JMIR Medical Education

Impact Factor (2024): 3.2
Volume 7 (2021), Issue 2 ISSN 2369-3762 Editor-in-Chief: Blake J. Lesselroth, MD, MBI, FACP, FAMIA

Contents

Original Papers

Shared Decision-Making With a Virtual Patient in Medical Education: Mixed Methods Evaluation Study (e22745)
Simon Jacklin, Neal Maskrey, Stephen Chapman. . . . 4

Shared Tobacco Cessation Curriculum Website for Health Professionals: Longitudinal Analysis of User and Utilization Data Over a Period of 15 Years (e20704)
Nervana Elkhadragy, Jeremie Aviado, Henry Huang, Robin Corelli, Karen Hudmon. . . . 33

Using a Web-Based Platform as an Alternative for Conducting International, Multidisciplinary Medical Conferences During the Novel COVID-19 Pandemic: Analysis of a Conference (e23980)
Po-Jen Ko, Sheng-Yueh Yu, John Chang, Ming-Ju Hsieh, Sung-Yu Chu, Jimmy Tan, Wan-Ling Cheng, Pei Ho. . . . 43

Knowledge and Attitude Toward Evidence-Based Medicine and Associated Factors Among Medical Interns in Amhara Regional State Teaching Hospitals, Northwest Ethiopia: Cross-sectional Study (e28739)
Delelegn Emwodew, Tesfahun Melese, Adamu Takele, Nebiyu Mesfin, Binyam Tariku. . . . 51

Using a Web-Based Quiz Game as a Tool to Summarize Essential Content in Medical School Classes: Retrospective Comparative Study (e22992)
Varah Yuenyongviwat, Jongdee Bvonpanttarananon. . . . 62

Application of the Inverted Classroom Model for Teaching Pathophysiology to Chinese Undergraduate Medical Students: Usability Study (e24358)
Hui Lin, Xiaoping Zeng, Jun Zhu, Zhenzhen Hu, Ying Ying, Yonghong Huang, Hongmei Wang. . . . 66

Using a Scenario-Based Approach to Teaching Professionalism to Medical Students: Course Description and Evaluation (e26667)
James Ashcroft, Patrick Warren, Thomas Weatherby, Stephen Barclay, Laurence Kemp, Richard Davies, Catherine Hook, Elizabeth Fistein, Elizabeth Soilleux. . . . 74

Nursing Students' Perceptions about Effective Pedagogy: Netnographic Analysis (e27736)
Jennie De Gagne, Paula Koppel, Hyeyoung Park, Allen Cadavero, Eunji Cho, Sharron Rushton, Sandra Yamane, Kim Manturuk, Dukyoo Jung.
8 2

Audiovisual Content for a Radiology Fellowship Selection Process During the COVID-19 Pandemic: Pilot Web-Based Questionnaire Study (e28733)
Ivan Godoy, Luís Neto, Abdalla Skaf, Hilton Leão-Filho, Tomás Freddi, Dany Jasinowodolinski, André Yamada. . . . 109

Novice and Advanced Learners' Satisfaction and Perceptions of an e-Learning Renal Semiology Module During the COVID-19 Pandemic: Mixed Methods Study (e29216)
Ido Zamberg, Eduardo Schiffer, Catherine Stoermann-Chopard. . . . 115

The Impact of Systematic Review Automation Tools on Methodological Quality and Time Taken to Complete Systematic Review Tasks: Case Study (e24418)
Justin Clark, Catherine McFarlane, Gina Cleo, Christiane Ishikawa Ramos, Skye Marshall. . . . 132

Analysis of Cyberincivility in Posts by Health Professions Students: Descriptive Twitter Data Mining Study (e28805)
Jennie De Gagne, Eunji Cho, Sandra Yamane, Haesu Jin, Jeehae Nam, Dukyoo Jung. . . . 160

Remote Teaching in a Preclinical Phantom Course in Operative Dentistry During the COVID-19 Pandemic: Observational Case Study (e25506)
Philipp Kanzow, Christiane Krantz-Schäfers, Michael Hülsmann. . . . 183

Viewpoints

Best Practices for Integrating Medical Students Into Telehealth Visits (e27877)
Maria Wamsley, Laeesha Cornejo, Irina Kryzhanovskaya, Brian Lin, Joseph Sullivan, Jordan Yoder, Tali Ziv. . . . 14

An Imperative for the National Public Health School in Burkina Faso to Promote the Use of Information and Communication Technologies in Education During the COVID-19 Pandemic: Critical Analysis (e27169)
Arzouma Pilabré, Patrice Ngangue, Abibata Barro, Yacouba Pafadnam. . . . 22

Survey of Residency Directors' Views on Entrepreneurship (e19079)
Emily Tam, Xuezhi Dong. . . . 94

Teaching Telemedicine: The Next Frontier for Medical Educators (e29099)
Maria Alcocer Alkureishi, Gena Lenti, Zi-Yi Choo, Jason Castaneda, George Weyer, Julie Oyler, Wei Lee. . . . 98

The United States Medical Licensing Exam Step 2 Clinical Skills Examination: Potential Alternatives During and After the COVID-19 Pandemic (e25903)
Rawish Fatima, Ahmad Assaly, Muhammad Aziz, Mohamad Moussa, Ragheb Assaly. . . . 105

Planning Engaging, Remote, Synchronous Didactics in the COVID-19 Pandemic Era (e25213)
Ronald Rivera, Jonathan Smart, Sangeeta Sakaria, Alisa Wray, Warren Wiechmann, Megan Boysen-Osborn, Shannon Toohey. . . . 142

Medical Students Learning on the COVID-19 Front Line (e28264)
Ioanna Zimianiti, Vyshnavi Thanaraaj, Francesca Watson, Oluwapelumi Osibona. . . . 175

Adapting Medical Education Initiatives Through Team-Based e-Learning, Telemedicine Objective Structured Clinical Exams, and Student-Led Community Outreach During the COVID-19 Pandemic (e26797)
Julia Miao. . . . 178

Tutorial

Incorporating Medical Students Into Primary Care Telehealth Visits: Tutorial (e24300)
Aanika Balaji, Sarah Clever. . . . 125

Review

Social Media and Medical Education in the Context of the COVID-19 Pandemic: Scoping Review (e25892)
Marc Katz, Neilanjan Nandi . . . 150

Letters to the Editor

Virtual vs Online: Insight From Medical Students. Comment on “Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review” (e27020)
Shahil Kaini, Lucinda Motie . . . 193

Author’s Reply to: Virtual vs Online: Insight From Medical Students. Comment on “Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review” (e29335)
Robyn-Jenia Wilcha . . . 195

Original Paper

Shared Decision-Making With a Virtual Patient in Medical Education: Mixed Methods Evaluation Study

Simon Jacklin[1*], MPharm, PhD; Neal Maskrey[1*], MBChB, MSc; Stephen Chapman[1*], BPharm, PhD

School of Pharmacy and Bioengineering, Keele University, Keele, United Kingdom

[*]all authors contributed equally

Corresponding Author:
Simon Jacklin, MPharm, PhD
School of Pharmacy and Bioengineering
Keele University
1.24, Hornbeam Building
Keele, ST55BG
United Kingdom
Phone: 44 01782 734792
Email: s.jacklin@keele.ac.uk

Abstract

Background: Shared decision-making (SDM) is a process in which clinicians and patients work together to select tests, treatments, management, or support packages based on clinical evidence and the patient's informed preferences. Similar to any skill, SDM requires practice to improve. Virtual patients (VPs) are simulations that allow one to practice a variety of clinical skills, including communication. VPs can be used to help professionals and students practice communication skills required to engage in SDM; however, this specific focus has not received much attention within the literature. A multiple-choice VP was developed to allow students the opportunity to practice SDM. To interact with the VP, users chose what they wanted to say to the VP by choosing from multiple predefined options, rather than typing in what they wanted to say.

Objective: This study aims to evaluate a VP workshop for medical students aimed at developing the communication skills required for SDM.

Methods: Preintervention and postintervention questionnaires were administered, followed by semistructured interviews. The questionnaires provided cohort-level data on the participants' views of the VP and helped to inform the interview guide; the interviews were used to explore some of the data from the questionnaire in more depth, including the participants' experience of using the VP.

Results: The interviews and questionnaires suggested that the VP was enjoyable and easy to use. When the participants were asked to rank their priorities in both pre- and post-VP consultations, there was a change in the rank position of *respecting patient choices*, with the median rank changing from second to first. Owing to the small sample size, this was not analyzed for statistical significance. The VP allowed the participants to explore a consultation in a way that they could not with simulated or real patients, which may be part of the reason that the VP was suggested as a useful intervention for bridging from the early, theory-focused years of the curriculum to the more patient-focused ones later.

Conclusions: The VP was well accepted by the participants. The multiple-choice system of interaction was reported to be both useful and restrictive. Future work should look at further developing the mode of interaction and explore whether the VP results in any changes in observed behavior or practice.

(JMIR Med Educ 2021;7(2):e22745) doi:10.2196/22745

KEYWORDS

shared decision making; virtual patient; communication; medical education

Introduction

Background

Shared decision-making (SDM) is a process in which clinicians and patients work together to select tests, treatments, management, or support packages based on clinical evidence and the patient's informed preferences [1]. The General Medical Council, National Institute for Health and Care Excellence, and National Health Service England all recognize that SDM should become the norm for clinical practice. This is supported by the Montgomery ruling, which provides a legal basis for SDM [2] and established that rather than a clinician deciding what they think a patient should be told, patients should be told whatever they would like to know [3]. In addition to ethical and legal arguments, SDM has been shown to improve patient satisfaction [4], decrease decisional conflict [5], and reduce antibiotic prescription [6].

The Care Quality Commission 2018 annual survey of National Health Service hospital inpatients [7] included a question that asked, "Were you involved in decisions about your care as much as you wanted to be?" Of the patients who responded, 11% answered "No" and 35% answered "Yes, to some extent," suggesting that SDM did not occur to the optimal extent.

Professionals have been found to consciously adopt a paternalistic decision-making style to care for their patients, as they feel that their knowledge and experience enables them to make decisions in the patients' best interests [8,9]. Mulley et al [10] refer to this as the *silent misdiagnosis*, because if patients are not involved in decisions about their care, they cannot communicate what outcomes matter to them as individuals and thus which course of action may be the most appropriate.

There are many barriers to the wider adoption of SDM [11]. Some of these, such as longer appointment times, require system-level interventions to resolve, but others are concerned with individual practitioners. One such barrier is professionals having the skills embedded so that SDM becomes routine within their practice. SDM represents a new approach to patient care, which requires a set of consultation skills that may differ from those currently used by professionals [12].

The amount of time dedicated to consultation skills in undergraduate medical education varies and has been found to be as low as 0.15% of the curriculum time [13]. The level of SDM within undergraduate medical education is unclear but a review of the literature suggests that it is low [14]. The focus in postgraduate medical education varies based on specialty but some feature very little variation that is unwarranted [15,16]. The teaching of consultation skills is often confined to the first few years of medical undergraduate courses, and the subject may be taught separately rather than fully integrated with other clinical content. This does not reflect optimum clinical practice as described by the General Medical Council and could frame consultation skills as something less important than other more knowledge-based areas of the curriculum.

SDM is a skill [17], and all skills require deliberate practice and feedback to be acquired and improved [18]. In the context of SDM, any practice often uses simulated patients (SPs), role-plays with peers or with actors, or real patients, all of which have issues associated with their use. These include poor-quality acting, lack of standardization, and resource intensity [19,20]. In such environments, opportunities for learners to repeat their consultation skills or test different approaches to a consultation for themselves are limited and usually not possible.

Virtual patients (VPs) are a "specific type of computer program that simulates real-life clinical scenarios; learners emulate the roles of health care providers to obtain a history, conduct a physical exam, and make diagnostic and therapeutic decisions" [21]. In contrast to other traditional and widely used approaches to practicing consultation skills, VPs may offer a method that is standardized, customizable, repeatable, flexible, low risk, and accessible at any time to a large number of learners.

Objective

This study aims to evaluate the views of undergraduate medical students toward a VP workshop aimed at developing the skills required for SDM.

Methods

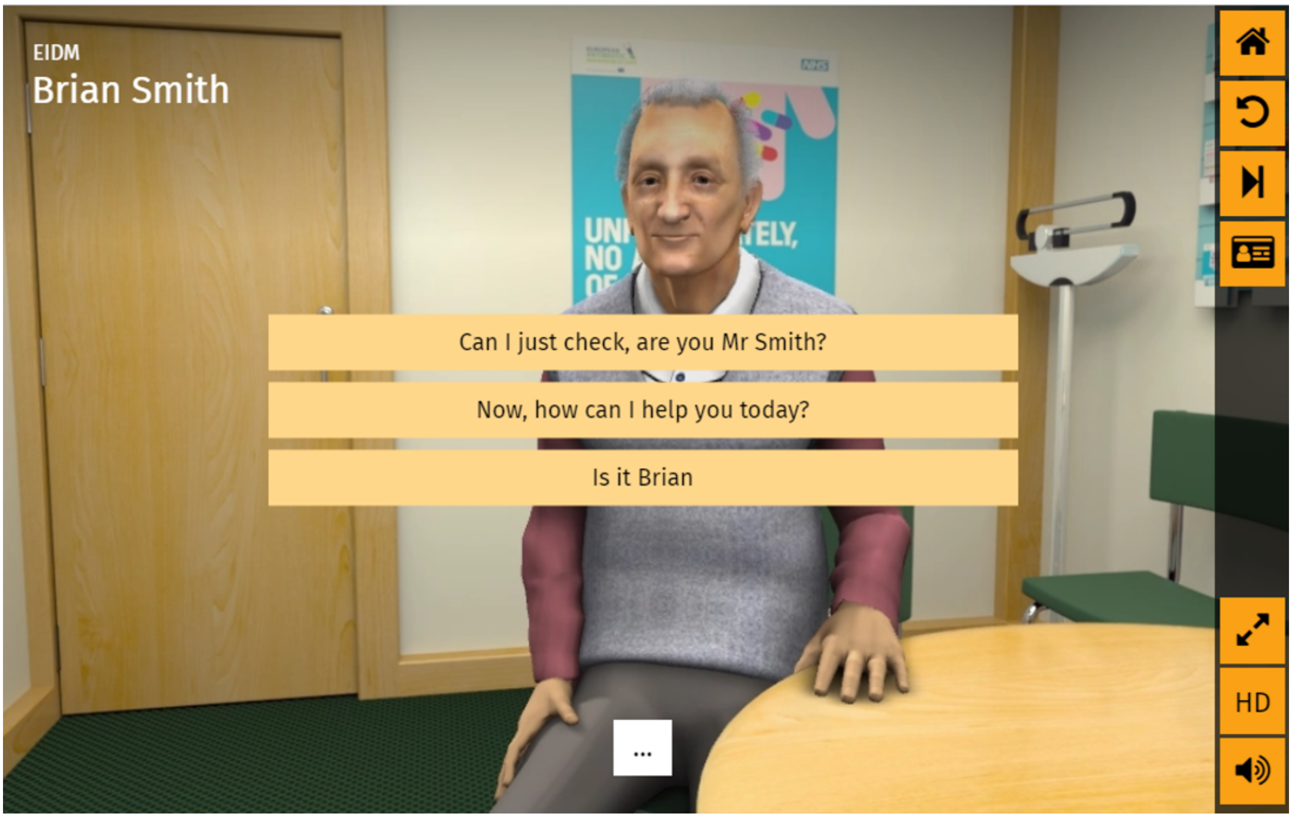
Population

The Manchester Medical Research Student Society holds an annual student conference. SC was invited to run an educational session using a VP. Medical student delegates attended the session voluntarily, and it was from this session that the participants were recruited. Participation in the study was voluntary.

Intervention

The intervention was a VP that simulated a single primary care consultation. The VP, Brian Smith, comes to discuss whether to initiate a statin after referral from the practice nurse. The VP was accessible from a website and usable on multimedia devices. Interaction with the VP was achieved via multiple-choice selection, and personalized feedback was delivered at the end of the simulation. The design process for the VP was previously published [22] and a screenshot is provided in Figure 1.

Figure 1. Screenshot of the virtual patient.



Evaluation Process

The setting for the evaluation was a 1-hour clinical decision-making workshop at a medical student conference. A mixed methods evaluation focusing on the VP component of the workshop was conducted.

All students were provided with information sheets and consent forms and could decide whether they wished to take part. A total of 22 participants completed a consent form and prequestionnaire immediately before using the VP and then completed a postquestionnaire immediately afterward; the students were given 30 minutes to use the VP independently on their own or a borrowed device. This gave the students the opportunity to run through the consultation multiple times. Shortly after the workshop, participants who completed the questionnaire evaluation were emailed to invite them to participate in a semistructured interview; a £10 (US $14) Amazon voucher was offered to participants who consented to an interview to compensate them for their time. The interviews were planned to use purposive sampling, but ultimately, a convenience sample was used because of low recruitment. The questionnaire provided cohort-level data and helped to inform the interview guide; the interviews were used to explore some of the data from the questionnaire in more depth. The interview asked the participants about their experience of the VP, how useful it was for developing communication skills required for SDM, and at which point in the medical curriculum the VP might be best placed.

Ethical approval was obtained from the Keele University Faculty of Health Ethical Review Panel.

Data Analysis

Overview

Quantitative data were analyzed using descriptive statistics. A single question asked the participants to rank their treatment priorities during a consultation both before and after using the VP; this was based on the prescribing principles proposed by Barber [23].

The qualitative data were obtained from semistructured interviews conducted by SJ over the telephone. None of the participants knew SJ before the study. The data were analyzed using semantic thematic analysis, with codes derived from raw data, not from preexisting theory. The process described by Braun and Clarke [24] was used and is outlined below.

Step 1: Data Familiarization

The transcript was read over while listening to the audio recording. This had the dual function of checking the transcript for accuracy and familiarizing the coder with the data.

Step 2: Generation of Initial Codes

The transcripts were coded using NVivo 11 (QSR International) using what Braun and Clarke [24] called semantic coding; the surface meaning of the words used by the participants was of interest, rather than trying to identify the features that resulted in the form and meaning of the words as in latent coding.

