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The academic experience in distance (virtual) rounding and education of emergency surgery during COVID-19 pandemic[☆]

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ABSTRACT

Background: To cope with COVID-19 pandemic control precautions, many surgical residency programs have adopted a Declared Health Emergency rotation to minimize exposure to the COVID-19. We evaluated the experience and educational value of virtual education activities by reviewing the perceptions of the Declared Health Emergency rotation participants through survey questionnaire analysis.

Methods: Participants of the Declared Health Emergency rotation virtual educational activities were asked to complete a survey questionnaire describing their perception and experience.

Results: The survey response rate was 100% (faculty, n = 13; residents, n = 8; nurse practitioners/physician assistants, n = 4). The majority reported that virtual activities required minimal technical skills (n = 17, 68%). Compared to the traditional in-person conferences before the pandemic, the majority reported that they participated in virtual rounds more often or the same (n = 22, 88%), that the overall level and quality of interactions were the same or better (n = 19, 76%), and that the knowledge gained was the same or more (n = 22, 88%). All respondents reported that virtual conferences educational objectives were met.

Conclusion: The quality of education and the knowledge gain during the virtual educational activities are equivalent or better than in the traditional face-to-face activities. The use of technology in virtual educational activities is a practical and convenient approach to achieve the desired educational objectives during and potentially after the COVID-19 pandemic.

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INTRODUCTION

The wide and rapid spread of COVID-19 followed by the declaration of a global pandemic on March 11, 2020, forced residency training programs to adopt Declared Health Emergency (DHE) rotations. Under such a strategy, residents are divided into 2 groups. The first group is assigned to hospital duties (ie, direct patient care, rounding on inpatients, and covering urgent surgeries). At the same time, the second group is to stay home and participate in virtual learning. The goal of this restructuring has been to minimize exposure to both residents and patients, optimize the workforce to ensure maintenance of providing optimal patient care, and promote residents' well-being.

Our program curriculum restructuring was specifically designed within the constraints of the COVID-19 pandemic. Although part of

the curriculum is directed toward disaster management and emergency preparedness, it did not lose focus on continuing surgical training in all 6 aspects of core competencies.

In this study, we sought to examine and evaluate our faculty and trainees' experience with the restructured virtual educational activities by analyzing data collected through survey questionnaire.

METHODS

During the COVID-19 pandemic, DHE rotation was introduced on an urgent basis to accommodate the new social physical distancing and other pandemic control precautions. Therefore, the residents were divided into 2 groups that alternate weekly on 2 different rotation curricula. One group would be involved in the in-hospital patient surgical care and activities while participating in the group and department virtual activities. The second group does not participate in the in-hospital patient surgical care activities for that week. Instead, they participate in the Disaster and Emergency Preparedness (DMEP) curriculum, study/SIM laboratory training plan, and the department virtual meeting and group learning activities.

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Disaster and Emergency Preparedness (DMEP) Curriculum. The United States Department of Homeland Security and Federal Emergency Management Agency and its Center for Domestic Preparedness offer courses and training in disaster management in a wide variety of contexts and disciplines. For the rapid deployment of a virtual course experience for surgical residents, we utilized the ACS DMEP course manual to identify the areas that were felt to be key areas for surgeons to be well-versed in [1]. We next surveyed the courses offered by FEMA's CDP [2] and determined that the following online course modules would be appropriate for the residents to complete: IS-100 Introduction to Incident Command System for Healthcare/Hospitals; IS-700 National Incident Management System, An Introduction; IS-800 National Response Framework, An Introduction; and IS-0520 Introduction to Continuity of Operations Planning for Pandemic Influenzas. This was then structured in a flipped classroom model, where the off-site residents would complete modules individually and submit a brief response paragraph with specific focus to subject matter comprehension, critical analysis, and application. They were provided a graded evaluation on these 3 areas ranging from excellent, good, satisfactory, and needs improvement. During their off-site weeks, they participated in online virtual discussion forums designed to highlight the key features of the online modules they had completed and how it applied to their own experiences as surgical residents during the COVID-19 pandemic. Finally, the residents underwent a capstone virtual case scenario with assigned role-play developed in a manner similar to the simulated exercises conducted by FEMA's CDP on-site courses for certification in leadership in disaster preparedness. After completing the virtual case scenarios, the residents completed a brief survey on their course experience and knowledge enhancement.

