiences to students during the pandemic. Before March of 2020, pediatric simulation sessions at Yale involved medical students, facilitators, and staff in coming together in person at our simulation center (Fig. 1A, traditional simulation). Telesimulation is an innovative approach that typically involves learners and facilitators in separate locations with the simulation equipment in the same location as the learners (Fig. 1B).[2–4] This article describes an approach involving the medical students, facilitators, technicians, actors, and simulation equipment all in separate locations (Fig. 1C).

Our objectives are to (1) describe the rapid creation and implementation of a fully online simulation-based pediatric emergency medicine training intervention for medical student learners using existing simulation center staff (faculty, technicians, actors) and resources (simulation technology, scenario files) and (2) report student and faculty feedback on the intervention.

METHODS

Equipment/Resources

These sessions involved the use of our existing simulation center faculty, staff, and resources. Technicians, patient actors, faculty, and learners all joined onto a teleconference platform (Zoom Video Communications, San Jose, CA) from separate locations via their personal computer, phone, or tablet. The technicians used a remote desktop software to access the centers Laerdal LLEAP Software (Laerdal Medical, Stavanger, Norway) and existing preprogrammed scenario files that had been developed and used in prior years for our traditional in person pediatric clerkship simulations. Throughout the scenario, the technicians used the scenario files trends, handlers, laboratories, and videos/images from our simulation center computers (as they would in their traditional role during in person simulations) to share the monitor output spotlighted on Zoom. A professional actor served in the role of the parent. She used an existing scenario parent script with unprompted verbal statements at specific times, responses to the team's questions when asked, and emotions. The actor used the virtual background function to display the pediatric patient's images and the hospital room. An additional standardized nurse actor relayed the clinical status and examination findings when prompted according to the scenario script.

Simulation-Intervention

At the start of the session, the 2 faculty, the technicians, the actors, and the students introduced themselves. Next, the lead facilitator conducted a 5-min prebriefing and ensured that the audio/video was functioning appropriately for each learner. Next, the students were divided into 2 teams of 3 with each team participating in 1 of 2 scenarios. The team was provided with assigned roles, including team leader, bedside provider, and parent liaison. Although 1 team actively cared for the patient, the other observed (and turned off their video cameras) and were instructed to take notes on an assigned focus area to contribute to the debriefing. During the 10- to 15-minute scenario, the software provided for concurrent viewing of 3 participating students, actors, patient monitors, laboratories, and imaging. The chat function of the software was used to place orders. An image of the simulation from the perspective of the learner is included as Figure 2. The students were encouraged to use a "pause button," and the technician would freeze the scenario. During that time, the students reflected

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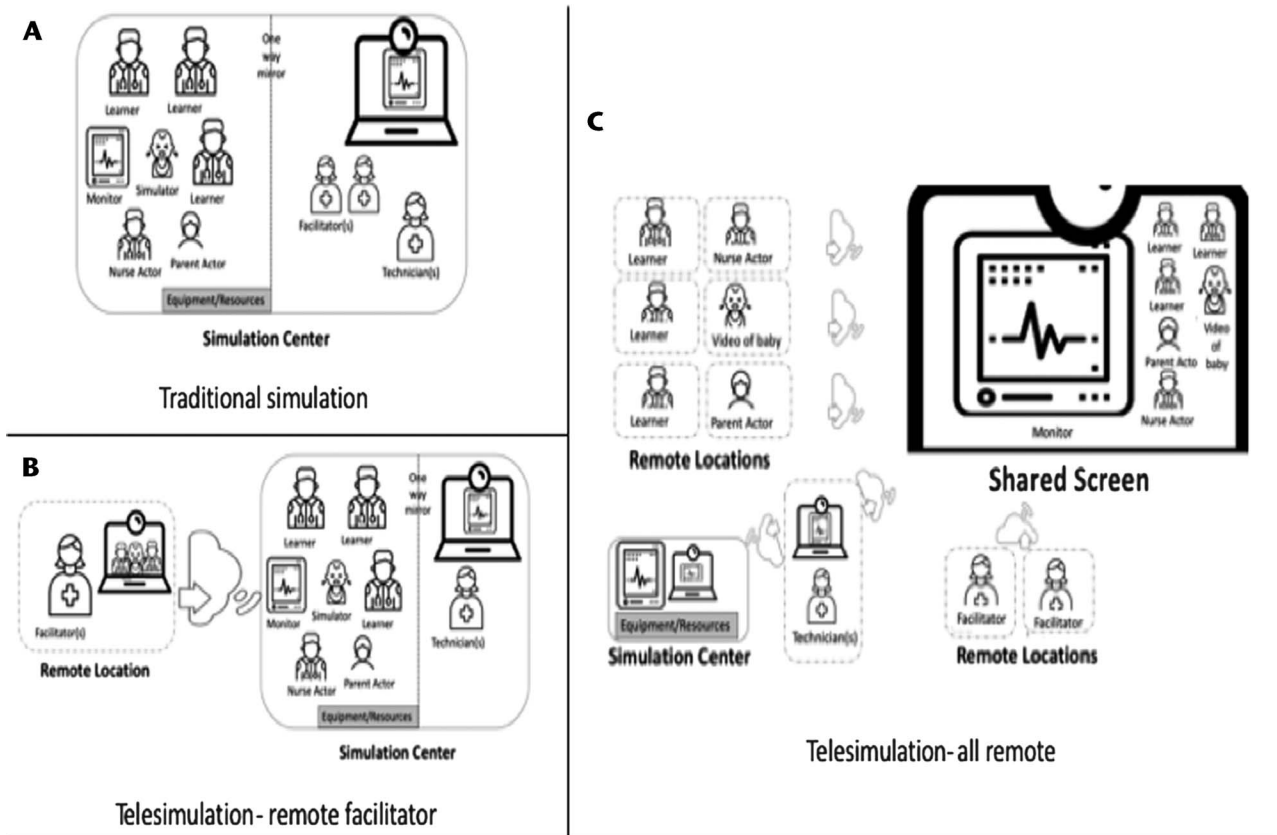Disclosure: The authors declare no conflict of interest.
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Overall figure was created by Marc Auerbach with the icons made by Learner/Nurse by Wichai Wi, computer by Vectors Market, baby by dDara, monitor by Nhor, parent by bambaleq, facilitator by Made from thenounproject.com under creative commons license