Step 3: Searching for Themes

After the transcripts had been annotated with codes, the codes were grouped together into overarching themes.

Step 4: Reviewing Themes

The initial themes were refined by combing themes or leaving certain themes that lacked support from the data.

Step 5: Defining Themes

This step involved clarifying what each theme captured and why it was important to go beyond just paraphrasing the data.

Step 6: Write Up

Once the final themes had been established, the report was written.

NVivo 11 (QSR International) was used to organize the coding. SJ was the only coder; however, the codes and themes were discussed with SC and NM to encourage reflexivity. Member checking was not undertaken because of the power imbalance present between a participant and the researcher; a participant may well acquiesce to the researchers' suggestions, thus giving a false impression of validity [25].

Results

Questionnaire Data

A total of 24 students participated in the workshop, and 22 participated in the study by completing both the prequestionnaires and postquestionnaires; 2 students declined to participate in the study. Table 1 presents the demographic data of the participants in the questionnaire phase of the study.

Table 1. Demographic data of participants in the questionnaire phase.

Characteristics	Participants, n (%)
Gender	
Male	6 (27)
Female	16 (73)
Year of study	
First	1 (5)
Second	5 (23)
Third	0 (0)
Fourth	8 (36)
Fifth	7 (32)
Sixth	1 (5)

Most participants found the VP enjoyable to use, with 19 of them suggesting that it was either "enjoyable" or "very enjoyable" to use. They also found it accessible, with 100% (22/22) of the study participants rating it as either "very accessible" or "accessible."

Table 2 shows a distribution of views on the format of the reply, the multiple-choice interaction system.

Table 2. Participants' views on the format of reply to the virtual patient.

Evaluation of reply format[a]	Respondents, n (%)
1	0 (0)
2	4 (18)
3	5 (23)
4	10 (45)
5	3 (14)

[a]Scores range from 1, very poor, to 5, very good.

As Table 3 shows, just over half (13/22, 59%) of the participants suggested that it was "likely" or "highly likely" that there would be a change in their practice as a result of using the VP. Most of the changes suggested were related to either being more patient centered or trying to engage in SDM.

Table 3. Participants' self-reported likelihood of change in their clinical practice.

Likelihood of change	Respondents, n (%)
Highly unlikely	2 (9)
Unlikely	7 (32)
Likely	11 (50)
Highly likely	2 (9)

The participants were asked to rank four priorities, without the possibility of equal rankings. When comparing the preintervention responses with the postinterview responses, there was a change in the rank position of "respecting patient choices," shifting from a median position of second to first (Table 4).

Table 4. Participants' priorities during a consultation, preintervention and postintervention.

Priorities within a consultation	Respondents, n (%)			
	Fourth	Third	Second	First
Preintervention				
Maximizing effectiveness	0 (0)	8 (36)	8 (36)	6 (27)
Minimizing risks	0 (0)	7 (32)	9 (41)	6 (27)
Minimizing costs	22 (100)	0 (0)	0 (0)	0 (0)
Respecting patient choices	0 (0)	7 (32)	5 (23)	10 (45)
Postintervention				
Maximizing effectiveness	0 (0)	12 (55)	6 (27)	4 (18)
Minimizing risks	0 (0)	7 (32)	10 (45)	5 (23)
Minimizing costs	22 (100)	0 (0)	0 (0)	0 (0)
Respecting patient choices	0 (0)	3 (14)	6 (27)	13 (59)

Interview Data

A total of 7 participants consented to an interview; all of them were interviewed. A total of 3 main themes were constructed from the interview transcript data. These themes are elaborated here using verbatim quotations. Data saturation was not reached as the last interview resulted in subtle restructuring of the themes; the major themes were established after the sixth interview. The major themes were as follows:

- Bridging: the VP was suggested to be useful in helping medical students transition from preclinical to clinical teaching in undergraduate studies.
- Exploring the consultation: the VP permitted the user to explore different approaches during a consultation, something that is difficult to do in conversation with simulated or real patients.
- Personal style and subjectivity: every doctor has their own style for consulting with patients, and it was suggested that the VP did not reflect this.

Bridging

The theme bridging describes the VP helping learners transition from one part of the undergraduate course to another. Specifically, some participants suggested that when one first encounters patients or actors in an undergraduate course, the experience is intimidating and overwhelming. Some of the participants suggested that the VP could be usefully deployed between the early, theory-based years of the course and the later, more patient-oriented ones to act as a stepping stone:

> *I think that's where it has a lot of value because I know that there are quite a lot of people in Medical School who start off Medical Schoolby doing quite scientifical [sic] things and then when it gets to their first patient contact, it can be very daunting and it can be quite frightening because you don't really know what to say. People can teach you how to take a history but if you're sat in front of someone and you have to chat to them for bit, then it can feel quite awkward to start off with. I think if you had some kind of virtual introduction to all of this, it can make things a bit easier when you actually get into it.* [P3]

A key part of the reason why the VP was useful as a bridge related to the multiple-choice response system. As there were multiple options presented each time, the participants could read them and receive a prompt, a suggestion of how to phrase something. This was posited as useful for learning, particularly in the earlier years of undergraduate study:

> *I definitely think that would be useful, like getting those prompts of what's good to say [yeah] when you're starting clinical years, I think would be, personally I would've found that really helpful because that's something that takes a while to pick up and you sort of learn, I think you learn more from seeing other people do it and hearing other people*

do it. So, if virtual patient can be those prompts for you and you can learn from that, then I think that would be really helpful. [P2]

Exploring the Consultation

The participants suggested that the VP allowed them to explore the consultation. By using the VP multiple times, the participants reported that they were able to try different routes, phrases, or approaches to the consultation. The demonstration of the consequences of one's actions seemed to be beneficial to the exploration. This may form a part of *bridging* but is perhaps also a separate theme:

> *It's probably good in terms of it makes you more likely to explore different ways of managing a situation. Some might be wrong; some might be right but even if you take the wrong route, nothing serious is going to happen at the end of the day. It's not like you've committed an offence or anything like that. I think it's quite good in terms of that.* [P3]

> *I think what I quite like about the virtual one is that you can take it in different directions and almost test it out. Sometimes it's harder to do that with a simulated patient just because you don't get the opportunity to do it again.* [P7]

The second of these responses (P7) contrasts the VP with SPs, suggesting that the latter do not permit one to explore a consultation to the same degree as a VP. The idea that the VP allowed participants to repeatedly explore a consultation in a manner that an SP does not was further expanded

> *I think if you learn from your mistakes and do it again and that's what it's good for as well because with a simulated patient, you can stop and start. When we have the Simulated Patient Workshops, if you're stuck or if you don't know where to go next, you can always stop and it's quite a safe space but you can never really just take the whole thing and start all over again because there's a schedule that you have to go with. You only have a certain amount of time. You can only do one scenario because there are loads of people that need to go through. At least with something like that, it kind of releases the tension because you can just do it over and over again. You don't have that extra time management problem.* [P3]

This response suggests that one benefit that the VP had over an SP was that time was not an issue. The VP gave the students a greater amount of time to practice, and they could explore the consultation multiple times.

Personal Style and Subjectivity

The multiple-choice system of interaction was a feature of the VP that divided participants' opinions. For some participants, it provided a useful prompt of phrases they could use (*Bridging* section), whereas for others, it was not flexible enough to encompass their own personal consultation style:

> *I guess the obvious thing was that you are limited by what you can say. You have to choose [from] the answers which the computer gives.* [P4]

> *I think I thought some of the stuff was a good prompt as to like, you know, I should be saying this or I should have spoken about this.* [P5]

> *Erm, obviously everyone has their own flow and way of doing consultations [mmm] erm and the algorithm just gave three options, it was really difficult to choose basically, it could be more flexible.* [P6]

It seems that the restriction experienced by some participants was not just concerned with the three choices presented at each point but the order in which the consultation could be navigated:

I think I didn't find them restrictive in the sense that I would chose something else apart from the three options, it's just that the order of, you know, the consultation, like the order in which the consultation was done, there was no flexibility to it [OK yeah]. So, you'd go from a certain topic first and then you had to move onto another topic and then you'd get the final topic. But their own style might be different,they might have the consultation in a different order [yeah, yes] than you could. [P5]

Discussion

Principal Findings

This study positively evaluated a VP workshop for developing the consultation skills required to engage in SDM with patients. The medical student participants suggested that the simulation was enjoyable to use, easy to access, and there was a change in the participants' prescribing priorities when comparing pre- and post-VP consultation. The interviews suggested that the VP was useful in allowing students to explore a consultation and trying different phrases and approaches in a consultation to see what effect they had. The results suggested that the VP could be a useful tool to help students progress from the early, theory-focused years of medical school to the more patient-oriented ones later.

When comparing pre- and post-VP responses, there appeared to be a change toward a more patient-centered priority. As Table 4 shows, there was a change in the rank position of "respecting patient choices," with the median rank changing from second to first. This would seem to be a favorable change, as it reflects the current opinion about the promotion of SDM [26]. There are a few caveats to this measurement. First, there was no analysis of student interactions with the VP; therefore, whether this would translate into a change in practice in clinical situations is unknown. It is also unknown whether any change would endure over time. These points are particularly germane because SDM is suggested to be philosophically valued by professionals but not necessarily practiced [11,27,28].

The theme of *exploring* from the interviews described the important opportunity VPs provide for safe and repetitive exploration of a consultation. As it was not a real person, the participants suggested that they felt at ease trying out different techniques and phrases, exploring the consultation with a variety of approaches. Unlike an SP interaction, the VP was not subject to the same time constraints; therefore, it could be reset and used multiple times.

The interview data suggested that the exploratory nature of the VP meant that it could serve as a useful intervention for bridging from the early, theory-focused years of medical school to the more patient-oriented ones later. Medical students have been reported to find interactions with SPs stressful [29], and VPs have been found to improve learner confidence before interacting with SPs [30] or real patients [31]. This seems to be because the VP is not a real person; therefore, failure did not incur the same consequences as with another human, even when simulating. The VP allowed repetitive, safe practice, which is essential for skill acquisition and improvement [18].

The VP featured a multiple-choice system of interaction where the learner could select one of the responses displayed on the screen; this system was reported to have both positive and negative elements. The potential benefit for the learner, as the interview data suggested, is that the limited but multiple options act as a kind of prompt, suggesting alternate phrases or routes through the consultation. Students have to read the options available to respond; therefore, they are forced, however briefly, to consider a range of responses and potentially explore them. These *prompts* could help teach or remind learners of more or less helpful approaches they could use or not use in real-world consultations.

The main limitation of the multiple choice was its restrictive nature, which meant that it could not incorporate the learners' individual consultation styles. This sense of restriction was reported as a negative experience by some of the participants, and for them, it also altered the learning experience. This is a recognized issue in the design of multiple-choice VPs [32]. With a free-text VP, where one can type in any preferred response, the learner must recall the phrase they want to use by thinking independently, similar to a real conversation. With a multiple-choice VP, a learner is only required to recognize the *correct* response from the three options presented. However, the VP was designed according to the evidence and principles of a good consultation [22]; therefore, if the learner wanted to take a different action, it could be that they wanted to consult in a way that was not optimal. McCartney et al [12] suggest that SDM requires professionals to consult in new and different ways, and surveys suggest that the teaching of consultation skills and SDM is relatively low in some undergraduate courses [13,14]. It could indeed be the case that the VP was too restrictive to adequately reflect the flexible nature of a consultation; however, there could also be an issue of overconfidence bias leading to learners wanting to consult in their own individual but suboptimal way. The latter point is particularly germane when one considers some of the participants' responses, which demonstrated that they had not yet fully understood what SDM entails.

The literature suggests that simulation learning mirrors the theory of reflective practice by Kolb [33], where all learning occurs after the simulation through reflection on a concrete experience [34]. This evaluation suggests that for this VP, some learning occurred during the experience, not solely afterward. Thus, the Kolb theory may not apply that well to this VP; instead, the theory by Schon may be a more relevant theoretical approach, as it differentiates between reflection-in-action and reflection-on-action [35].

Educational feedback was an element that was not touched on in this evaluation. Feedback is often overlooked in the VP literature, although some studies have explored this issue [36,37]. Future work could explore how feedback can be delivered and facilitated most effectively with this VP.

A limitation of this evaluation is that the authors of this paper were also the designers of the VP [22]. This introduces a potential bias. Second, there was only a single coder (SJ) for the interview data, introducing another potential source of bias. To reduce the effect of this potential bias, all transcripts and quotes were discussed among the 3 authors to encourage reflexivity. Another source of bias results from the participants attending the workshop voluntarily; the potential participants were self-selecting, as delegates to the conference could choose whether to attend the workshop. Finally, the sample size was limited because of the small number of delegates to the conference and subsequent attendance at the VP workshop. This resulted in data saturation not being reached during the interviews; there is potential for further interviews to change the conclusions of this paper.

The purpose of this study is to report early work on a VP to develop SDM skills. Both the interviews and questionnaires indicate that there is sufficient perceived value in VPs as a training tool to make it worthwhile to develop further. Future work should build on this to form a more complete picture of the application of VP to SDM. This work should include exploring the VP with larger groups of students, focusing on how the VP could be integrated into an undergraduate curriculum and the effect the VP has on students' subsequent consultations with patients. Further work could also explore the role of these simulations in developing the SDM skills of postgraduate professionals; for example, continuing professional development.

Conclusions

The VP was found to be accessible and enjoyable; in addition, it made some participants suggest that they would make changes in their practice. The VP also induced a change in participants' self-reported priorities during a consultation.

The multiple-choice system was suggested to be key to the way the VP worked, prompting the users with ideas of what to say. The participants were all undergraduates; therefore, it is unknown whether postgraduates would require prompting in a simulated conclusion. It is therefore a direction for future research to see whether postgraduate health professionals would find the multiple-choice prompts useful. The multiple-choice system was not universally popular, as some participants felt it restricted them from consulting in their natural way; it is unknown whether their preferred consultation style is in line with best practice and evidence around consultation skills and SDM. Consideration will also be given to using the VP with earlier-year students so that they can experience it before interactions with SPs. This too will require evaluation to observe the effect that these changes may have.

Acknowledgments

The authors would like to thank the Digital Development Team from the Keele School of Pharmacy and Bioengineering for their work in animating and developing the VP with them.

Conflicts of Interest

The VP described in this paper is not licensed for commercial sale; therefore, none of the authors will receive any monetary gain from the tool. SC is one of the 2 patent holders for the virtual patient technology. Keele University School of Pharmacy and Bioengineering makes VP products similar to those described in this paper. NM is a former medical director of the National Prescribing Centre, former program director of the Medicines and Prescribing Centre at NICE, and a current member of the NICE Shared Decision-Making Collaborative. No other conflicts of interest are declared.

References

1. Coulter A, Collins A. Making Shared Decision-Making a Reality: No Decision About Me, Without Me. London: King's Fund; 2011:1-56.
2. Coulter A, Hopkins A, Moulton B. Montgomery v Lanarkshire Health Board: transforming informed consent. Bulletin 2017 Jan;99(1):36-38. [doi: 10.1308/rcsbull.2017.36]
3. Chan SW, Tulloch E, Cooper ES, Smith A, Wojcik W, Norman JE. Montgomery and informed consent: where are we now? Br Med J 2017 May 12;357:j2224 [FREE Full text] [doi: 10.1136/bmj.j2224] [Medline: 28500035]
4. Wiley J, Westbrook M, Greenfield JR, Day RO, Braithwaite J. Shared decision-making: the perspectives of young adults with type 1 diabetes mellitus. Patient Prefer Adherence 2014;8:423-435 [FREE Full text] [doi: 10.2147/PPA.S57707] [Medline: 24729690]
5. Hong P, Maguire E, Purcell M, Ritchie KC, Chorney J. Decision-making quality in parents considering adenotonsillectomy or tympanostomy tube insertion for their children. JAMA Otolaryngol Head Neck Surg 2017 Mar 01;143(3):260-266. [doi: 10.1001/jamaoto.2016.3365] [Medline: 27930764]
6. Coxeter P, Del MC, McGregor L, Beller EM, Hoffmann TC. Interventions to facilitate shared decision making to address antibiotic use for acute respiratory infections in primary care. Cochrane Database Syst Rev 2015 Nov 12(11):CD010907. [doi: 10.1002/14651858.CD010907.pub2] [Medline: 26560888]
7. Adult inpatient survey 2019. Care Quality Commission. 2019. URL: https://www.cqc.org.uk/publications/surveys/adult-inpatient-survey-2019 [accessed 2021-05-24]
8. Dierckx K, Deveugele M, Roosen P, Devisch I. Implementation of shared decision making in physical therapy: observed level of involvement and patient preference. Phys Ther 2013 Oct;93(10):1321-1330. [doi: 10.2522/ptj.20120286] [Medline: 23641024]
9. Engelhardt EG, Pieterse AH, van der Hout A, de Haes HJ, Kroep JR, van Ufford-Mannesse PQ, et al. Use of implicit persuasion in decision making about adjuvant cancer treatment: a potential barrier to shared decision making. Eur J Cancer 2016 Oct;66:55-66. [doi: 10.1016/j.ejca.2016.07.011] [Medline: 27525573]
10. Mulley AG, Trimble C, Elwyn G. Stop the silent misdiagnosis: patients' preferences matter. Br Med J 2012 Nov 08;345:e6572. [Medline: 23137819]
11. Joseph-Williams N, Lloyd A, Edwards A, Stobbart L, Tomson D, Macphail S, et al. Implementing shared decision making in the NHS: lessons from the MAGIC programme. Br Med J 2017 Dec 18;357:j1744 [FREE Full text] [Medline: 28420639]
12. McCartney M, Treadwell J, Maskrey N, Lehman R. Making evidence based medicine work for individual patients. Br Med J 2016 May 16;353:i2452. [Medline: 27185764]
13. Hargie O, Boohan M, McCoy M, Murphy P. Current trends in communication skills training in UK schools of medicine. Med Teach 2010;32(5):385-391. [doi: 10.3109/01421590903394603] [Medline: 20423257]
14. Durand M, DiMilia PR, Song J, Yen RW, Barr PJ. Shared decision making embedded in the undergraduate medical curriculum: a scoping review. PLoS One 2018;13(11):e0207012 [FREE Full text] [doi: 10.1371/journal.pone.0207012] [Medline: 30427901]
15. Brown J. Perspective: clinical communication education in the United Kingdom: some fresh insights. Acad Med 2012 Aug;87(8):1101-1104. [doi: 10.1097/ACM.0b013e31825ccbb4] [Medline: 22827991]
16. Maskrey N. Shared decision making: why the slow progress? An essay by Neal Maskrey. Br Med J 2019 Dec 05;367:l6762. [doi: 10.1136/bmj.l6762] [Medline: 31806646]
17. Maskrey N, Gordon A. Shared understanding with patients. JAMA Intern Med 2017 Sep 01;177(9):1247-1248. [doi: 10.1001/jamainternmed.2017.1932] [Medline: 28783822]
18. Ericsson KA, Krampe RT, Tesch-Römer C. The role of deliberate practice in the acquisition of expert performance. Psychol Rev 1993;100(3):363-406. [doi: 10.1037/0033-295x.100.3.363]
19. Smith CM, Gephardt EG, Nestel D. Applying the theory of Stanislavski to simulation: stepping into role. Clin Simul Nurs 2015 Aug;11(8):361-367. [doi: 10.1016/j.ecns.2015.04.001]