Virtual Educational Activities During the Emergency Rotation. The emergency rotation consisted of the following virtual key activities: (1) virtual general surgery rounds, (2) virtual trauma rounds, and a (3) virtual disaster management course. The virtual general surgery and virtual trauma rounds were held every weekday; general surgery at 7:00 AM (for 60 minutes) and trauma at 11:30 AM (for 30 minutes). During virtual rounds, on-site residents presented each patient on the service as if they were presenting them on teaching rounds including pertinent review of imaging and laboratory tests, and presentation of assessment and plan. Remote audiovisual participation was conducted using an online/virtual meeting platform. The virtual meeting platform used (Cisco-Webex) was provided and recommended by the university. It has reasonable levels of security measures that comply with the HIPAA regulations, along with the ease of use and practicality [3]. Participants were encouraged to ask questions, and there was also directed questioning from the supervising attendings to remote participants. In addition, the weekly grand rounds, mortality and morbidity rounds, the journal club sessions, and the SCORE or Decker sessions on Thursday morning were conducted virtually.

Study Design. This study is designed to examine and evaluate the experience of virtual surgical educational activities that replaced the traditional face-to-face educational activities of the curriculum before the COVID-19 pandemic. The theoretical framework in this study is based on the social and the connectivism learning theories [4,5].

To evaluate the educational experience, all residents, nurse practitioners/physician assistants (NP/PA), and surgeons who participated in the DHE rotation were asked to complete the survey questionnaire describing their perception and experience.

A special survey for the study was developed by the authors based on the active elements and issues of the curriculum that were discussed among residents and faculty attending during the rotation. The survey was reviewed and vetted by the program director, associates program director, program coordinator, curriculum-editing faculty, and the surgical disciplines chairman, who all participated to varying degrees in the virtual educational activities. The domains that were covered in

the survey are the educational value, the use of educational technology, and the practicality of use. The study was exempted by the Institutional Review Board for anonymity of participants. The survey was electronically distributed to all participants using the Qualtrix platform. All results were collected electronically except one that was submitted by paper.

RESULTS

Twenty-five survey questionnaires were sent by e-mail ($n = 24$) or paper format ($n = 1$) to all participants of the virtual educational activities of the General Surgery Department, Central Michigan University College of Medicine, during the DHE rotation. Response rate was 100% [faculty, $n = 12$ (52%); residents, $n = 8$ (32%); and NP/PA, $n = 4$ (16%)] (Table 1). The majority of responders most often participated in the virtual educational activities from hospital ($n = 13$, 52%), whereas other responders most often participated from home ($n = 9$, 36%) or academic office ($n = 3$, 12%). When asked "from what other places did you participate?", responders reported that they less often participated from home ($n = 12$, 48%), hospital ($n = 11$, 44%), academic office ($n = 8$, 32%), and/or other places (ie, library or car) ($n = 7$, 28%). Participants most often logged in the online activity using a laptop computer ($n = 15$, 60%), a smart phone ($n = 5$, 20%), a desktop computer ($n = 4$, 16%), or an electronic tablet/iPad ($n = 1$, 4%). When asked "what other devices did you use to log in?", responders reported that they less often logged in virtual activities using smart phones ($n = 16$, 64%), desktop computer ($n = 8$, 32%), laptop computer ($n = 8$, 32%), and/or electronic tablet/iPad ($n = 6$, 24%). The majority of responders reported that they preferred participating in the virtual activities using a laptop computer ($n = 15$, 60%). Other participants preferred using a desktop computer ($n = 5$, 20%), a smart phone ($n = 4$, 16%), or an electronic tablet/iPad ($n = 1$, 4%). The majority of participants ($n = 15$, 60%) most commonly participated in the virtual activities audiovisually, whereas 10 participants (40%) most commonly participated using audio-only mode. When asked "what mode do you prefer to have other participants use?", 13 participants (52%) preferred the audiovisual mode, 2 (8%) preferred the audio-only mode, and 10 (40%) did not have a specific preference. All responders ($n = 25$, 100%) participated in virtual grand rounds and morbidity and mortality conferences. Eighteen responders (72%) participated in virtual didactic sessions, 16 (64%) participated in virtual clinical rounds, and 13 (52%) participated in separate personal teleconference with faculty or residents. When asked "what are your preferred virtual activities to participate in?", responders reported that morbidity and mortality conferences were the most preferable virtual activity to participate in ($n = 20$, 80%) followed by grand rounds ($n = 17$, 68%), didactics ($n = 11$, 44%), virtual clinical rounds ($n = 11$, 44%), and separate personal teleconference with faculty or residents ($n = 4$, 16%). The vast majority of the responders ($n = 22$, 88%) reported that they participated in virtual clinical rounds more often or the same compared to the traditional in-person meetings before the pandemic. The majority of participants ($n = 12$, 48%) reported that they had an average of 3–5 interactions (presenting, asking/answering questions, commenting) per virtual meeting, whereas 8 participants (32%) had an average of 1–2 interactions per meeting. The majority of participants ($n = 19$, 76%) reported that the overall level and quality of interactions between participants during virtual educational activities were the same or better compared to the traditional in-person conferences before the pandemic. The majority of responders reported that virtual activities required minimal technical skills ($n = 17$, 68%) and that the quality of audiovisual connectivity was either good or excellent ($n = 20$, 80%). All responders ($n = 25$, 100%) reported that virtual meetings and conferences educational objectives were met, and 22 (88%) reported that the knowledge gained during the virtual activities was the same or more compared to the in-person conferences before the pandemic. The majority of the responders ($n = 12$, 48%) either disagreed or strongly disagreed that they felt isolated from faculty and