FIGURE 1. Three types of simulation: 1a. Traditional (all in person), 1b. Telesimulation (remote facilitator, learners in person), 1c. Telesimulation (all remote).

in action and discussed the care of the patient as a group (these discussions were included in the debriefing). The 30-minute debriefing used the PEARLS debriefing tool, and during the analysis phase, visual teaching aids were displayed.[5] After the simulation session, additional learning resources were disseminated to all students, including podcasts, evidence-based guidelines, and clinical summaries. The 2 cases conducted included a septic infant and a toddler with anaphylaxis. These simulations' objectives were related to pediatric acute care medical knowledge, teamwork, communication, and family centered care. The objectives and
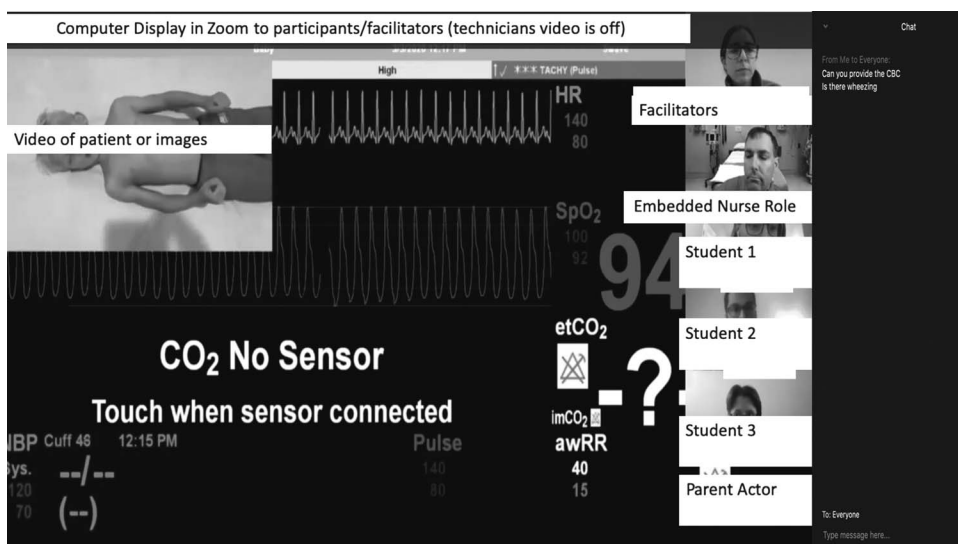

FIGURE 2. Screenshot of the telesimulation experience from the learners perspective.

cases were developed over 5 years ago for in person simulations and have been iteratively adapted in response to learner and faculty feedback from these sessions. The participating medical students received an introductory email with a video tutorial to review before the scheduled telesimulations. This video included information on the format and expectations for the session as well as detailed information on how to use the teleconference platform during the session (https://youtu.be/CQROasrd5vA). A single simulation fellow (T.Y.) served as the lead debriefer for all sessions. Nine pediatric faculty were recruited to serve as a codebriefers/content experts from our experienced pediatric simulation facilitator group. All faculty received a train-the-trainer package that included a tutorial on the teleconference platform and a detailed pre-brief script, simulation scenario, and debrief script. All sessions involved 2 experienced senior simulation center technicians and experienced patient/nurse actors for consistency.