20. Yardley S, Irvine AW, Lefroy J. Minding the gap between communication skills simulation and authentic experience. Med Educ 2013 May;47(5):495-510. [doi: 10.1111/medu.12146] [Medline: 23574062]
21. Effective use of educational technology in medical education; colloquium on educational technology: recommendations and guidelines for medical educators. AAMC Institute for Improving Medical Education. 2007. URL: https://store.aamc.org/downloadable/download/sample/sample_id/111/ [accessed 2021-05-24]
22. Jacklin S, Maskrey N, Chapman S. Improving shared decision making between patients and clinicians: design and development of a virtual patient simulation tool. JMIR Med Educ 2018 Nov 06;4(2):e10088 [FREE Full text] [doi: 10.2196/10088] [Medline: 30401667]
23. Barber N. What constitutes good prescribing? Br Med J 1995 May 08;310(6984):923-925. [doi: 10.1136/bmj.310.6984.923] [Medline: 7719188]
24. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol 2006 Jan;3(2):77-101. [doi: 10.1191/1478088706qp063oa]
25. Buchbinder E. Beyond checking. Qual Soc Work 2010 Nov 30;10(1):106-122. [doi: 10.1177/1473325010370189]
26. Hamann J, Mendel R, Bühner M, Kissling W, Cohen R, Knipfer E, et al. How should patients behave to facilitate shared decision making - the doctors' view. Health Expect 2012 Dec;15(4):360-366 [FREE Full text] [doi: 10.1111/j.1369-7625.2011.00682.x] [Medline: 21624024]
27. Driever EM, Stiggelbout AM, Brand PL. Shared decision making: physicians' preferred role, usual role and their perception of its key components. Patient Educ Couns 2020 Jan;103(1):77-82. [doi: 10.1016/j.pec.2019.08.004] [Medline: 31431308]
28. Karnieli-Miller O, Eisikovits Z. Physician as partner or salesman? Shared decision-making in real-time encounters. Soc Sci Med 2009 Jul;69(1):1-8. [doi: 10.1016/j.socscimed.2009.04.030] [Medline: 19464097]
29. Hulsman RL, Pranger S, Koot S, Fabriek M, Karemaker JM, Smets EM. How stressful is doctor-patient communication? Physiological and psychological stress of medical students in simulated history taking and bad-news consultations. Int J Psychophysiol 2010 Jul;77(1):26-34. [doi: 10.1016/j.ijpsycho.2010.04.001] [Medline: 20399815]
30. Kleinsmith A, Rivera-Gutierrez D, Finney G, Cendan J, Lok B. Understanding empathy training with virtual patients. Comput Hum Behav 2015 Nov 01;52:151-158 [FREE Full text] [doi: 10.1016/j.chb.2015.05.033] [Medline: 26166942]
31. Sunnqvist C, Karlsson K, Lindell L, Fors U. Virtual patient simulation in psychiatric care - a pilot study of digital support for collaborate learning. Nurse Educ Pract 2016 Mar;17:30-35. [doi: 10.1016/j.nepr.2016.02.004] [Medline: 27038085]
32. Janda MS, Mattheos N, Nattestad A, Wagner A, Nebel D, Färbom C, et al. Simulation of patient encounters using a virtual patient in periodontology instruction of dental students: design, usability, and learning effect in history-taking skills. Eur J Dent Educ 2004 Aug;8(3):111-119. [doi: 10.1111/j.1600-0579.2004.00339.x] [Medline: 15233775]
33. Kolb AY, Kolb DA. Learning styles and learning spaces: enhancing experiential learning in higher education. Acad Manag Learn Educ 2005 Jun;4(2):193-212. [doi: 10.5465/amle.2005.17268566]
34. Zigmont JJ, Kappus LJ, Sudikoff SN. Theoretical foundations of learning through simulation. Semin Perinatol 2011 Apr;35(2):47-51. [doi: 10.1053/j.semperi.2011.01.002] [Medline: 21440810]
35. Schön D. Educating the reflective practitioner. J Contin Educ Health Prof 1989;9(2):115-116. [doi: 10.1002/chp.4750090207]
36. Close A, Goldberg A, Helenowski I, Schuller M, DaRosa D, Fryer J. Beta test of web-based virtual patient decision-making exercises for residents demonstrates discriminant validity and learning. J Surg Educ 2015;72(6):130-136. [doi: 10.1016/j.jsurg.2015.10.011] [Medline: 26610356]
37. Pantziaras I, Fors U, Ekblad S. Training with virtual patients in transcultural psychiatry: do the learners actually learn? J Med Internet Res 2015 Feb 16;17(2):e46 [FREE Full text] [doi: 10.2196/jmir.3497] [Medline: 25689716]

Abbreviations

SDM: shared decision-making
SP: simulated patient
VP: virtual patient

Edited by G Eysenbach; submitted 23.07.20; peer-reviewed by L Woodham, T Wieringa; comments to author 13.11.20; revised version received 11.02.21; accepted 17.04.21; published 10.06.21.

Please cite as:
Jacklin S, Maskrey N, Chapman S
Shared Decision-Making With a Virtual Patient in Medical Education: Mixed Methods Evaluation Study
JMIR Med Educ 2021;7(2):e22745
URL: https://mededu.jmir.org/2021/2/e22745
doi:10.2196/22745
PMID:34110299

Viewpoint

Best Practices for Integrating Medical Students Into Telehealth Visits

Maria Wamsley[1], MD; Laeesha Cornejo[2], BA; Irina Kryzhanovskaya[1], MD; Brian W Lin[3,4], MD; Joseph Sullivan[5], MD; Jordan Yoder[1,6], MD; Tali Ziv[1,6], MD

[1]Department of Medicine, University of California San Francisco School of Medicine, San Francisco, CA, United States
[2]University of California San Francisco School of Medicine, San Francisco, CA, United States
[3]Department of Emergency Medicine, University of California San Francisco School of Medicine, San Francisco, CA, United States
[4]Department of Emergency Medicine, Kaiser Permanente Northern California, San Francisco, CA, United States
[5]Department of Neurology, University of California San Francisco School of Medicine, San Francisco, CA, United States
[6]Kaiser Permanente Northern California, Oakland, CA, United States

Corresponding Author:
Maria Wamsley, MD
Department of Medicine
University of California San Francisco School of Medicine
San Francisco, CA
United States
Phone: 1 415 514 8660
Email: maria.wamsley@ucsf.edu

Abstract

Telehealth has become an increasingly important part of health care delivery, with a dramatic rise in telehealth visits during the COVID-19 pandemic. Telehealth visits will continue to be a part of care delivery after the pandemic subsides, and it is important that medical students receive training in telehealth skills to meet emerging telehealth competencies. This paper describes strategies for successfully integrating medical students into telehealth visits in the ambulatory setting based on existing literature and the extensive experience of the authors teaching and learning in the telehealth environment.

(JMIR Med Educ 2021;7(2):e27877) doi:10.2196/27877

KEYWORDS

telehealth; undergraduate medical education; workplace learning; ambulatory care; telehealth competencies; medical education; student education; digital learning; online learning; ambulatory; digital health

Introduction

Telehealth and *telemedicine* are terms that are used interchangeably in much of the existing literature and have become an increasingly important part of health care in the last several decades [1]. Telehealth or virtual visits are defined as live, synchronous, interactive encounters between a patient and a health care provider through video, telephone, or live chat [2]. The COVID-19 pandemic has greatly accelerated the use of telehealth visits to improve patient access to care and minimize risks to patients and health care providers [3,4], and even after the pandemic subsides, telehealth will remain an important and growing modality for care delivery [5]. The benefits of telehealth include increased access to care in remote or rural areas, mitigation of workforce shortages, improved chronic disease management, and improved health outcomes [6].

Given the rise in telehealth, it is important to prepare medical students for effective participation in telehealth visits and share best practices for integrating students into telehealth visits. The 2015-2016 Liaison Committee on Medical Education Annual Medical School Questionnaire reported that over a quarter of US medical schools have implemented telehealth training in their preclinical curriculum and nearly half have implemented it in their clinical curriculum [7]. However, much of the existing literature on telehealth for learners focuses on residents [3,8,9] or telehealth curricular descriptions for medical students [7,10-13]. There is limited but growing literature on integrating medical students into telehealth visits [14-17].

Integrating students into telehealth visits has several potential advantages. It can overcome space limitations in clinical settings, provide opportunities for learners to participate in clinical care at a distance including in settings that may be less accessible (eg, international or rural settings), provide a window into patients' home environments, and allow students to participate in specialty consultations and interprofessional care. Telehealth provides teachers with opportunities both for direct observation of students' patient communication and physical examination skills and for teaching focused on clinical reasoning [18].

In this paper, we describe strategies for effectively integrating medical students into telehealth visits in the ambulatory setting. We derive our approach from the educational literature and from our extensive experience with direct recommendations for teachers who have integrated or wish to integrate learners into telehealth visits. We have organized our suggestions based on Billett's framework of workplace learning that highlights the importance of pedagogic practices before, during, and after practice-based experiences [19]. We do acknowledge that there is overlap between these categories; however, we feel that it is helpful for teachers to have a framework for approaching the incorporation of learners into telehealth experiences.

Before the Visit

Know Your Telehealth Platform

Facility with your telehealth platform is imperative to maximize time focused on teaching, observation, and learner assessment. Institutional decisions to use encrypted software packages approved for the transmission of protected health information leave health care providers working within the confines of systems and software packages that may be unfamiliar. Institutional training and online tutorials can enhance comfort and skills with specific technology platforms and increase familiarity with system features that may be disabled, enabled, or customized. To build patient trust and facilitate the teaching experience with the learner, it is critical that the teacher is comfortable with the telehealth platform and can troubleshoot challenges in advance of any telehealth visit.

Provide Students With a Telehealth Curriculum That Is Aligned With Telehealth Competencies

The literature describes various telehealth curricula for medical students [7,10,11,13] and residents [3,8,9,20-22]. There has been an attempt to define both general [23] and discipline-specific telehealth competencies at the postgraduate level [8]. The American Association of Medical Colleges recently released telehealth competencies for the recent medical school graduate entering residency, the graduating resident entering practice, and the experienced practicing physician [24]. It is important to note that teachers may not yet have mastered telehealth competencies given the evolving nature of these competencies and the relatively recent expansion of telehealth.

Based on the available literature, telehealth curricula should include the following key content areas: technical skills needed to operate equipment and software, including troubleshooting difficulties; professionalism in telehealth, including review of informed consent and patient privacy; telehealth communication skills [25-27]; physical examination skills in the telehealth environment [28,29]; and affordances and limitations of telehealth visits, including the potential for telehealth to increase disparities in care [30]. It is important to specifically teach and coach students through sensitive aspects of patient history, which can include eliciting social and mental health histories and intimate partner violence screening [31] and which may be more challenging in the virtual environment. Strategies such as ensuring safety and privacy prior to initiating a telehealth visit by asking simple yes-or-no questions can be taught and modeled for learners, who in turn can be provided with opportunities to practice these skills through roleplay or simulation. Described methods for delivery of telehealth curricula include e-learning, lectures, and small group discussions. In addition, it is essential to provide opportunities for telehealth skills practice with feedback, which can be accomplished using objective structured clinical examinations in a simulated telehealth environment or in the context of patient care [8,10,32].

Prepare Students for Success in the Virtual Visit

The first step to student success in a virtual visit is ensuring access to the appropriate technology and a private space in which to successfully conduct a telehealth visit. There may be disparities in student access to reliable broadband service, and many students may live in shared living spaces without adequate access to the private space needed for a telehealth visit. Medical schools can address these disparities by providing private rooms with Wi-Fi access for students to conduct telehealth visits or through providing Wi-Fi hotspots for learners without access to reliable broadband service.

To contribute to the team and learn most effectively, students require orientation and goal setting at the start of each telehealth session. As Knowles' theory of andragogy outlines, adult learners are self-directed and learn best when engaged in the workplace with authentic roles [33]. In addition, learners involved in formulating task strategies perform better with a higher self-efficacy than those who do not participate in formulating strategies [34]. Establishing a sense of the student's level of medical knowledge and any other core skills required as well as considering the student's prior experience with telehealth will prepare for a more productive session. Choose patients together from the schedule with the highest learning potential and match the patients' demographics, chief complaints, problem list, and presentation complexity with the student's learning goals for the session. Share with the student your history of caring for the patient and any tips or pearls from previous encounters that will help the student. For example, if you know the patient tends to prefer a certain approach, this is helpful to share with the student in advance. Prime the student for success by starting with easier initial tasks. Be specific with expectations by, for example, delineating the amount of time the student should spend on the visit before looping you in again, what tasks the student should accomplish, and how to best communicate with you during the visit.

Leverage Students' Knowledge of Technology

Ramping up to provide virtual care is challenging and may be more difficult for those clinicians who are accustomed to a particular structure and rhythm of in-person clinical visits. In contrast, students are still developing their frameworks for the clinical visit and may be more flexible in their approach. Learners may appreciate the early integration of technology in their learning [35], recognizing the significant role that telehealth will play in future outpatient care delivery. Millennials, defined as those individuals born between 1981 and 2000, currently constitute the majority of medical students. They have been shaped by a profound expansion of information technology, and their facility with various hardware, platforms, and apps can be time-saving in the telehealth work environment. Millennial learners embrace collaboration, and they thrive in flat rather than pyramidal structures [36]. Inviting a student to share with the team what they know about how to best use technology in the context of telehealth visits will strengthen the learning climate and invite collaborative learning. As Generation Z students (those born between 1997 and 2012) soon emerge among our trainees, an even more technology-focused generation will challenge us to once again rethink our relationship to technology and the ways educational practice in telehealth will necessarily evolve.

Address Disparities in Telehealth Utilization

Although the use of telehealth visits has increased dramatically, this trend has been disproportionately generated by young, non-Hispanic White patients. Patients over 65 years, those whose primary language is not English, and those insured by Medicare or Medicaid all saw a decrease in health care utilization when practices shifted from in-person to virtual care in the context of the COVID-19 pandemic [30]. As medical training and health care delivery become more virtual, medical students will have an increasingly important role in addressing disparities in access to health care. Teachers can encourage their students to engage in local efforts to improve broadband and mobile device access in underserved communities and to challenge health system barriers to telehealth access. Support for this work can be provided through systems-improvement projects or elective courses. For example, students can reach out to those most in need of connection, such as more frail older adults, screen them for mood disorders, and connect them with community resources. In the clinical setting, teachers should prompt students to proactively reach out to patients whose primary language is not English to check if they need assistance accessing virtual care by ensuring adequate access to interpreters in the visit, screening patients for privacy or technical barriers, and teaching patients how to use the telehealth platform before the appointment begins. Addressing disparities in telehealth access is also crucial for learner development. Medical trainees' preparedness to deliver cross-cultural care often trails other clinical milestones [37], but exposure to and discussion of health care disparities in medical school has been linked to improvements in that preparedness [38]. Development of formal curricula to adapt cultural humility and antiracism training for virtual care and role modeling these within the virtual workplace will both be imperative in this new era of medical education.

During the Visit

Establish and Model "Webside Manner"

Connection means more than just establishing a video or telephone connection between you, the patient, and the student. Most in-person visits to a medical provider involve some physical interaction, such as a handshake or other nonverbal interaction. Virtual visits have changed that dynamic, requiring new strategies for "webside manner" to establish this extremely important personal connection. To address these challenges in communication and opportunities for relationship building, the authors of the Stanford Presence 5 [26] adapted their original evidence-based practices to help clinicians foster humanism during clinical encounters for telehealth visits [26]. Body positioning, eye contact, nodding, smiling to demonstrate a listening posture, and allowing extra pauses before speaking to account for lag time are particularly important when engaging in a telehealth visit, especially with three or more participants (patient, teacher, and student) [39]. To allow for optimal visualization of body language, position the camera in a way that allows others to see your torso and arms and use gestures as you would in person but keep the gestures in the square of your body (ie, closer to your shoulder). Be mindful that gestures may appear more unnatural with virtual backgrounds. Although it is natural to look at participants' faces and video on the screen, from the perspective of the student or patient, this does not come across as direct eye contact. Try to maintain direct eye contact by looking at the camera when you are speaking. Consider putting something next to the camera lens that will remind you to focus your gaze there and close other computer windows to minimize distractions.