Table 1
Response to the survey questionnaire

Q1	What is your academic role?				
	Faculty	Residents	NP/PA		
	13 (52%)	8 (32%)	4 (16%)		
Q2	From where did you most often participate?				
	Academic office	Hospital	Home		
	3 (12%)	13 (52%)	9 (36%)		
Q3	From what other places did you participate? You may choose more than one.				
	Academic office	Hospital	Home	Others	
	8 (32%)	11 (44%)	12 (48%)	7 (28%)	
Q4	What device did you use most often to log in?				
	Desktop	Laptop	Smart phone	Tablet/iPad	
	4 (16%)	15 (60%)	5 (20%)	1 (4%)	
Q5	What other devices did you use to log in? You may choose more than one.				
	Desktop	Laptop	Smart phone	Tablet/iPad	
	8 (32%)	8 (32%)	16 (64%)	6 (24%)	
Q6	What device do you prefer to use (if more than one was used)?				
	Desktop	Laptop	Smart phone	Tablet/iPad	
	5 (20%)	15 (60%)	4 (16%)	1 (4%)	
Q7	What was your most common participation mode?				
	Audio only		Audio/Video		
	10 (40%)		15 (60%)		
Q8	What mode do you prefer to have other participants use?				
	Audio only		Audio/Video		No preference
	2 (8%)		13 (52%)		10 (40%)
Q9	What activities did you participate in? Choose all that apply.				
	Grand round	M&M	Didactics	Virtual clinical rounds	
	25 (100%)	25 (100%)	18 (72%)	16 (64%)	
Q10	What are your preferred virtual activities to participate in? Choose all that apply.				
	Grand round	M&M	Didactics	Virtual clinical rounds	
	17 (68%)	20 (80%)	11 (44%)	11 (44%)	
Q11	Compared to the traditional in-person meetings before the pandemic, I participated in virtual clinical rounds:				
	More often		Same		Less often
	11 (44%)		11 (44%)		3 (12%)
Q12	What would you estimate was your average number of interactions (presenting, asking/answering questions, commenting) per virtual meeting?				
	0	1–2	3–5	6–9	>9
	2 (8%)	8 (32%)	12 (48%)	2 (8%)	1 (4%)
Q13	Compared to the traditional in-person conferences before the pandemic, the overall level and quality of interactions between participants were:				
	Better		Same		Worse
	7 (28%)		12 (48%)		6 (24%)
Q14	What were the quality and clarity of audiovisual and connectivity of the sessions?				
	Excellent		Good		Needs improvement
	6 (24%)		14 (56%)		5 (20%)
Q15	What do you think were the technical skills you needed to participate?				
	Minimal		More than I can do		
	17 (68%)		8 (32%)		
Q16	Were the meeting and conference educational objectives met?				
	Yes		No		
	25 (100%)		0		
Q17	Compared to the traditional in-person conferences before the pandemic, the knowledge gained was				
	More		Same		Less
	6 (24%)		16 (64%)		3 (12%)
Q18	In using virtual rounds and conference sessions, I felt isolated from faculty and peers during the rotation:				
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	2 (8%)	8 (32%)	3 (12%)	9 (36%)	3 (12%)
Q19	Compared to the traditional in-person conferences before the pandemic, I experienced disinterest/absentmindedness:				
	More often		same		
	4 (16%)		16 (64%)		
Q20	Has this virtual format allowed you more time for other activities, such as research, clinical work, or administrative activities?				
	Yes		No		
	16 (64%)		9 (36%)		