Evaluation

Feedback on the simulation session was collected via an online survey (Qualtrics, Provo, UT) from faculty and students at the end of each session using a quick response code link. The survey included 6 statements using 5-point Likert scales and 2 demographic questions. This project was reviewed by the Yale Human Investigation Committee and was deemed exempt as an educational intervention.

RESULTS

Sixty-two medical students signed up for this session, and 48 students were selected to participate in this experience during 16 scheduled sessions in April 2020. All 48 students and 10 faculty completed the pediatric scenarios, and all completed the survey (35 MS2, 7 MS3, 2 MS4). Ninety percent of the students agreed with the statements, "I am more comfortable with pediatrics after this session," "participating improved my pediatric knowledge/skills," "this session was more useful than other learning activities I am involved in at this time." Seventy percent of students agreed with the statement, "I learned as much from observing as when I was actively involved." All faculty agreed with the statement, "this was an effective educational strategy compared to other distance learning." Most faculty (60%) disagreed with the statement, "virtual simulation was equal to or superior to in person simulation." All students and faculty strongly agreed with the statement, "I would highly recommend this to others."

DISCUSSION

Our experiences provide evidence of high levels of satisfaction with telesimulations involving all staff and medical students interacting remotely during COVID, when other in-person learning activities were halted, especially clinical rotations. We intend to apply telesimulation as a method to augment our standard in-person medical student simulation activities after the pandemic and as a flexible modality in response to further pandemic waves. Although our sessions were based on a subset of medical students within a single well-resourced medical school simulation center, our findings suggest that telesimulations can be considered as an alternative approach for students and other learner groups with less resources and/or for other learner groups. For example, our simulation center has initiated additional telesimulation sessions with other learner groups (residents, faculty, nurses) and different clinical topic areas (airway, cardiac arrest, sedation) during May and June. We have also worked with other medical school simulation centers to share our approach and learn from others working in this emerging area of simulation to improve the feasibility and generalizability of telesimulation.

Limitations

Despite positive feedback from the learners participating in these sessions, there are important limitations to our work that must be considered. First, we did not collect substantive data to compare the effectiveness of telesimulations to other traditional learning activities in medical school (ex: lectures, presentations, team-based group discussions, role plays, in-person simulations). However, clinical rotations and other in-person learning sessions were on hold because of safety precautions that were implemented at the hospital during the pandemic. Since the pandemic affected clinical education swiftly and unexpectedly, our team used "Design Thinking." It is a concept known where products are created to accelerate and implement solution prototypes through ideation and implementation.[6] Because of its nature, our educational curriculum and evaluation were simplified to generate pilot data that assessed reactions to guide future applications. Normally, curriculum development is a robust, long, detailed process. It includes generalized needs assessment, targeted needs assessment, goals and objectives, educational strategies, implementation, and evaluation.[7] Learners could have reported high levels of satisfaction related to these sessions because they were the only available clinical activities. Also, our data could also be effected by selection bias because our sessions were limited to 48 students who volunteered on a first-come-basis, which does not capture the entire population. Future implementation of telesimulation could involve a more robust curriculum design process following the above model.

Second, it is not clear if this intervention is generalizable. This innovative instructional approach required technology, such as licensing products to virtual monitors and remote desktops. This approach may not be feasible in certain countries or other remote areas with limited support. The facilitator team also needs faculty committing to contribute their time, this can be an issue in certain medical schools or departments, particularly with competing personal and professional demands because of the pandemic. Future work could explore the feasibility and generalizability of telesimulation in remote areas with less access to resource and more diverse populations of learners and faculty.

Third, there was mixed feedback from faculty. The faculty and facilitator time commitment was increased during our sessions as they were all compressed into 1 week. In addition, because of COVID, many faculty and facilitators were facing additional personal and professional stresses. It would have been interesting to determine if stress or other emotional factors were impacting staff and faculty responses; however, we did not include questions on those topics. Also, future efforts should explore methods to conduct telesimulations with a reduced number of staff members and spreading out the sessions over a longer period.

CONCLUSIONS

A telesimulation intervention involving all medical students, staff, and facilitators interacting remotely for pediatric emergency training during COVID was associated with high levels of satisfaction by the majority of learners and faculty. We encourage others to apply this and other innovative approaches to ensure continued opportunities for clinical training in the face of a pandemic requiring physical distancing and significant changes to our center's activities. With these data and our experiences, we plan to integrate telesimulation into our existing curriculum and are considering developing a new telesimulation curriculum using Kern's 6-step approach. This work will involve additional assessment tools to evaluate for cognitive, affective, psychomotor, or patient-outcome differences in learners participating in telesimulations.

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