Adapt the Students' Authentic Roles To Be Commensurate With Their Clinical Developmental Stage

To establish an inviting virtual learning climate, you can start to iteratively develop the student's telehealth skills. Telehealth provides a rich opportunity for the student to join the greater community of practice [40], as they quickly learn competencies ranging from medical knowledge to systems-based practice. Consider the gradient of competency in the many domains within telehealth just as you would a continuum of competency in medical knowledge. Eventually the student might participate in all aspects of telehealth, including preparing for the session with appropriate technology in place, precharting, obtaining a history, completing a virtual physical exam, and providing patient education with anticipatory guidance. However, these steps might be considered building blocks and can be approached stepwise with supported participation matching the student's skill development [41]. Initially, students might listen in by telephone or video with the teacher and patient. As familiarity with the basic technical tools required to conduct a visit grows, the student can engage in independent communication with the patient for a portion of the encounter. One helpful framework to consider the student's skills and developmental progress is the Reporter, Interpreter, Manager, Educator framework [42], which describes the progression of student skills during the clinical clerkship year. For students in the reporter stage, eliciting an initial history in the telehealth visit might be an appropriate task, while students in the manager stage might be able to wrap up the visit with the patient, communicating the plan and next steps with faculty supervision. These expectations should be discussed with the learner as part of the previsit preparation. Students may also follow up on results of laboratory examinations and studies after the encounter. Frequent feedback and flexibility [43] to gauge competency while cultivating a growth mindset will allow the student to progress across multiple competencies.

Ensure “Sidelines Communication”

It is worth recognizing that when students and teachers work together in person, they have frequent points of contact. It is therefore important during telehealth sessions to preserve and promote opportunities for the student and teacher to communicate throughout the session. Dialogue is an important tool for building trust between students and teachers and can shift the power dynamic to provide students with a sense of expertise and autonomy [44]. The day-to-day interactions between students and teachers give teachers the opportunity to shape and understand the identity and roles of the medical students and provide students the dynamic to develop their professional identity [45]. It is therefore not surprising that medical students highly value having teachers who are readily available [44]. Agree on a private and reliable messaging platform for “sidelines communication” during the clinic session to communicate about timing, address questions, or provide support. Options include secure text messaging, computer communication platforms, phone calls, and videoconferencing chat functions. Which sidelines communication method you choose should be dictated by institutional privacy guidelines to comply with regulations such as the HIPAA (Health Insurance Portability and Accountability Act), institutional technical fire walls, and personal preference. Regardless of which sidelines communication you use, establishing a clear communication workflow allows students greater independence and teachers more efficient use of time while maintaining appropriate supervision.

Foster Relationships: Engage the Patient and the Student Within the Virtual Environment

Telehealth visits provide both additional challenges and opportunities for provider–patient communication and relationship building between the student, teacher, and patient. When reflecting on telehealth visits, patients report difficulty finding opportunities to speak, a sense that providers pay less attention to them, and an inability to establish a connection with their provider [46]. However, telehealth visits also present an opportunity to engage with patients in their own environments. At the beginning of the telehealth visit, extra consideration should be given to student introductions and consent, as creating a connection can be more difficult virtually. Best practices for in-person interactions, such as exploration of emotional cues, use of open-ended questions, and the teach-back method [47], should be adapted, modeled, and encouraged during virtual interactions. Similarly, relationship-centered care can also still be achieved through telehealth visits [48]. After first ensuring safety, privacy, and appropriate occasion, engaging in the patient, student, or provider’s home environments can allow for a greater connection. Family members previously unable to attend office appointments can be involved, while pets or other important facets of patients’ lives can add depth to the interaction. Lastly, be aware of virtual meeting fatigue that results from not having full access to nonverbal cues and the mental fatigue that results from having to process the accumulation of these important missing elements of in-person social interaction [49]. Engaging in relationship building and focusing on mindful communication can help prevent burnout within more virtual clinical and teaching environments [50].

Build In Opportunities To Teach and Observe the Virtual Physical Exam

Eliciting student learning goals in advance of the session will provide you with a focus for your teaching and observation. If the student identifies questions about how to perform an exam maneuver in your previsit conversation, take time to consider together how to most effectively perform the exam during the encounter. Even the more challenging maneuvers can be conducted over video or telephone. Plan in advance which specific examination maneuvers the student will perform and how to communicate the instructions for the exam to the patient. Consider with the student what can be gleaned from the encounter: how the patient tells their story; aspects of the history that help build the differential diagnosis; which data are available from wearable devices; or what findings can result from the “Telehealth Ten,” a patient-assisted clinical examination to help guide providers in their physical examination and clinical reasoning over telemedicine [28]. Clerkship students have noted that they appreciate timely feedback during the telehealth encounter or right after the visit, and virtual exam skills observation allows for a focused discussion around behaviors the student can keep, start, or stop doing [14]. During the visit, it may become clear that the symptoms discussed or signs noted in the virtual examination require transition to an in-person visit. Preparing the student for this possibility by explicitly exploring it with the student in advance and discussing what options exist for transitioning patients to in-person visits will allow the student to consider the opportunities and limitations of the telehealth encounter. Additionally, modeling for the student how to approach this conversation with the patient provides another opportunity for student learning.

After the Visit

Ensure a Post-Session Huddle: Set Aside Time To Debrief and Give Feedback

As the closing guidepost on the telehealth journey with the student, a postsession huddle creates the opportunity to reflect on the visit, share feedback with the student based on their identified goals, and create a plan or a Specific, Measurable, Attainable, Realistic, and Time-Bound (SMART) goal [51] for the next telehealth visit and the time between visits. Whether you are working with a student for two sessions or twenty-two sessions, providing feedback in the moment based on your observations can help to stimulate the student’s growth mindset and enhance the telehealth learning experience [52]. Having a feedback dialogue in a postsession online huddle without the patient present allows the teacher to share reinforcing and redirecting feedback based on their observations [14]. One potential structure for the postsession huddle is the “ask-tell-ask framework” [53]. First, ask the student to reflect on their own performance and then share (tell) your specific observations and feedback on the student’s performance and developing telehealth skills. You can share your screen in the virtual platform to highlight any particular observations. After sharing your thoughts, ask the student for their reaction to your feedback. Close the postsession huddle with a request to the student to generate a SMART goal or a plan about how to continue progressing in their telehealth skills development. Students may share their SMART goal via electronic messaging or through a shared platform for tracking student goals and progress.

Engage in Virtual Care Across Specialties

When patients are seen by other health care providers, either in a different specialty or profession, it is often difficult for students to participate in-person if these appointments occur in different locations. Telehealth provides an opportunity for students to more readily join visits across departments with health care providers of diverse specialties and professions, enhancing opportunities for building longitudinal relationships with patients. Through active participation in patient care in different settings, the student can bridge health care providers across specialties and benefit from experiential learning, constructing knowledge and meaning from an authentic experience [41]. Encourage the student to solicit patient and provider permission in advance of joining a visit virtually. Students can provide additional support, navigation, education, and advocacy for patients during virtual visits in different settings [54]. With knowledge of the patient's history and diagnoses, students can share additional background and context for the health care provider. Encourage students to check for patient understanding before, during, and after the visit, as this is particularly important in helping the patient navigate multiple settings and ensuring that the patient and family members have an understanding of the impression and plan from every visit; furthermore, it provides the student with a better perspective of the patient's care experience.

Conclusions

It is clear that telehealth visits will continue to be an expanding modality for the provision of care in the future. Consequently, medical students will need to be trained to meet telehealth competencies, and teachers will need to be able to coach medical students in these important skills. Creating opportunities for students to engage in telehealth visits using the above outlined best practices will provide them with opportunities to practice telehealth skills safely and effectively with guidance and feedback from prepared teachers.

Acknowledgments

The authors would like to thank Mr Quincy D McCrary for his assistance with the preparation of the manuscript for publication.

Conflicts of Interest

None declared.

References

1. Tuckson RV, Edmunds M, Hodgkins ML. Telehealth. N Engl J Med 2017 Oct 19;377(16):1585-1592. [doi: 10.1056/NEJMsr1503323] [Medline: 29045204]
2. Telehealth: defining 21st century care. American Telemedicine Association. 2020. URL: https://www.americantelemed.org/resource/why-telemedicine/ [accessed 2021-04-05]
3. Zha AM, Chung LS, Song SS, Majersik JJ, Jagolino-Cole AL. Training in neurology: adoption of resident teleneurology training in the wake of COVID-19: telemedicine crash course. Neurology 2020 Sep 01;95(9):404-407. [doi: 10.1212/WNL.0000000000010029] [Medline: 32554768]
4. Hollander JE, Carr BG. Virtually Perfect? Telemedicine for Covid-19. N Engl J Med 2020 Apr 30;382(18):1679-1681. [doi: 10.1056/NEJMp2003539] [Medline: 32160451]
5. Bashshur R, Doarn CR, Frenk JM, Kvedar JC, Woolliscroft JO. Telemedicine and the COVID-19 Pandemic, Lessons for the Future. Telemed J E Health 2020 May;26(5):571-573. [doi: 10.1089/tmj.2020.29040.rb] [Medline: 32275485]
6. Totten A, Womack D, Eden K, McDonagh M, Griffin J, Grusing S. Telehealth: mapping the evidence for patient outcomes from systematic reviews. AHRQ Comparative Effectiveness Technical Briefs 2016 Jun:13-44. [Medline: 27536752]
7. Waseh S, Dicker AP. Telemedicine training in undergraduate medical education: mixed-methods review. JMIR Med Educ 2019 Apr 08;5(1):e12515 [FREE Full text] [doi: 10.2196/12515] [Medline: 30958269]
8. Crawford A, Sunderji N, López J, Soklaridis S. Defining competencies for the practice of telepsychiatry through an assessment of resident learning needs. BMC Med Educ 2016 Jan 26;16:28 [FREE Full text] [doi: 10.1186/s12909-016-0529-0] [Medline: 26813286]
9. Govindarajan R, Anderson ER, Hesselbrock RR, Madhavan R, Moo LR, Mowzoon N, et al. Developing an outline for teleneurology curriculum: AAN Telemedicine Work Group recommendations. Neurology 2017 Aug 29;89(9):951-959. [doi: 10.1212/WNL.0000000000004285] [Medline: 28768842]
10. Jonas CE, Durning SJ, Zebrowski C, Cimino F. An interdisciplinary, multi-institution telehealth course for third-year medical students. Acad Med 2019 Jun;94(6):833-837. [doi: 10.1097/ACM.0000000000002701] [Medline: 30870152]
11. Edirippulige S, Armfield NR. Education and training to support the use of clinical telehealth: a review of the literature. J Telemed Telecare 2017 Feb;23(2):273-282. [doi: 10.1177/1357633X16632968] [Medline: 26892005]

12. Poncette A, Glauert DL, Mosch L, Braune K, Balzer F, Back D. Undergraduate medical competencies in digital health and curricular module development: mixed methods study. J Med Internet Res 2020 Oct 29;22(10):e22161 [FREE Full text] [doi: 10.2196/22161] [Medline: 33118935]
13. Rienits H, Teuss G, Bonney A. Teaching telehealth consultation skills. Clin Teach 2016 Apr;13(2):119-123. [doi: 10.1111/tct.12378] [Medline: 26016733]
14. Abraham HN, Opara IN, Dwaihy RL, Acuff C, Brauer B, Nabaty R, et al. Engaging third-year medical students on their internal medicine clerkship in telehealth during COVID-19. Cureus 2020 Jun 24;12(6):e8791 [FREE Full text] [doi: 10.7759/cureus.8791] [Medline: 32724740]
15. Chao TN, Frost AS, Brody RM, Byrnes YM, Cannady SB, Luu NN, et al. Creation of an interactive virtual surgical rotation for undergraduate medical education during the COVID-19 pandemic. J Surg Educ 2021;78(1):346-350 [FREE Full text] [doi: 10.1016/j.jsurg.2020.06.039] [Medline: 32654999]
16. Aron JA, Bulteel AJB, Clayman KA, Cornett JA, Filtz K, Heneghan L, et al. A role for telemedicine in medical education during the COVID-19 pandemic. Acad Med 2020 Nov;95(11):e4-e5 [FREE Full text] [doi: 10.1097/ACM.0000000000003572] [Medline: 32639263]
17. Cain R, Shafer Klink D, Yunus S. Telemedicine implementation in family medicine: undergraduate clerkship during COVID-19 pandemic. Med Educ 2020 Nov;54(11):1064-1065 [FREE Full text] [doi: 10.1111/medu.14313] [Medline: 32959423]
18. Iancu AM, Kemp MT, Alam HB. Unmuting medical students' education: utilizing telemedicine during the COVID-19 pandemic and beyond. J Med Internet Res 2020 Jul 20;22(7):e19667 [FREE Full text] [doi: 10.2196/19667] [Medline: 32614776]
19. Billet S. Guidelines for practice: integrating practice-based experiences. Australian Learning & Teaching Council.: Australian Learning & Teaching Council; 2011. URL: https://stephenbillett.com.au/wp-content/uploads/2020/09/Guidelines-for-practice-Integrating-practice-based-experiences.pdf [accessed 2021-04-05]
20. Afshari M, Witek NP, Galifianakis NB. Education Research: An experiential outpatient teleneurology curriculum for residents. Neurology 2019 Jul 23;93(4):170-175. [doi: 10.1212/WNL.0000000000007848] [Medline: 31332085]
21. Kirkland EB, DuBose-Morris R, Duckett A. Telehealth for the internal medicine resident: A 3-year longitudinal curriculum. J Telemed Telecare 2019 Dec 31:1357633X19896683. [doi: 10.1177/1357633X19896683] [Medline: 31888396]
22. Hilty D, Chan S, Torous J, Luo J, Boland R. A framework for competencies for the use of mobile technologies in psychiatry and medicine: scoping review. JMIR Mhealth Uhealth 2020 Feb 21;8(2):e12229 [FREE Full text] [doi: 10.2196/12229] [Medline: 32130153]
23. Sharma R, Nachum S, Davidson KW, Nochomovitz M. It's not just FaceTime: core competencies for the medical virtualist. Int J Emerg Med 2019 Mar 12;12(1):8 [FREE Full text] [doi: 10.1186/s12245-019-0226-y] [Medline: 31179921]
24. Association of American Medical Colleges. Telehealth competencies across the learning continuum. Washington DC: AAMC; 2021. URL: https://store.aamc.org/telehealth-competencies-across-the-learning-continuum.html [accessed 2021-04-04]
25. Shankar M, Fischer M, Brown-Johnson C, Safaeinili N, Haverfield M, Shaw J. Humanism in telemedicine: connecting through virtual visits during the COVID-19 pandemic. Annals of Family Medicine Preprint Collections 2020 Apr 13:1-10 [FREE Full text]
26. Zulman DM, Haverfield MC, Shaw JG, Brown-Johnson CG, Schwartz R, Tierney AA, et al. Telepresence 5: A ritual of connection for virtual visits. 2021. URL: https://med.stanford.edu/presence/initiatives/stanford-presence-5/tele-presence-5.html [accessed 2021-04-05]
27. Telehealth communication: quick tips. Academy of Communication in Healthcare. 2021. URL: http://achonline.org/Telehealth [accessed 2021-04-05]
28. Benziger CP, Huffman MD, Sweis RN, Stone NJ. The telehealth ten: a guide for a patient-assisted virtual physical examination. Am J Med 2021 Jan;134(1):48-51 [FREE Full text] [doi: 10.1016/j.amjmed.2020.06.015] [Medline: 32687813]
29. Ansary AM, Martinez JN, Scott JD. The virtual physical exam in the 21st century. J Telemed Telecare 2019 Nov 06:1357633X19878330. [doi: 10.1177/1357633X19878330] [Medline: 31690169]
30. Nouri S, Khoong EC, Lyles CR, Karliner L. Addressing equity in telemedicine for chronic disease management during the covid-19 pandemic. NEJM Catalyst Innovations in Care Delivery 2020;1(3):1-13 [FREE Full text] [doi: 10.1056/CAT.20.0123]
31. Rossi FS, Shankar M, Buckholdt K, Bailey Y, Israni ST, Iverson KM. Trying times and trying out solutions: intimate partner violence screening and support for women veterans during COVID-19. J Gen Intern Med 2020 Sep;35(9):2728-2731 [FREE Full text] [doi: 10.1007/s11606-020-05990-0] [Medline: 32607932]
32. Cantone RE, Palmer R, Dodson LG, Biagioli FE. Insomnia Telemedicine OSCE (TeleOSCE): a simulated standardized patient video-visit case for clerkship students. MedEdPORTAL 2019 Dec 27;15:10867 [FREE Full text] [doi: 10.15766/mep_2374-8265.10867] [Medline: 32051850]
33. Knowles M. Andragogy in Action: Applying Modern Principles of Adult Learning 1st edition. San Francisco: Jossey-Bass; 1984.