Q21	Should we continue making morning hospital rounds also available in a virtual format when the pandemic is over? (24 answered the question)	
	Yes	No
	16 (67%)	8 (33%)
Q22	Should we continue making grand rounds/M&M conferences also available in a virtual format when the pandemic is over?	
	Yes	No
	22 (88%)	3 (12%)
Q23	What suggestions do you have to improve the clinical virtual rounds?	
	Adding a short survey of feedback at the end of sessions to evaluate the quality of event	
	Have everyone use both video and audio so that they can be seen	
	Make shorter so residents would have time to place orders and go into OR	

peers during the rotation, and 21 (84%) reported that they experienced disinterest/absentmindedness the same or less often compared to the traditional in-person conferences before the pandemic. The majority of responders ($n = 16, 64\%$) reported that the virtual format of the meetings/conferences allowed them more time for other activities such as research, clinical work, or administrative activities. The majority of the responders agreed that the surgery program should continue making morning hospital rounds ($n = 16, 67\%$) and grand rounds/M&M ($n = 22, 88\%$) available in a virtual format when the pandemic is over. When asked about how to improve the quality/knowledge gain of the clinical virtual rounds, the responders suggested that all participants should visually interact in the meeting using a video camera for better engagement in the educational activity. In addition, responders suggested that meetings should be shorter to allow more time for other educational/clinical activities and that a short feedback survey be added at the end of each session to evaluate its educational value.

DISCUSSION

Distance education using virtual rounding and meetings has become a common practice during the COVID-19 pandemic. Several institutions have adopted variable forms of distance education tools and practices to accommodate the current limitations in face-to-face educational activities [6–9]. The authors of this study chose to review and evaluate the local experience systematically to analyze and construct conclusions based on the social constructive learning theory.

The domains that were assessed in the study include the technical aspects and technology tools, the learning process and outcomes, and the social context with the convenience and practicality aspects. The experience is considered blended learning that combines both the newly introduced virtual meetings and the face-to-face clinical educational activities [10].

The technical aspects of the experience including the technology tools and devices, the process and preference of use, the audiovisual median and connectivity, and the challenges or troubleshooting were evaluated by specific questions of the survey questionnaire.

In spite of the minimal preparation and training prior to the beginning of the experience, the survey data indicate that the process of the virtual meetings was conducted reasonably efficiently, clearly, and practically. Whether additional educational technology training and preparation could result in further improvement and optimization of the educational quality and outcomes is unknown. Generally, instructors need continuous improvement and motivation to teach online [11]. There is clear dominance for the use and preference of the mobile devices. Studies of the devices used in higher education online learning showed higher use of laptops among other mobile devices [12]. The screen size and spectrum of computing services while maintaining mobility might explain this preference. There is a slightly higher rate of use of the audiovisual participation mode than the audio-only mode. Participating audiovisually will likely simulate the traditional face-to-face activities and enrich the social context.

The educational outcome and quality of education were measured by the number of interactions, meeting the educational objective, and

the knowledge gain as perceived by the participants. The rate of participation in the educational activities is higher in the virtual meetings than in the face-to-face meetings. Convenience while maintaining effectiveness is a possible explanation of this finding. As a replacement to traditional face-to-face educational activities, virtual meetings resulted in achieving the same or better educational outcomes than face-to-face. This is a significant factor that could affect the choice of the mode of academic meetings and activities by educators, programs, and institutions in the future. Knowledge gain was perceived by most respondents to be the same as, or better than, in the face-to-face meetings. All participants agreed that the objectives of the educational activities were met. This is another important indicator of the overall educational quality of the virtual meetings.

Based on the survey data, the quality of the virtual events did not result in disengagement of attendees. The comfort level and convenience obtained in virtual meetings might be the explanation. There is clear preference to making the academic activities available in the virtual format in addition to the face-to-face after lifting the social physical distancing precautions. That could be a preference of participating virtually or just keeping this option available in case it is needed.

As an indirect implication, the virtual experiences in clinical training may foster more support, engagement, and facileness with virtual health care delivery. As our survey identified, 64% of respondents felt that they had more time for other activities, and therein may be an opportunity to counter physician burnout via virtual care. Future studies should further explore if this observation is secondary to a true effect of transitioning from face-to-face activities to virtual format or is a result of having the remote participants partially relieved from clinical activities during the DHE rotation.