34. Locke EA, Alavi M, Wagner III J. Participation in decision making: An information exchange perspective. In: Ferris GR, editor. Research in personnel and human resources management: Elsevier Science/JAI Press; 1997:293-331.
35. Paul N, Kohara S, Khera GK, Gunawardena R. Integration of technology in medical education on primary care during the COVID-19 pandemic: students' viewpoint. JMIR Med Educ 2020 Nov 18;6(2):e22926 [FREE Full text] [doi: 10.2196/22926] [Medline: 33112760]
36. Waljee JF, Chopra V, Saint S. Mentoring millennials. JAMA 2020 May 05;323(17):1716-1717. [doi: 10.1001/jama.2020.3085] [Medline: 32369152]
37. Weissman JS, Betancourt J, Campbell EG, Park ER, Kim M, Clarridge B, et al. Resident physicians' preparedness to provide cross-cultural care. JAMA 2005 Sep 07;294(9):1058-1067. [doi: 10.1001/jama.294.9.1058] [Medline: 16145026]
38. van Ryn M, Hardeman R, Phelan SM, Burgess DJ, Dovidio JF, Herrin J, et al. Medical school experiences associated with change in implicit racial bias among 3547 students: a medical student changes study report. J Gen Intern Med 2015 Dec;30(12):1748-1756 [FREE Full text] [doi: 10.1007/s11606-015-3447-7] [Medline: 26129779]
39. Adams RD. Virtual meeting 101: body language tips for Zoom, Teams, and life. Tech Republic. 2020 Jul 10. URL: https://www.techrepublic.com/article/virtual-meeting-101-body-language-tips-for-zoom-teams-and-life/ [accessed 2021-04-12]
40. Wenger E. Communities of practice and social learning systems: the career of a concept. In: Blackmore C, editor. Social Learning Systems and Communities of Practice. London: Springer London; 2010:179-198.
41. Dornan T, Boshuizen H, King N, Scherpbier A. Experience-based learning: a model linking the processes and outcomes of medical students' workplace learning. Med Educ 2007 Jan;41(1):84-91. [doi: 10.1111/j.1365-2929.2006.02652.x] [Medline: 17209896]
42. Pangaro L. A new vocabulary and other innovations for improving descriptive in-training evaluations. Acad Med 1999 Nov;74(11):1203-1207. [doi: 10.1097/00001888-199911000-00012] [Medline: 10587681]
43. Hauer KE, Lockspeiser TM, Chen HC. The COVID-19 pandemic as an imperative to advance medical student assessment: three areas for change. Acad Med 2021 Feb 01;96(2):182-185 [FREE Full text] [doi: 10.1097/ACM.0000000000003764] [Medline: 33003038]
44. Hendren EM, Kumagai AK. A matter of trust. Acad Med 2019 Sep;94(9):1270-1272. [doi: 10.1097/ACM.0000000000002846] [Medline: 31460913]
45. van der Zwet J, Dornan T, Teunissen PW, de Jonge LPJWM, Scherpbier AJJA. Making sense of how physician preceptors interact with medical students: discourses of dialogue, good medical practice, and relationship trajectories. Adv Health Sci Educ Theory Pract 2014 Mar;19(1):85-98. [doi: 10.1007/s10459-013-9465-5] [Medline: 23771397]
46. Gordon HS, Solanki P, Bokhour BG, Gopal RK. "I'm not feeling like I'm part of the conversation" patients' perspectives on communicating in clinical video telehealth visits. J Gen Intern Med 2020 Jun;35(6):1751-1758. [doi: 10.1007/s11606-020-05673-w] [Medline: 32016705]
47. Bodenheimer T. Teach-back: a simple technique to enhance patients' understanding. Fam Pract Manag 2018;25(4):20-22 [FREE Full text] [Medline: 29989780]
48. Beach MC, Inui T, Relationship-Centered CRN. Relationship-centered care. A constructive reframing. J Gen Intern Med 2006 Jan;21 Suppl 1:S3-S8 [FREE Full text] [doi: 10.1111/j.1525-1497.2006.00302.x] [Medline: 16405707]
49. Blank S. What's missing from zoom reminds us what it means to be human. Medium. 2020. URL: https://medium.com/@sgblank/whats-missing-from-zoom-reminds-us-what-it-means-to-be-human-651be7cbff39 [accessed 2021-04-12]
50. Krasner MS, Epstein RM, Beckman H, Suchman AL, Chapman B, Mooney CJ, et al. Association of an educational program in mindful communication with burnout, empathy, and attitudes among primary care physicians. JAMA 2009 Sep 23;302(12):1284-1293. [doi: 10.1001/jama.2009.1384] [Medline: 19773563]
51. O'Neill J, Conzemius AE. The Power of SMART Goals: Using Goals to Improve Student Learning. Bloomington: Solution Tree; 2006.
52. Ramani S, Könings KD, Ginsburg S, van der Vleuten CPM. Twelve tips to promote a feedback culture with a growth mind-set: swinging the feedback pendulum from recipes to relationships. Med Teach 2019 Jun;41(6):625-631. [doi: 10.1080/0142159X.2018.1432850] [Medline: 29411668]
53. French JC, Colbert CY, Pien LC, Dannefer EF, Taylor CA. Targeted feedback in the milestones era: utilization of the ask-tell-ask feedback model to promote reflection and self-assessment. Journal of Surgical Education 2015 Nov;72(6):e274-e279. [doi: 10.1016/j.jsurg.2015.05.016]
54. Poncelet AN, Wamsley M, Hauer KE, Lai C, Becker T, O'Brien B. Patient views of continuity relationships with medical students. Med Teach 2013 Jun;35(6):465-471. [doi: 10.3109/0142159X.2013.774335] [Medline: 23477473]

Abbreviations

HIPAA: Health Insurance Portability and Accountability Act
SMART: Specific, Measurable, Attainable, Realistic, and Time-Bound

Edited by G Eysenbach; submitted 10.02.21; peer-reviewed by D Newman, Y Lin; comments to author 11.03.21; revised version received 17.03.21; accepted 25.03.21; published 21.04.21.

Please cite as:
Wamsley M, Cornejo L, Kryzhanovskaya I, Lin BW, Sullivan J, Yoder J, Ziv T
Best Practices for Integrating Medical Students Into Telehealth Visits
JMIR Med Educ 2021;7(2):e27877
URL: https://mededu.jmir.org/2021/2/e27877
doi:10.2196/27877
PMID:33881407

Viewpoint

An Imperative for the National Public Health School in Burkina Faso to Promote the Use of Information and Communication Technologies in Education During the COVID-19 Pandemic: Critical Analysis

Arzouma Hermann Pilabré[1], MSc; Patrice Ngangue[2], MD, MSc, PhD; Abibata Barro[1], MSc; Yacouba Pafadnam[1], MSc

[1]Institut de Formation et de Recherche Interdisciplinaires en Sciences de la Santé et de l'Éducation, Ouagadougou, Burkina Faso

[2]Faculté de médecine et sciences de la santé, Université de Sherbrooke, Sherbrooke, QC, Canada

Corresponding Author:
Arzouma Hermann Pilabré, MSc
Institut de Formation et de Recherche Interdisciplinaires en Sciences de la Santé et de l'Éducation
09 BP 311 Ouagadougou 09
Ouagadougou
Burkina Faso
Phone: 226 702 709 14
Email: hpilabr@yahoo.com

Abstract

Background: Several studies have reported the positive impact of information and communication technologies (ICTs) on academic performance and outcomes. Although some equipment is available, the ICTs for education at the National Public Health School (NPHS) of Burkina Faso have many shortcomings. These shortcomings were clearly revealed during the search for responses to the crisis caused by the COVID-19 pandemic. Indeed, to curb the spread of COVID-19, some measures were taken, such as closure of educational institutions. This resulted in a 2.5-month suspension of educational activities. Despite its willingness, the NPHS was unable to use ICTs to continue teaching during the closure period of educational institutions.

Objective: In this paper, we aim to propose practical solutions to promote ICT use in teaching at the NPHS by analyzing the weaknesses and challenges related to its use.

Methods: We conducted a critical analysis based on information from the gray literature of NPHS. This critical analysis was preceded by a review of systematic reviews on barriers and facilitating factors to using ICTs in higher education and a systematic review of ICT use during the COVID-19 pandemic in higher education. An ICT integration model and a clustering of ICT integration factors guided the analysis.

Results: The weaknesses and challenges identified relate to the infrastructure and equipment for the use of ICTs in pedagogical situations in face-to-face and distance learning; training of actors, namely the teachers and students; availability of qualified resource persons and adequate and specific financial resources; motivation of teachers; and stage of use of ICTs.

Conclusions: To promote the use of ICTs in teaching at the NPHS, actions must be performed to strengthen the infrastructure and equipment, human resources, the skills of actors and the motivation of teachers in the pedagogical use of ICTs.

(JMIR Med Educ 2021;7(2):e27169) doi:10.2196/27169

KEYWORDS

Burkina Faso; teaching; learning; ICT; COVID-19; critical analysis; public health; online learning; e-learning; information and communication technology; challenge

Introduction

The rapid evolution of information and communication technologies (ICTs) has led to the development of applications for use in everyday life and in all activity sectors [1]. Faced with this development, the integration of ICTs has become a necessity in education systems [2]. In Burkina Faso, the National Public Health School (NPHS) began integrating and promoting ICTs in education approximately 10 years ago. This integration has resulted in the establishment of infrastructures and training of actors [3].

Located within West Africa, the country of Burkina Faso covers an area of 274,200 km^2. It is subdivided into 13 regions, 45 provinces, 350 departments, and 351 municipalities [4]. The number of students per 100,000 inhabitants has increased from 336 in 2009-2010 to 600 in 2017-2018. Under the Education Guidance Act, the education system in Burkina Faso is organized into formal, nonformal, informal, and special education [5].

Since the 1980s, numerous private and public actions have been implemented to integrate ICTs in education in Burkina Faso [6]. The development of skills and abilities for the widespread use of ICTs is one of the challenges faced by the higher education system in Burkina Faso [4].

The NPHS is ranked in the Higher School category, which is a component of higher education. Its main mission is to ensure training of midwives and paramedical staff in primary and specialized fields to benefit the public and the private sector. The NPHS is organized as follows: the Board of Directors, which holds the highest administrative responsibility; and the Executive Board, which directs and coordinates all institution activities. The Executive Board includes the central and regional directorates. There are 10 regional directorates. In addition to the regional directorates, the Directorate of Higher Education in Health Science (DHEHS) is responsible for specialized training of paramedical and midwifery personnel. Each regional directorate and the DHEHS has the following work stations: a secretariat; a pedagogical service; training services; a school life service; two control rooms; and an administrative and financial service [3].

In 2006, the West African Health Organization, together with its member countries, including Burkina Faso, initiated harmonization of curricula. This harmonization, which adopted the Bachelor-Master-Doctorate (BMD) system in the Economic Community of West African States (ECOWAS), is seen as a means of regulating the training and career development of health professionals [7]. The harmonization began with the curricula for nurses and midwives, which were approved and adopted in 2010 by ECOWAS Health Ministers. From 2011, the NPHS entered into this process of harmonizing basic and postbasic training curricula. It then embarked on implementing the BMD system, starting with the nursing and midwifery streams. In the institution’s progression toward effective application of the BMD system, ICTs are of paramount importance. In this sense, the NPHS has equipped itself with a videoconferencing system installed in all the regional directorates except in the recently established ones of Dédougou, Ziniaré, and Banfora. This system enables video conferencing and distance learning to benefit the institution's trainers [3].

In the absence of a strategy document, it is not easy to obtain a clear picture of the design and process for implementing ICTs in teaching at the NPHS. Literature reports show that the use or integration of ICTs in education requires policy or strategies [8]. Pedagogical integration or use of ICTs in teaching refers not only to the educational institution equipment and networking but also to the appropriate, usual, and regular use of ICTs by teachers and students to support and enhance teaching and learning [9]. The use of ICTs in teaching can occur in a face-to-face educational situation and/or in a distance pedagogical situation in synchronous and/or asynchronous mode [10-27].

The shift to distance education can help institutions cope with unexpected situations, such as those caused by the COVID-19 pandemic. Indeed, due to the COVID-19 pandemic, most universities have moved to web-based distance learning in synchronous and/or asynchronous environments [10-27]. Several countries, including Burkina Faso, have imposed closure of educational and training institutions to ensure the respecting of physical distancing measures and to reduce the risk of contamination [10-27]. Although in some countries, this situation has led several educational structures to optimize the use of the potential of ICTs to provide e-learning to students, this has not been possible at the NPHS [28].

NPHS officials were unable to maintain teaching continuity due to inadequate and obsolete equipment [29] and poor preparation. This suspension of educational activities has had many consequences for students, teachers, and NPHS officials. Given the magnitude of these consequences, upgrading and promoting the effective use of ICT in education is becoming imperative for the NPHS, especially in the case of a second wave. This crisis also creates the opportunity for all systems to look to the future, adapt to possible threats, and strengthen their capacity [30].

The goal of this paper is to enable the NPHS and educational structures that are in a similar situation to exploit the potential offered by ICTs, through proposals for solutions, to improve the quality of training and to be able to address unexpected situations such as those generated by the COVID-19 pandemic.

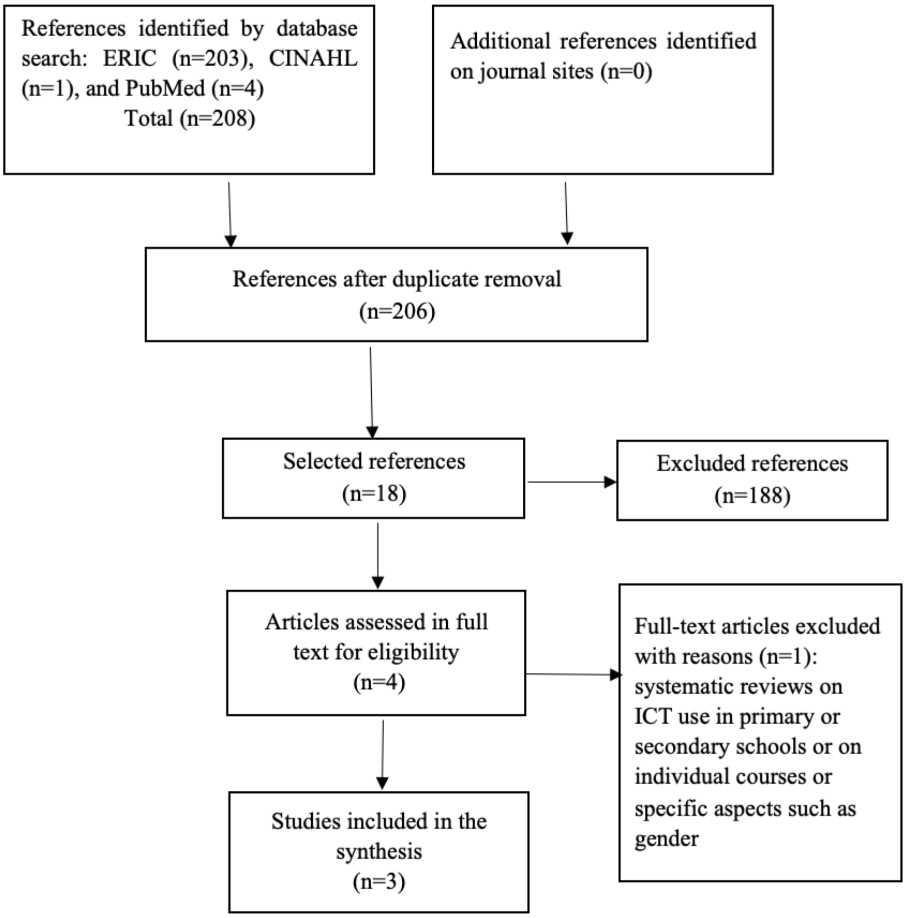
Methods

To perform the critical analysis, we first carried out two rapid systematic reviews. The methodology followed PRISMA-P (Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols) [31]. The first review was a review of systematic reviews. Systematic reviews published between 2017 and 2021 that examined encountered difficulties in ICT use in higher education and strategies to overcome these difficulties were included. Systematic reviews on ICT use in primary or secondary schools or on individual courses or specific aspects such as gender were excluded. We searched three electronic bibliographic databases (ERIC, CINAHL, and PubMed) to identify systematic reviews focused on barriers and facilitators in using ICT in higher education. We used the following terms to develop the search strategies: *students*, *learners*, *teachers*, *trainers*, *educators*, *manager*, *higher education*, *university*, *information and communication technologies for education*, *ICT for education*, *web-based learning*, *e-learning*, *distance education*, *computerized technological resources*, *online learning*, *virtual classroom*, *virtual class*, *remote education*, *remote instruction*, *internet use for education*, *access to ICT*, *use of ICT*, *the capacity of use*, *perceived usefulness*, *barriers*, *facilitating factors*, and *systematic review*.

The search strategy for the PubMed database was as follows: ("Students" [MeSH] OR "Learners" OR "Teachers" OR "Trainers" OR "Campus managers" OR "Directors" OR "Education, Graduate" [MeSH] OR "Universities" [MeSH] OR "Faculty" [MeSH]) **AND** ("Information and communication technologies for education" OR "ICT for education" OR "Web-based learning" OR "E-learning" OR "Distance education" OR "Distance Learning" [MeSH] OR "Learning, Distance" [MeSH] OR "Computerized technological resources" OR "Online Learning" [MeSH] OR "Learning, Online" [MeSH] OR "Online Education" [MeSH] OR "Remote Education" OR "Remote instruction" OR "Virtual classes" OR "Virtual classroom" OR "Integration of ICT" OR "ICT" OR "Internet use" [MeSH] OR "Computer User Training" [MeSH]) **AND** ("Access to ICT" OR "Use of ICT" OR "Capacity of use" OR "Perceived usefulness" OR "Barriers" OR "Facilitating factors"). This strategy was adapted for use in the ERIC and CINAHL bibliographic databases.

Figure 1 illustrates the study selection process for the first literature review.

Figure 1. Adapted PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols) flow diagram to show the results of the searches in the first literature review. ICT: information and communications technology.



In the second literature review, we included published articles from 2020 to 2021 with primary data describing the use of ICTs during the COVID-19 pandemic in universities, faculties, and colleges. We excluded editorials, commentaries, and articles reporting experiences with web-based distance education and learning of specific courses, implementation projects, or web-based distance education evaluations. For this purpose, we searched three databases (ERIC, CINAHL, and PubMed). The following terms were used to develop the research strategies: *students*, *learners*, *teachers*, *trainers*, *educators*, *manager*, *higher education*, *university*, *COVID-19*, *information and communication technologies for education*, *ICT for education*, *web-based learning*, *e-learning*, *distance education*, *computerized technological resources*, *online learning*, *virtual classroom*, *virtual class*, *remote education*, *remote instruction*, *internet use for education*, *access to ICT*, *use of ICT*, *the capacity of use*, *perceived usefulness*, *confirmation of expectations*, *students' satisfaction*, *knowledge*, *attitudes*, *practice*, and *students' engagement*.

The search strategy for the PubMed database was as follows: ("Students" [MeSH] OR "Learners" OR "Teachers" OR "Trainers" OR "Campus managers" OR "Directors" OR "Education, Graduate" [MeSH] OR "Universities" [MeSH] OR "Faculty" [MeSH] OR "COVID-19" [MeSH]) **AND** ("Information and communication technologies for education" OR "ICT for education" OR "Web-based learning" OR "E-learning" OR "Distance education" OR "Distance Learning" [MeSH] OR "Learning, Distance" [MeSH] OR "Computerized technological resources" OR "Online Learning" [MeSH] OR "Learning, Online" [MeSH] OR "Online Education" [MeSH]

OR “Remote Education” OR “Remote instruction” OR “Virtual classes” OR “Virtual classroom” OR “Integration of ICT” OR “ICT” OR “Internet use” [MeSH] OR “Computer User Training” [MeSH]) **AND** (“Access to ICT” OR “Use of ICT” OR “Capacity of use” OR “Perceived usefulness” OR “Confirmation of expectations” OR “Student satisfaction” OR “Health knowledge, attitudes, practice” OR “Health Knowledge, Attitudes, Practice” [MeSH] OR “Student engagement” OR “Academic Success” [MeSH] OR “Learning” OR “Professional Competence” [MeSH] OR “mental competency” [MeSH] OR “Skills”). This strategy was adapted for use in the ERIC and CINAHL bibliographic databases.