The study is limited by the relatively small number of participants and by being conducted in a single program. As the study data were drawn from survey questionnaire, the study is subjected to response and questions order biases as well. The risk of sampling and nonresponse biases is minimal, as all of the DHE rotation participants were included and responded to all of the survey questions.

In conclusion, examining and analyzing experiences of virtual meetings and distance education are scientific approaches to improving surgical education during and after the COVID-19 pandemic. The use of technology in virtual educational activities is a practical and convenient approach to achieve the desired educational objectives. The survey data showed that the quality of education, outcomes, and knowledge gain might be comparable to traditional face-to-face activities. Future studies for the long-term effects, wider applications and use, and in-depth details of the educational process are required to evaluate this style of surgical education and provide further recommendations for future use. In addition, potential negative effects of using the virtual format on experiencing social isolation need to be further investigated in larger-scale studies. Sharing local experiences and outcomes

among programs and institutions is a valuable source in the meantime.

Author Contribution

Faiz Tuma, John Blebea: Conceptualization, Methodology.

Faiz Tuma, Mohamed K Kamel, Cristina Nituica: Data curation, Writing – original draft preparation.

Faiz Tuma, Cristina Nituica, Oveys Mansuri, Mohamed K Kamel, John Blebea: Visualization, Investigation.

Faiz Tuma, John Blebea: Supervision.

Faiz Tuma, Mohamed K Kamel, Jaime McKenna, Oveys Mansuri, John Blebea: Writing – reviewing & editing.

Conflict of interest

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References

- [1] <https://www.facs.org/quality-programs/trauma/education/dmep>. [Accessed 19 February 2021].
- [2] <https://training.fema.gov/is/crslist.aspx>. [Accessed 19 February 2021].
- [3] Sinclair P, Kable A, Levett-Jones T. The effectiveness of internet-based e-learning on clinician behavior and patient outcomes: a systematic review protocol. *JBI Database System Rev Implement Rep*. 2015;13(1):52–64. <https://doi.org/10.11124/jbisrir-2015-1919>.
- [4] Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev*. 1977;84(2):191–215. <https://doi.org/10.1037//0033-295x.84.2.191>.
- [5] Siemens G. Connectivism: a learning theory for the digital age. *elearnspace*. 2004 from www.elearnspace.org/Articles/connectivism.htm.
- [6] Kogan, M., Klein, S.E., Hannon, C.P., Nolte, M.T. Orthopaedic education during the COVID-19 pandemic. *J Am Acad Orthop Surg*. Publish Ahead of Print.
- [7] Rakowsky S, Flashner BM, Doolin J, Reese Z, Shpilsky J, Yang S, Smith CC, Graham K. Five questions for residency leadership in the time of COVID-19: reflections of chief medical residents from an internal medicine program. *Acad Med*. 2020;95(8):1152–4. <https://doi.org/10.1097/ACM.0000000000003419>.
- [8] Sabharwal S, Ficke JR, LaPorte DM. How we do it: modified residency programming and adoption of remote didactic curriculum during the COVID-19 pandemic [published online ahead of print, 2020 May 28]. *J Surg Educ*. 2020. <https://doi.org/10.1016/j.jsurg.2020.05.026> S1931–7204(20)30161–6.
- [9] Keswani SG, Parikh UM, Gosain A, et al. Impact of the coronavirus disease 2019 pandemic on surgical research and lessons for the future [published online ahead of print, 2020 Sep 19]. *Surgery*. 2020. <https://doi.org/10.1016/j.surg.2020.09.012> S0039–6060(20)30615–2.
- [10] Munro V, Morello A, Oster C, et al. E-learning for self-management support: introducing blended learning for graduate students—a cohort study. *BMC Med Educ*. 2018;18(1):219. Published 2018 Sep 24 <https://doi.org/10.1186/s12909-018-1328-6>.
- [11] Darby F. How to be a better online teacher. *The chronicle of higher education*. <https://www.chronicle.com/interactives/advice-online-teaching>. Published April 17, 2019. Accessed June 26, 2020.
- [12] Mobasher MH, Johnston M, Syed UM, King D, Darzi A. The uses of smartphones and tablet devices in surgery: a systematic review of the literature. *Surgery*. 2015;158(5):1352–71. <https://doi.org/10.1016/j.surg.2015.03.029>.