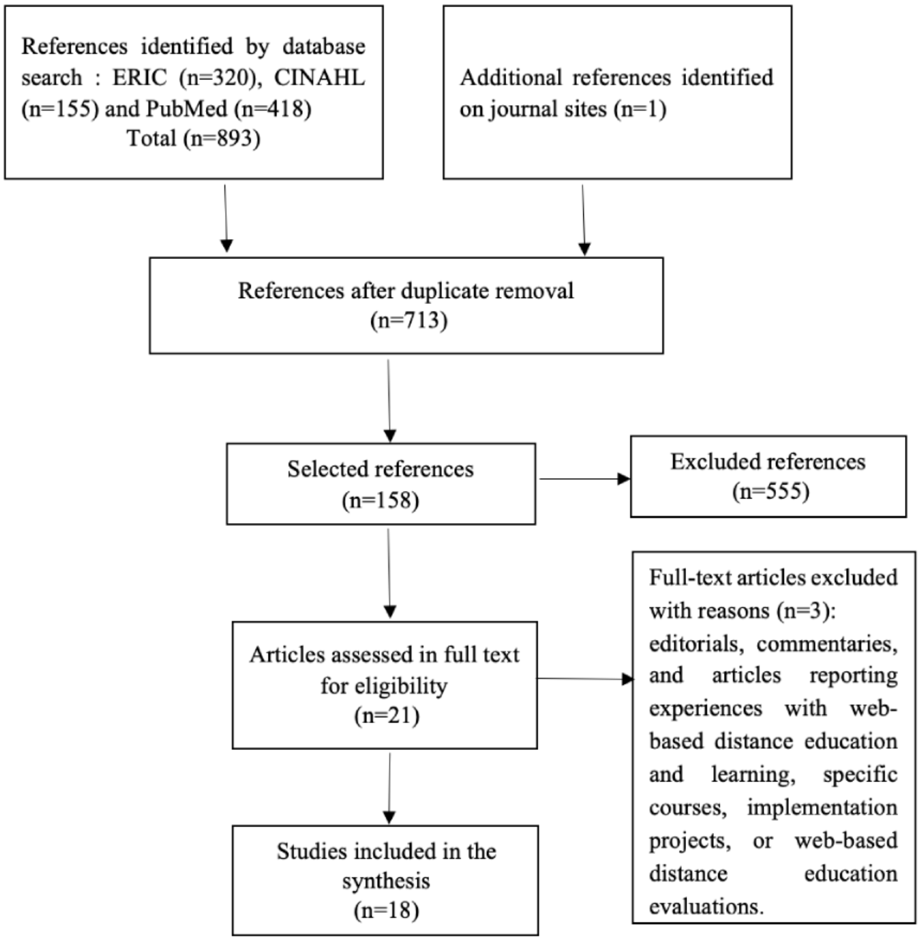
Figure 2 illustrates the study selection process for the second literature review.

The database search results were stored in a single reference manager software (Zotero). Duplicate references were removed. Titles and abstracts of the review papers retrieved using the search strategy were screened.

A standardized data extraction form was developed, piloted, and used to extract data from the full text of the included publications. In addition to the general characteristics of the studies, we extracted data regarding the use of ICTs in teaching, learning, and the management of the COVID-19 pandemic in high schools.

An ICT integration model and a clustering type of ICT integration factors guided the data synthesis. The information concerning the NPHS was taken from the gray literature of the institution.

Figure 2. Adapted PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols) flow diagram to show the results of the searches in the second literature review.



Results

Literature Reviews

In the first systematic review on barriers and facilitators of ICT use in higher education, a search of the three databases identified 208 articles. We deemed 3 articles to be relevant. The articles included are those by Webb et al [8], Regmi et al [32], and Atmacasoy et al [33]; the selected systematic reviews date from 2017, 2018, and 2020, respectively. Of these reviews, 2 were conducted in the United Kingdom [8,32] and 1 in Turkey [33].

The 3 systematic reviews included 128 articles and 10 theses [8,32,33].

For the second systematic review on the use of ICTs in higher education during the COVID-19 pandemic, 893 articles were retrieved from the databases. The search of websites of specialized journals yielded 1 additional article, for a total of 894 articles. We deemed 18 articles to be relevant. The articles included are those of van der Keylen et al [10], Soy-Muner [11], Daniel [12], Moszkowicz et al [13], Yılmaz et al [14], Al-Balas et al [15], Sharma [16], George [17], Kim et al [18], Sabharwal et al [19], Sutiah et al [20], Scull et al [21], Barik et al [22], Khalaf [23], Mansoor [24], Ibrahim et al [25], Lowenthal et al [26], and Chick et al [27]. Of these 18 articles, 8 are from Asia, 4 from America, 4 from Europe, 1 from Africa, and 1 from Oceania. All these articles were published in 2020. Most of the studies first presented a section that describes the use of ICTs during the COVID-19 pandemic and another section devoted to assessment.

Web-Based Distance Education in Higher Education

ICTs are used in higher education to achieve web-based distance education and learning. The blended learning mode is the most widely used. A systematic review [32], which included 21 articles and 10 theses, reported that most web-based distance education studies focused on a blended learning environment via Moodle. Moodle is a free learning management system for creating flexible and engaging web-based experiences or a website specifically designed for a blended learning course. Blended learning is defined as a combination of learning delivery methods, including face-to-face teaching with asynchronous or synchronous computer technologies [32]. Some of the descriptions of the components of blended learning are as follows [32]:

- Carious web technology tools are combined, such as live virtual classrooms, collaborative learning and streaming video.
- An optimal learning outcome is achieved with or without instructional technology by combining different pedagogical approaches, such as constructivism, behaviorism, and cognitivism.
- Any form of instructional technology (eg, videotape, CD-ROM, e-learning, and film) is combined with face-to-face instruction.
- Instructional technology is combined with real-world tasks to support work-based learning.

Blended learning has brought several benefits, mainly due to the successful merging of face-to-face and web-based aspects by making resources more accessible. It promotes the student-centered approach by providing various materials, increasing participation, and fostering student-student and teacher-student interaction. In addition, it provides timely feedback and creates a ground for synchronous and asynchronous discussions [32].

Encountered Difficulties in Web-Based Distance Learning

Encountered difficulties in web-based distance education in higher education are related to personal, institutional, and pedagogical factors.

Personal Factors

Personal factors relate to teachers and students' motivation and commitment to using ICTs in teaching and learning [34].

One of the reported personal factors is teacher anxiety due to the considerable importance of using ICTs in blended learning [32]. Students also have high levels of anxiety and stress related to the use of ICTs in learning. These high levels of anxiety and stress are due to inappropriate equipment and technological illiteracy [8].

Another difficulty related to personal factors is low motivation or lack of enthusiasm of teachers and students for educational technology [8,33]. Low motivation about web-based distance education refers to low commitment, poor perception, limited flexibility, lack of student self-discipline, low self-efficacy, and poor interaction between learners and facilitators [8].

Institutional Factors

Institutional factors include creating an adequate pedagogical environment that enables teachers to apply ICT in teaching methods [34].

A systematic review has highlighted some of the barriers that threaten the construction of effective blended learning environments. These barriers include infrastructure problems, connection failures and slow internet access, technical problems, and lack of personal computers [32,33]. Lack of internal support for ICT use is also a concern for both students and faculty [33].

In one review, 9 out of 24 articles reported that e-learning is a time-, cost-, and labor-intensive approach. Insufficient resources are a significant barrier. A total of 8 out of 24 articles identified the lack of a computer or user-friendly computer as one of the main challenges to successful e-learning [8].

It was also pointed out that problems related to cost and availability of resources in the long term raise concerns for ensuring quality, user-friendliness, and distance education and learning effectiveness. In addition, insufficient consideration of users' needs and lack of time are barriers that will negatively impact e-learning [8].

Pedagogical Factors

Pedagogical factors take into account the technical abilities of teachers to use a computer. To this end, teachers must design teaching materials and produce courses with multimedia support to support and facilitate student learning [34].

The most frequently encountered barriers are lack of teachers' computer skills [33], poor course structure, poor instructional design, absence of clear objectives, limited use of technology in teaching, and insufficient teacher training [8]. Indeed, the university staff is also concerned about the lack of training and time needed to develop asynchronous learning regimes and invest more ICT resources in their teaching [33]. At the learner level, several articles also raised technological or computer challenges. Indeed, many learners are not familiar with e-learning, and in some contexts, they even lack basic computer literacy [8].

Another obstacle identified is related to the fact that web-based distance learning is not suitable for all disciplines or contents. A total of 8 of 24 papers reported that integrating learning into existing programs would be problematic, as some disciplines would take a long time for learners and facilitators to adapt the content in e-learning programs. Moreover, several articles reported that some content may be unsuitable for e-learning, but some content may not be appropriate because these disciplines need practical or demonstrative types of learning [8].

Strategies to Overcome the Difficulties Encountered in Web-Based Distance Education

To overcome the difficulties encountered in web-based distance education, the development of appropriate institutional strategies is essential. These institutional strategies could include flexibility of web-based distance education, access to systems, costs, learning styles, training of teachers and learners, and exploitation of local systems management of learning [8].

In addition, human and environmental barriers such as beliefs and motivation of staff and students must be overcome. Substantial financial resources must be mobilized to finance the long-term functioning of web-based distance education and learning systems. Furthermore, faculties or universities should allow time for training of teachers and students and for course content preparation. They should also provide technical support staff and effective systems for web-based distance education [33].

ICT Use During the COVID-19 Pandemic

The closure of educational institutions caused by the COVID-19 pandemic encourages optimal exploitation of the potential offered by ICTs around the world [10-27]. ICT has been used primarily to provide distance education and learning on the web. All of the studies included in this systematic review described using ICT in universities during the COVID-19 pandemic to provide distance teaching and learning or education on the web [10-27].

Most studies have reported that the synchronous and asynchronous use of web-based distance teaching and learning is the option chosen by universities [10-13], [16,17], [19,20], [23-27]. This choice could be explained by the fact that web-based learning works best when the material designed, used asynchronously by students, is associated with synchronous class discussions [12]. Teaching synchronous and asynchronous learning consists of live lectures and pre-recorded lectures or SMS text messages made available to students [10-13], [16,17], [19,20], [24-27]. The videoconferencing method can be applied to clinical lessons and anatomy lessons [13].

A total of 2 studies described the option provided by universities to realize web-based distance learning and teaching in synchronous form. This uniquely synchronous web-based distance learning occurs through live teleconferences or webinars and through educational meetings held on different web platforms [18,21].

Only one study reported web-based distance learning education by a university in the asynchronous form through video applications. The option of the exclusively asynchronous form was made due to constraints following the synchronous form [25].

A useful resource in face-to-face teaching restrictions is that of a very detailed workbook-type text. The text presents elements for all of the course topics using step-by-step solutions to problems and diagrams. Practical questions and their answers are presented at the end of each chapter. This resource is made available to students for download [16].

Beyond lessons, ICTs have been used to conduct examinations or train students by remote evaluations [16,22,24]. An app is used in combination with a browser for written examinations. Oral examinations are organized as web-based meetings [22]. Simulated web-based quizzes are also sent to students to enable them to answer structured questions and to familiarize them with the web-based examinations [16].

To be effective, adoption of early web-based distance education and learning by universities must meet certain conditions. Comprehensive web-based teaching and learning require rich lesson plan design and quality and engaging instructional content supported by audio and video content with strong technology support teams. The smooth migration to web-based teaching and learning requires the implementation of an educational policy of (1) grouping and reorganizing course content into smaller, more understandable units to help students navigate, focus, and understand; (2) emphasizing the use of “modulation, inflexion, pitch and timbre of the voice” in web-based education; (3) training the faculty, because the technical specifications of web-based education are much higher than those of traditional classroom instruction for inexperienced faculty members who deliver educational content on the web for the first time; (4) reinforcing students' active learning skills, as compared to traditional lessons, teachers have less control over web-based instruction, and students are more likely to avoid lessons; (5) developing the concept of web-based and offline self-learning [27].

Discussion

Principal Findings and Recommendations

The NPHS should exploit the potential of ICTs to avoid the total suspension of educational activities for approximately 2.5 months. Early leaders thought about this but soon encountered the limitations of using ICTs in teaching in their institution. It is this suspension of educational activities at NPHS for a long time during the COVID-19 pandemic that motivated this critical analysis.

The results of the review of systematic reviews indicate that ICTs have long been used in higher education in blended learning modalities [32]. Difficulties are encountered in web-based distance learning. These difficulties include the anxiety and lack of motivation of teachers and students, insufficient pedagogical and teachers' computer skills, insufficient connection to the internet, lack of time for teachers, insufficient infrastructure and equipment, insufficient human and financial resources, and insufficient computer skills among students [8,32,33]. Solutions to overcome these difficulties have been suggested. These solutions involve developing appropriate institutional strategies, the motivation of the main actors, the mobilization of financial resources, and the strengthening of infrastructure and equipment [8,33]. The systematic review shows that the use of ICTs in higher education has intensified and spread with the advent of the COVID-19 pandemic. Several universities or faculties have moved to web-based distance education and learning in a synchronous or asynchronous environment [10-27]. One of the difficulties of using ICT in higher education linked to personal factors is low motivation or lack of enthusiasm for educational technology teachers and students [8,33]. The integration of ICTs is an innovation whose application requires the motivation of teachers [33]. The NPHS also encounters this difficulty because the motivation of teachers to use ICT is nonexistent. The evaluation of lessons that could encourage, value, and reward teachers is not implemented [3].

To remedy teachers' lack of motivation to use ICTs effectively [33], the authors recommend that the NPHS develop strategies to recognize and value the teaching profession using ICTs. One strategy could be course evaluation followed by rewards for the best teachers. In addition, teachers' involvement in decision-making concerning ICT use in education must be strengthened because it is also a motivating factor [33]. The obstacles that threaten the construction of effective blended learning environments include infrastructure problems, connection failures and slow internet access, technical problems, and a lack of personal computers [32,33]. In short, there is no conducive educational environment for teachers to apply ICT to teaching techniques. The educational environment should be accompanied by equipment of teachers with technopedagogical tools, the establishment of adequate infrastructure and equipment, and the establishment and training of teachers and students in the educational applications of ICTs. A favorable educational environment requires the creation of a structure that is responsible for the educational integration of ICTs to provide leadership to general or regional management [35].

At the NPHS, teachers do not have computers or accessories such as USB keys, servers, cables, connection wires, telecommunications links, videoconferencing equipment, and networks or operating software [3] to enable the educational integration of ICTs in their professional practice. Pending the development and implementation of a specific plan to respond to the lack of infrastructure and equipment and the poor access to a fluid and permanent internet connection, the authors of the article recommend that the NPHS build infrastructures and equip the regional offices with distance education facilities, high-speed internet access systems, and other ICT equipment of sufficient quantity and quality [33]. These investments can be made through advocacy with the Ministry of Health and technical and financial partners. In addition, the NPHS must facilitate the acquisition of computer and pericomputer equipment by students and teachers. Students' acquisition of computer equipment could be facilitated by pleading with the president of Burkina Faso for the inclusion of NPHS students in the "one student, one computer" program. This program aims to provide each participating student with a computer at a subsidized price. In fact, a study showed that the "one student, one computer" program was effective [36]. A special operation focusing on flexible payment terms could be organized to provide permanent teachers with computers. It has also been pointed out that issues related to the cost and availability of long-term resources raise concerns to ensure quality, usability, distance education, and learning efficiency [8]. The availability of substantial financial resources is essential to ensure the permanent functioning of ICTs and address the costs of maintenance and renewal of technological equipment. Fundraising or providing adequate, equitable, and stable funding is essential to acquire technological resources [37]. At the NPHS, adequate and specific financial resources for using ICTs in education are not available [3]. The administration of the NPHS and active help from partners and parents can help subsidize the internet subscription and the ICT equipment [37]. Technological infrastructure requires regular and consistent funding, mainly because of the rapid pace of technological change [38]. In addition, ICT equipment is not regularly renewed due to a lack of funding. For example, none of the 23 initial computers in the computer room of the regional office of the NPHS in Ouagadougou is currently functional [39]. In this regional office, it is impossible to access the internet connection despite the installation of modems [39]. To obtain financial resources for the maintenance of ICT equipment and to ensure a permanent subscription to an internet connection and the renewal of ICT equipment [33,38], the authors of the article advise the NPHS to dedicate a specific budget line to this objective each year in its action plan [33].

The lack of internal support in terms of specialized human resources for ICT use is also a concern for students and teachers [33]. The availability of qualified resource persons such as an information technology (IT) specialist, a trainer, a tutor or an instructor to provide support and training in ICT to teachers is insufficient [33]. These professionals provide the necessary technical support to students and teachers [33]. Their technical assistance role can facilitate, among other things, research, the creation of a resource bank for teachers and students, and the safe use of equipment [37]. According to some authors, to fully exploit technology, four human resources categories are necessary: technical support staff; media production and management staff; instructional designers; and finally, teachers, professors, or content creators [38].

At the NPHS, this type of staff does not exist in any regional directorate. The only IT specialist recruited, who can be considered as a technical assistant, is assigned to general management [3]. Faced with the lack of human resources, the authors of the article recommend that the general management of the NPHS recruit and make available to the regional offices the necessary resource persons to promote the use of ICTs in education [33]. It would also be advantageous for the NPHS to develop partnerships with training establishments or universities with ICT experience related to education.

The most frequently encountered obstacles are the lack of computer skills of teachers [33], poor course structure, poor instructional design, lack of clarity of objectives, limited use of technology in teaching, and inadequate and insufficient training of teachers [8]. The establishment of adequate infrastructure and equipment must be accompanied by training of teachers and students in the pedagogical applications of ICTs. Teachers must be able to produce teaching materials and lessons with multimedia support to facilitate student learning [35]. No adequate training on the use of ICTs in education has been organized for teachers [8]. This lack of training is not conducive to effective and efficient pedagogical use of ICTs.

The majority of NPHS teachers cannot design teaching materials and produce courses with multimedia support to support and facilitate student learning. One of the manifestations of this lack of skills is the lack of educational innovation [3]. To improve teachers' ability to reach the stage of pedagogical use of ICTs [9] in teaching, the authors recommend that the NPHS organize training sessions for these teachers [33]. These training sessions should aim to make teachers capable of producing teaching material and multimedia support courses [34]. In addition, teachers must be made aware of the need for self-training. The stage of "pedagogical use" of ICTs begins when the teacher feels a pedagogical curiosity, need, or obligation [9].

All the articles included in the systematic review on the use of ICTs in universities during the COVID-19 pandemic showed that ICTs were used in these settings to ensure distance teaching and learning [10-27]. Only the use of ICTs could offer the possibility for universities to maintain contact with students and to continue certain educational activities during the closure of educational institutions to contribute to the reduction of the spread of the pandemic of COVID-19 [28]. However, the authors of the included articles did not explicitly present the methodology that was employed to describe this use of ICTs [10-27].

The unexpected closure of the NPHS, which resulted in the suspension of educational activities for a long time, had many negative consequences. The NPHS should exploit the potential of ICTs to avoid the total suspension of educational activities for approximately 2.5 months. Early leaders thought about this but soon came up against the limitations of using ICTs in teaching in their institution.

Most studies have reported that the synchronous and asynchronous use of web-based distance teaching and learning is the option chosen by universities [10-13,16,17,19,20,23-27]. This choice could be explained by the fact that web-based learning works best when the material designed to be used by students asynchronously is associated with synchronous class discussions [12]. To begin web-based distance education and learning, the NPHS could opt for the asynchronous form because the synchronous form has many more constraints [25]. This asynchronous use could be achieved by providing students with prerecorded lectures, PowerPoint presentations, or detailed SMS text messages [10-13,16].

To overcome the difficulties encountered in web-based distance education, the development of appropriate institutional strategies is essential [8]. These institutional strategies could include the flexibility of web-based distance education, access to systems, costs, learning styles, training of teachers and learners, and exploitation of local systems management of learning [8]. The implementation of conditions for integrating ICTs in education must be preceded by developing specific policies, strategies, or plans that take this aspect into account [11].

The NPHS does not have a policy document on the integration or use of ICTs in education [3]. In 2019, the NPHS adopted a Strategic Development Plan (SDP) for 2020-2024 to continue implementing various reforms. This strategic plan is now the reference tool for training at NPHS during this period. The operational planning of the 2020-2024 SDP is structured chronologically into intervention axes, strategic orientations, effects, products and activities [3].

From the SDP analysis, only one formulated product mentions ICTs in education: "innovative pedagogical strategies, including ICTs, are used." The plan does not include an axis of intervention or strategic orientation about using ICTs in teaching. However, shortcomings in using ICTs in teaching and learning are clearly mentioned in several situational analysis sections of the SDP. Of the 226 activities listed, no activity is dedicated explicitly to ICT use in education [3]. According to the SDP designers, three activities are related to pedagogical innovation, integrating the use of ICTs. These activities specifically concern the development of audiovisual teaching-learning tools, the reinforcement of the capacities of 200 actors on the use of these tools, and the organization of follow-up trips. Beyond the use of these tools, the training should aim at enabling teachers to design teaching materials and produce multimedia courses [34]. One activity concerns the construction of multimedia computer rooms for teachers and students. Another, much more global activity relating to infrastructure maintenance, equipment, and logistics is included in the plan.

Moreover, the SDP does not explicitly provide specific and adequate financial resources related to ICT use in education. These weaknesses demonstrate that ICT use in education does not yet seem to be well understood and is insufficiently implemented. To promote ICT use in education, priority actions are performed according to the weaknesses and challenges identified. In particular, the institutional, personal, and pedagogical factors favoring ICT use in education should be emphasized [8,32,33]. To this end, the NPHS should first include in the SDP at its midterm review a specific intervention strategy or effect with relevant activities related to ICT use in education. The school should then develop a specific plan for ICT use in education [8] with input from experts. Finally, the regional directorate should identify the feasible activities of the plan.

In the systematic review, solutions such as the development of appropriate institutional strategies, the motivation of the main actors, the mobilization of financial resources, and the strengthening of infrastructure and equipment were proposed to overcome difficulties [8,32,33]. However, these solutions have not been broken down into activities that can be easily implemented.

Limitations of the Study and Future Research

This paper has some limitations. It includes two systematic reviews that were conducted quickly because of a time constraint. The systematic review on barriers and facilitators of ICT use in higher education had a sample of 3 articles because a limited number of articles met the criteria. Nonetheless, these articles reported results from a significant number of primary articles. Detailed results on the barriers to ICT use were found in the included articles. However, the results regarding the factors facilitating ICT use were general and sparse. This insufficiency of detailed and abundant results on the strategies to be implemented to overcome the difficulties requires the realization of additional primary research.

Moreover, the lack of use of specific methodologies in the articles to describe the use of ICTs during the COVID-19 pandemic in education shows that the results must be interpreted while taking the limitations of the studies into account. For the two systematic reviews, no grey literature search was performed. Relevant studies may have gone unnoticed.

Conclusion

Inadequate quality of training, ongoing reforms at the NPHS, and restrictive measures imposed following the advent of the COVID-19 pandemic indicate the need to promote ICTs in teaching and learning. This promotion should be achieved progressively through rigorous planning and according to available resources. Priority actions should focus on institutional, personal, and pedagogical factors that promote ICT use in education. In-depth knowledge of the use or integration of ICTs in teaching-learning by the institution's officers, teachers, and students and the upgrading of equipment will be essential steps toward the optimal exploitation of ICTs in education at the Burkina Faso NPHS.

Conflicts of Interest

None declared.

References

1. Poyet F. Comprendre la construction des usages des TIC en formation : vers un modèle d'analyse systémique. Thesis. Université Claude Bernard Lyon 1. 2014. URL: https://archivesic.ccsd.cnrs.fr/tel-01356322/document [accessed 2021-05-13]
2. Riyami B. Analyse des effets des TIC sur l'enseignement supérieur au Maroc dans un contexte de formation en collaboration avec une université française. Thesis. Université de Bretagne Sud. 2018. URL: https://tel.archives-ouvertes.fr/tel-02004288/document [accessed 2021-05-13]
3. Plan stratégique de développement 2020-2024. Ecole nationale de santé publique, Burkina Faso. 2019. URL: http://www.insp.gov.bf/wp-content/uploads/2020/09/PLAN-STRATEGIQUE-INSP-2020-2024.pdf [accessed 2021-05-13]
4. Plan national d'action de développement de l'enseignement supérieur (PNADES) 2014-2023. Présidence du Faso. 2013. URL: https://www.univ-koudougou.gov.bf/fileadmin/user_upload/storage/documents/pnades_.pdf [accessed 2021-05-13]
5. Politique sectoriel de l'éducation du Burkina Faso (PSE/BF) 2014-2023. Présidence du Faso. 2013. URL: http://www.africanchildforum.org/clr/policy%20per%20country/2018%20Update/Burkina%20Faso/burkinafaso_sectoral policyofeducation_2013_fr.pdf [accessed 2021-05-13]
6. Ouattara B. Quels effets pour les scénarios pédagogiques s'appuyant sur les technologies de l'information et de la communication ? : Cas de la formation à distance pour l'obtention du certificat de compétences en informatique et Internet de l'Université Ouaga II (Burkina Faso). Thesis. Université de Cergy-Pontoise. 2019. URL: https://tel.archives-ouvertes.fr/tel-02501539/document [accessed 2021-05-13]
7. Curriculum de fomation harmonisé des infirliers et sages-femmes des pays membres de la CEDEAO. West African Health Organization. 2010. URL: https://www.wahooas.org/web-ooas-prod/sites/default/files/publications/1093/curriculumharmonisedeformationdesinfirmiersetsage-femmes.pdf [accessed 2021-05-13]
8. Webb L, Clough J, O'Reilly D, Wilmott D, Witham G. The utility and impact of information communication technology (ICT) for pre-registration nurse education: a narrative synthesis systematic review. Nurse Educ Today 2017 Jan;48:160-171. [doi: 10.1016/j.nedt.2016.10.007] [Medline: 27816862]
9. Raby C. Analyse du cheminement qui a mené des enseignants du primaire à développer une utilisation exemplaire des technologies de l'information et de la communication en classe. Thesis. Université du Québec à Montréal. 2004. URL: https://tel.archives-ouvertes.fr/edutice-00000750/document [accessed 2021-05-13]
10. van der Keylen P, Lippert N, Kunisch R, Kühlein T, Roos M. Asynchronous, digital teaching in times of COVID-19: a teaching example from general practice. GMS J Med Educ 2020;37(7):Doc98 [FREE Full text] [doi: 10.3205/zma001391] [Medline: 33364377]
11. Soy-Muner D. Continuous learning through platforms. Farm Hosp 2020 Jun 13;44(7):71-73 [FREE Full text] [doi: 10.7399/fh.11488] [Medline: 32533676]
12. Daniel J. COVID-19 -- A Two-Week Transition from Campus to Online at the Acsenda School of Management, Canada. JL4D 2020;7(3):85.
13. Moszkowicz D, Duboc H, Dubertret C, Roux D, Bretagnol F. Daily medical education for confined students during coronavirus disease 2019 pandemic: a simple videoconference solution. Clin Anat 2020 Sep 22;33(6):927-928 [FREE Full text] [doi: 10.1002/ca.23601] [Medline: 32253771]
14. Yılmaz İnce E, Kabul A, Diler I. Distance education in higher education in the COVID-19 pandemic process: a case of Isparta Applied Sciences University. IJTES 2020 Sep 02;4(4):343-351. [doi: 10.46328/ijtes.v4i4.112]
15. Al-Balas M, Al-Balas H, Jaber H, Obeidat K, Al-Balas H, Aborajooh E, et al. Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives. BMC Med Educ 2020 Oct 02;20(1):341 [FREE Full text] [doi: 10.1186/s12909-020-02257-4] [Medline: 33008392]
16. Sharma C. Effective online teaching in higher educational institutions: a case study of Rama University. 2020 May Presented at: Impact of COVID-19 on Higher Educational Institutions (Webinar); May 2020; Kanpur, India URL: https://www.researchgate.net/publication/341370220

17. George ML. Effective teaching and examination strategies for undergraduate learning during COVID-19 school restrictions. J Educ Technol Syst 2020 Jun 17;49(1):23-48. [doi: 10.1177/0047239520934017]
18. Kim J, Myung S, Yoon H, Moon S, Ryu H, Yim JJ. How medical education survives and evolves during COVID-19: our experience and future direction. PLoS One 2020;15(12):e0243958 [FREE Full text] [doi: 10.1371/journal.pone.0243958] [Medline: 33338045]
19. Sabharwal S, Ficke J, LaPorte D. How we do it: modified residency programming and adoption of remote didactic curriculum during the COVID-19 pandemic. J Surg Educ 2020;77(5):1033-1036 [FREE Full text] [doi: 10.1016/j.jsurg.2020.05.026] [Medline: 32546387]
20. Sutiah S, Slamet S, Shafqat A, Supriyono S. Implementation of distance learning during the covid-19 pandemic in faculty of education and teacher training. CJES 2020 Oct 29;15(5):1204-1214. [doi: 10.18844/cjes.v15i5.5151]
21. Scull J, Phillips M, Sharma U, Garnier K. Innovations in teacher education at the time of COVID19: an Australian perspective. J Educ Teach 2020 Jul 31;46(4):497-506. [doi: 10.1080/02607476.2020.1802701]
22. Barik S, Paul S, Kandwal P. Insight into the changing patterns in clinical and academic activities of the orthopedic residents during COVID-19 pandemic: a cross-sectional survey. Knee Surg Sports Traumatol Arthrosc 2020 Oct;28(10):3087-3093 [FREE Full text] [doi: 10.1007/s00167-020-06274-0] [Medline: 32926255]
23. Khalaf K, El-Kishawi M, Moufti MA, Al Kawas S. Introducing a comprehensive high-stake online exam to final-year dental students during the COVID-19 pandemic and evaluation of its effectiveness. Med Educ Online 2020 Oct 01;25(1):1826861. [doi: 10.1080/10872981.2020.1826861]
24. Mansoor J. Remote education during a nationwide pandemic: teaching and learning (dental teachers and students) during COVID-19. JEL 2020 Jul 13;9(4):140 [FREE Full text] [doi: 10.5539/jel.v9n4p140]
25. Ibrahim G, Luzinge H, Kapanda G. Teaching and learning experiences in medical education during the COVID-19 pandemic: the case of Kilimanjaro Christian Medical University College (KCMUCo), Tanzania. JL4D 2020;7(3):46.
26. Lowenthal P, Borup J, West R, Archambault L. Thinking beyond Zoom: using asynchronous video to maintain connection and engagement during the COVID-19 pandemic. JTATE 2020:383 [FREE Full text]
27. Chick R, Clifton G, Peace K, Propper B, Hale D, Alseidi A, et al. Using technology to maintain the education of residents during the COVID-19 pandemic. J Surg Educ 2020;77(4):729-732 [FREE Full text] [doi: 10.1016/j.jsurg.2020.03.018] [Medline: 32253133]
28. Crawford J, Butler-Henderson K, Rudolph J, Malkawi B, Glowatz M, Burton R. COVID-19: 20 countries' higher education intra-period digital pedagogy responses. JALT 2020 Apr 01;3(1):20. [doi: 10.37074/jalt.2020.3.1.7]
29. Plan d'action 2019. Ouagadougou: Ecole nationale de santé publique; 2018.
30. Patrinos HA, Shmis T. Can technology help mitigate the impact of COVID-19 on education systems in Europe and Central Asia? World Bank Blogs. 2020 Mar 23. URL: https://blogs.worldbank.org/europeandcentralasia/can-technology-help-mitigate-impact-covid-19-education-systems-europe-and [accessed 2021-05-13]
31. Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ 2015 Jan 02;350:g7647 [FREE Full text] [doi: 10.1136/bmj.g7647] [Medline: 25555855]
32. Regmi K, Jones L. A systematic review of the factors - enablers and barriers - affecting e-learning in health sciences education. BMC Med Educ 2020 Mar 30;20(1):91 [FREE Full text] [doi: 10.1186/s12909-020-02007-6] [Medline: 32228560]
33. Atmacasoy A, Aksu M. Blended learning at pre-service teacher education in Turkey: a systematic review. Educ Inf Technol 2018 May 3;23(6):2399-2422 [FREE Full text] [doi: 10.1007/s10639-018-9723-5]
34. Guèye Ba M. Intégration pédagogique des technologies de l'information et de la communication (TIC) en pédagogie médicale à l'Université Cheikh Anta Diop de Dakar au Sénégal. Université de Montréal. URL: https://papyrus.bib.umontreal.ca/xmlui/bitstream/handle/1866/20066/GUEYE_BA_Mariame_2017_These.pdf [accessed 2021-05-13]
35. Ben YA, Rallet A. Usage des T.I.C. dans l'enseignement supérieur. Réseaux 2009;155(3):9.
36. Maninger RM, Holden ME. Put the textbooks away: preparation and support for a middle school one-to-one laptop initiative. Am Second Educ 2009;38(1):5-33 [FREE Full text]
37. Karsenti T. Intégration pédagogique des TIC en Afrique : stratégies d'action et pistes de réflexion. Centre de recherches pour le développement international. 2009. URL: https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/39163/128404.pdf [accessed 2021-05-13]
38. Lat M, Sidir M. L'intégration des TIC dans l'enseignement supérieur au Sénégal : émergence de l'hypermédiatisation. London, UK: ISTE Group; Oct 16, 2015.
39. Plan d'action 2018. Ouagadougou: Direction régionale de l'École nationale de santé publique de Ouagadougou; 2017.

Abbreviations

BMD: Bachelor-Master-Doctorate
DHEHS: Directorate of Higher Education in Health Science
ECOWAS: Economic Community of West African States
ICT: information and communication technology

IT: information technology
NPHS: National Public Health School
PRISMA-P: Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols
SDP: strategic development plan

Edited by G Eysenbach; submitted 13.01.21; peer-reviewed by G Shimshon, C Mather, E Toki; comments to author 02.02.21; revised version received 21.02.21; accepted 11.04.21; published 18.05.21.

Please cite as:
Pilabré AH, Ngangue P, Barro A, Pafadnam Y
An Imperative for the National Public Health School in Burkina Faso to Promote the Use of Information and Communication Technologies in Education During the COVID-19 Pandemic: Critical Analysis
JMIR Med Educ 2021;7(2):e27169
URL: https://mededu.jmir.org/2021/2/e27169
doi:10.2196/27169
PMID:33970868

Original Paper

Shared Tobacco Cessation Curriculum Website for Health Professionals: Longitudinal Analysis of User and Utilization Data Over a Period of 15 Years

Nervana Elkhadragy[1], PhD, PharmD; Jeremie Aviado[2], PharmD; Henry Huang[2], PharmD; Robin L Corelli[2], PharmD; Karen Suchanek Hudmon[2,3], DrPH

[1]School of Pharmacy, University of Wyoming, Laramie, WY, United States

[2]Department of Clinical Pharmacy, School of Pharmacy, University of California San Francisco, San Francisco, CA, United States

[3]Department of Pharmacy Practice, College of Pharmacy, Purdue University, West Lafayette, IN, United States

Corresponding Author:
Karen Suchanek Hudmon, DrPH
Department of Pharmacy Practice
College of Pharmacy
Purdue University
575 Stadium Mall Drive
West Lafayette, IN
United States
Phone: 1 317 880 5427
Email: khudmon@purdue.edu

Abstract

Background: Because tobacco use is a major cause of morbidity and mortality worldwide, it is essential to prepare health care providers to assist patients with quitting smoking. Created in 1999, the "Rx for Change" tobacco cessation curriculum was designed to fill an educational gap in cessation training of health professional students. In 2004, a website was launched to host teaching materials and tools to support the efforts of educators and clinicians.

Objective: The objective of this study was to characterize users and utilization of a website hosting shared teaching materials over a period of 15 years.

Methods: Data from the Rx for Change website have been collected prospectively since its inception. In this study, end-user data were analyzed to determine user characteristics, how they heard about the website, intended use of the materials, and numbers of logins and file downloads over time.

Results: Total number of website registrants was 15,576, representing all 50 states in the United States and 94 countries. The most represented discipline was pharmacy (6393/15,505, 41.2%), and nearly half of users were students or residents. The most common source of referral to the website was a faculty member or colleague (33.4%, 2591/7758), and the purpose of enhancing personal knowledge and skills was the most commonly cited intended use of the curricular materials. A total of 259,835 file downloads occurred during the 15-year period, and the most commonly downloaded file type was ancillary handouts.

Conclusions: The Rx for Change website demonstrated sustained use, providing immediate access to tobacco cessation teaching and practice tools for educators and clinicians over the first 15 years of its existence. The website has a broad interprofessional reach, and the consistent utilization over time and large number of downloads provide evidence for the feasibility and utility of a public-access website hosting teaching materials. The shared curriculum approach averts the need for educators to create their own materials for teaching tobacco cessation to students in the health professions.

(JMIR Med Educ 2021;7(2):e20704) doi:10.2196/20704

KEYWORDS

health professional education; interprofessional education; shared curricula; website; end-user data; tobacco cessation

Introduction

Tobacco use is a major cause of morbidity and mortality worldwide, with more than 8 million deaths each year due to tobacco use or exposure to second-hand smoke [1]. In the United States, more than 480,000 deaths a year are attributable to cigarette smoking; of these, 33% are due to cardiovascular diseases, 27% lung cancer, 23% pulmonary diseases, 9% second-hand smoke, and 7% cancers other than lung [2]. Through multifaceted tobacco control efforts, significant progress has been made over the past several decades to reduce the overall prevalence of cigarette smoking among adults from 40% in 1964 to 14.0% in 2019 [3]. In recent years, however, the emergence of alternative nicotine delivery systems (ANDS; eg, e-cigarettes and other vaping methods) [4] has been reversing the downward trend of tobacco use, with 4.5% of adults reporting current use of e-cigarettes [3] and 20.8% currently using one or more forms of tobacco or ANDS. As such, tobacco use remains a public epidemic, predisposing individuals to an increased risk for developing diseases of virtually every organ system in the body and contributing to rising health care costs [2]. For each pack of cigarettes sold in the United States, the societal costs due to smoking-related health care costs and lost productivity are estimated at US $19.16 per pack, which is around 3 times the cost of the cigarettes [5].

It is well established that clinicians have a proven positive impact on their patients' ability to quit [6]. To achieve reductions in the public health burden of tobacco, the 2020 Surgeon General's report on smoking cessation highlights the importance of clinical interventions by health care providers of all disciplines [7]. Three factors should be considered when attempting to improve quit rates: (1) the efficacy of interventions on patients' ability to quit, (2) fidelity to implementing tobacco cessation interventions in clinical settings, and (3) clinicians' knowledge and skills for treating tobacco use and dependence. In regards to efficacy, research shows that clinician interventions that are based on the 5 A's (Ask, Advise, Assess, Assist, and Arrange) are effective and increase quit rates among patients and thus is considered a gold standard for comprehensive counseling [6]. Fidelity considers the extent to which the 5 A's are integrated into practice, in the face of challenges such as lack of time, competing demands, and lack of providers' self-efficacy for tobacco cessation counseling [8]. To mitigate these challenges, investigators have explored creative approaches to enhance the delivery of care (eg, Satterfield and colleagues [9] found that a computer-facilitated 5 A's approach performs better than usual care). The third aspect that can influence quit rates is clinicians' knowledge and skills for providing tobacco cessation interventions. To address this, the "Rx for Change Clinician-Assisted Tobacco Cessation" curriculum was designed, and its corresponding website [10] was launched to host the tobacco cessation teaching and counseling materials. The Rx for Change curriculum, and the website described here, aim to enhance the quality and quantity of tobacco counseling that occurs in clinical practice.

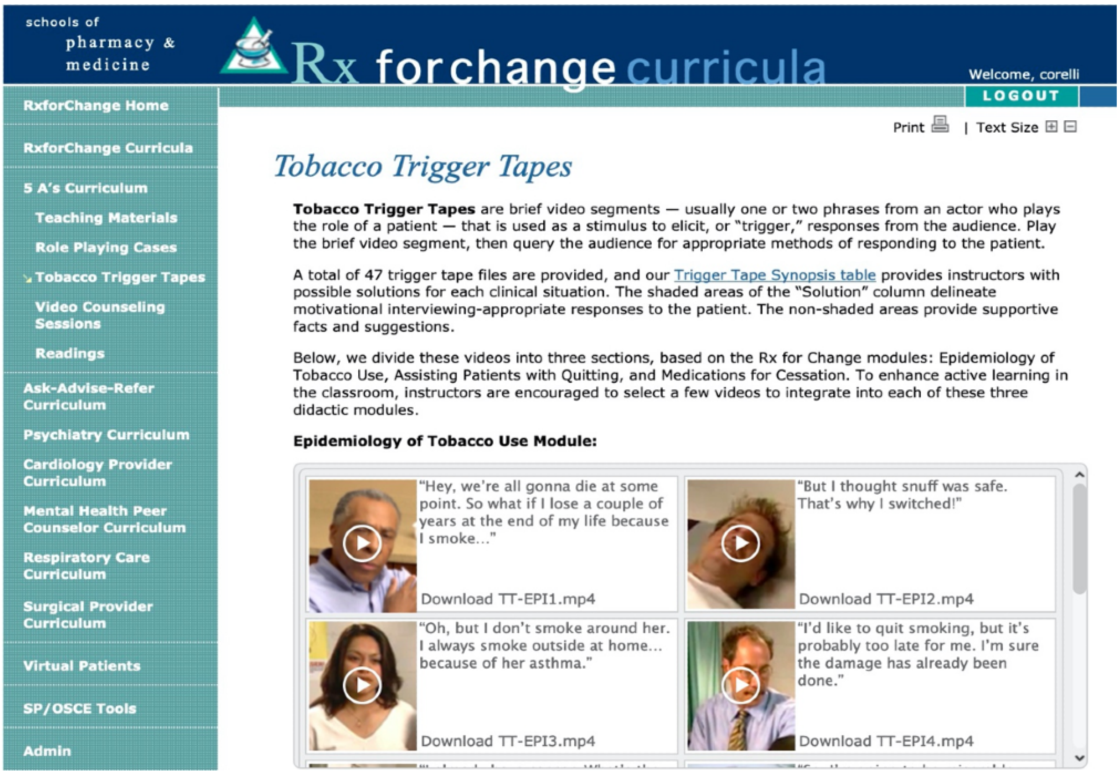
Historically, the extent of tobacco cessation content has been inadequate in all health professional school curricula, including medical [11-15], nursing [16-19], pharmacy [20,21], dental hygiene [22], physical therapy [23], physician assistant [24], and respiratory therapy [25,26]. The evidence-based Rx for Change curriculum was a practical solution to address this decades-long gap [27]. The term "Rx" means prescription, and a "curriculum" is defined as "the totality of student experiences that occur in the educational process" [28]. As such, Rx for Change is a curriculum about tobacco cessation that was designed to teach health professional students and licensed clinicians. Rogers' Diffusion of Innovations Theory [29] served as a guiding framework for program design, aiming to enhance the adoptability of the curricular innovation and structure future dissemination strategies. A key strategy for dissemination of Rx for Change occurred via targeted in-person and virtual train-the-trainer workshops for faculty at health professional schools (pharmacy, nursing, medicine, and respiratory care).

To facilitate integration of the Rx for Change curriculum at health professional schools, a public-access website was created to host all of the Rx for Change curricular materials (Figure 1). Several versions of the curriculum exist, each addressing a different clinical specialty for which patients can benefit from tobacco cessation interventions. Learning objectives are provided for each of the program's modules. PowerPoint slides, with detailed instructor notes, and learner handouts are downloadable and can be used by educators to teach in a lecture-based format. Additional teaching materials include dozens of videos (Figure 2), case materials for role playing, ancillary handouts for clinicians and patients, and a suite of tobacco-specific virtual patients. To facilitate assessment of counseling competencies, 6 standardized patient cases were created with associated scoring rubrics for conducting objective structured clinical examinations (OSCEs). Tools are also available to assist faculty with implementation of all aspects of the curriculum. The U.S. Surgeon General provides a 3-minute introductory video, highlighting the importance of integrating tobacco cessation into clinical practice (Figure 1).

Educational experts have placed much value on developing effective training programs and have also emphasized the need for program evaluation [30]. Unfortunately, when websites are created to host educational materials, these resources are often short-lived before becoming outdated and dormant after institutional support or grant funds expire. Launched in 2004, the Rx for Change website teaching content is updated at least annually and also when needed to address changes in clinical practice (eg, postlaunch of a new medication, inclusion or removal of a boxed warning). However, its usage has yet to be characterized. Such knowledge would be helpful to understand the impact of providing shared curricular materials through a public access website and to inform future curriculum developers about potential usage and benefits of hosting shared materials online. Therefore, the purpose of this study was to conduct a longitudinal analysis of user characteristics and utilization of the Rx for Change website over a period of 15 years.

Figure 1. Rx for Change website homepage [10].

Figure 2. Rx for Change website: sample page hosting tobacco “trigger tape” videos.



Methods

User and utilization data have been collected prospectively via the Rx for Change website since its launch in 2004. For the purpose of this study, data were extracted for a period of 15 years, ranging from the public launch date on April 1, 2004 to March 31, 2019. Individuals who registered on the website provided contact information, including their state and country, their primary discipline (medicine, nursing, pharmacy, respiratory care, dentistry, health educator/peer counselor, social work, other), and whether they were a student or resident. Additional information included how they heard about the Rx for Change program (conference/meeting/workshop; faculty member/colleague; internet LISTSERV; newsletter or publication; surfing the internet; University of California San Francisco Smoking Cessation Leadership Center; other) and their intended use of the materials (enhance own knowledge/skills; teach health professional students; teach licensed health professionals; not sure). In addition to user characteristics, prospectively collected data included various utilization measures: files downloaded (frequency and type), number of file downloads per user, number of logins, and trends in utilization over time. All video files on the website are permitted to be streamed directly on the website, and these occurrences were not linkable to individual users and therefore were not captured along with the number of file downloads.

With respect to data interpretation, it is important to note that not all programmatic materials were available at the launch of the website in 2004 — a version addressing brief counseling (Ask-Advise-Refer) was launched in November 2007, and new discipline-specific versions (eg, psychiatry, respiratory care, peer counselor, cardiology, and surgical care) became available over time. Along with the annual updates, new videos and role-playing case materials were added periodically, and all were modified as needed to be consistent with evolving clinical practice guidelines. In 2019, a suite of 6 standardized patient cases with scoring rubrics for OSCEs were added along with a link to a suite of tobacco-specific virtual patients [31]. No proactive efforts were made (eg, no email notifications) to alert users of the availability of new or updated content, and at no time during the 15-year period was the website inaccessible for more than a few hours at a time during updates or server maintenance.

Data cleaning occurred at the individual user level, which included combining duplicate registrants (eg, identical users who established separate accounts with different email addresses), reclassifying disciplines where appropriate, and recategorizing data response options labeled as “other” (eg, user checked “other” for the discipline field but provided information consistent with existing response options). Combining duplicate registrants was done by manually reviewing registrations that appeared to belong to the same person, and after extensive investigation through internet search engines and LinkedIn profiles, discussion, and consensus, the team determined when it was appropriate to attribute multiple registrants to the same user. Data were analyzed using SPSS, version 26 [32]. The study was approved by the University of California, San Francisco and Purdue University Institutional Review Boards for the protection of human subjects.

Results

User Characteristics

A total of 15,576 unique users registered on the Rx for Change website during the study period. Registrants represented all 50 states in the United States and 94 different countries. Among users with a designated health discipline (15,505/15,576, 99.5%), the top represented disciplines were pharmacy (6393/15,505, 41.2%), followed by nursing (3377/15,505, 21.8%) and health educators/peer counselors (1653/15,505, 10.7%; Table 1). Students and residents represented 49.7% (7747/15,576) of all registrants.

Table 1. Represented disciplines among 15,505[a] end users reporting discipline and student or resident status.

Disciplines	Nonstudent or nonresident (n=7758), n (%)	Student or resident (n=7747), n (%)	Total (n=15,505), n (%)
Pharmacy	1790 (23.1)	4603 (59.4)	6393 (41.2)
Nursing	1305 (16.8)	2072 (26.7)	3377 (21.8)
Health educator or peer counselor	1461 (18.8)	192 (2.5)	1653 (10.7)
Medicine[b]	677 (8.7)	239 (3.1)	916 (5.9)
Respiratory care	440 (5.7)	127 (1.6)	567 (3.7)
Dentistry	174 (2.2)	87 (1.1)	261 (1.7)
Social work	112 (1.4)	21 (0.3)	133 (0.9)
Other	1799 (23.2)	406 (5.3)	2205 (14.2)

[a]71 (0.5%) end users did not provide data describing their student/resident status and discipline.

[b]Includes physicians and physician assistants.

Of nonstudents/nonresidents, approximately one third (2591/7758, 33.4%) reported hearing about the website from a faculty member or colleague; the remainder heard about the website at a conference, meeting, or workshop (1305/7758, 16.8%); while surfing the internet (1295/7758, 16.7%); on an internet LISTSERV (734/7758, 9.5%), distributed by the University of California Smoking Cessation Leadership Center (531/7758, 6.8%), or in a newsletter publication or article (468/7758, 6.0%). The most commonly selected intended use of the Rx for Change materials was to enhance personal knowledge and skills (5792/7308, 79.3%); 39.2% (2867/7308) intended to teach licensed health professionals, and 33.2% (2425/7308) indicated that they intended to teach health professional students (categories not mutually exclusive).

Website Utilization Characteristics

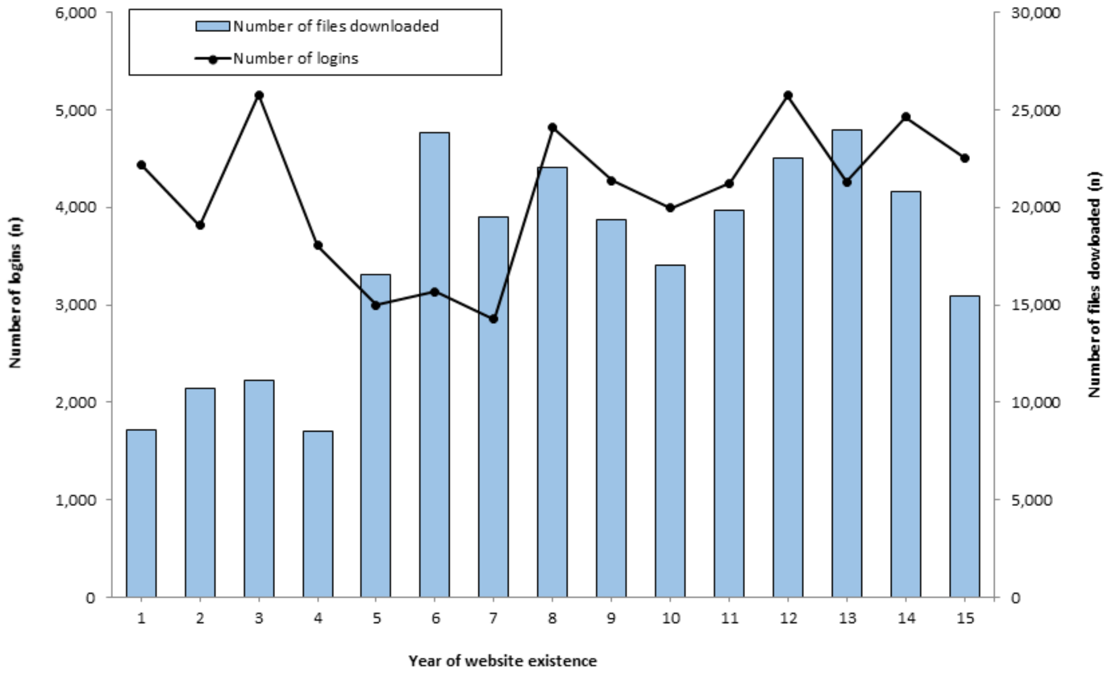
During the evaluation period, 259,835 files were downloaded by 12,387 users, representing 79.5% (12,387/15,576) of all website registrants. While the remainder of the registrants (3189/15,576; 20.5%) might have streamed videos on the website, they did not download any files. The file type most commonly downloaded was ancillary handouts (n=61,348), followed by counseling videos (n=58,109) and instructors' PowerPoint slides (n=49,501; Table 2). Across the 15-year time period, users logged into the website a total of 62,172 times. Login frequency and download frequency trends over time are shown in Figure 3.

Table 2. File downloads (n=259,835) by teaching tool.

Teaching tool	Description of tool	Number of downloads, n (%)
Ancillary handouts	Tools that clinicians can use when helping patients (eg, tobacco cessation counseling guide, withdrawal symptoms information sheet, drug interactions with tobacco smoke table, tobacco use log, coping strategies for patients, pharmacologic product guide)	61,348 (23.6)
Counseling videos	Video segments demonstrating counseling of a wide range of patients (not ready to quit, ready to quit, recent quitter, former tobacco user) in many patient care settings	58,109 (22.4)
PowerPoint teaching slides	PowerPoint slides with detailed instructor notes and relevant literature citations	49,501 (19.1)
Learner slide handouts	PDF versions of the PowerPoint slides	32,024 (12.3)
Role playing cases	Handouts for role playing with a wide range of patient case scenarios (not ready to quit, ready to quit, recent quitter, former tobacco user)	22,809 (8.8)
Trigger tape videos	Brief video segments (1-2 phrases from an actor who plays the role of a patient) that are used as a stimulus to elicit, or "trigger," discussion with learners	17,959 (6.9)
Instructor tools	Guides and other resources to facilitate implementation of the Rx for Change curriculum	8749 (3.4)
Introductory videos	A 3-minute video created by the U.S. Surgeon General highlighting the need for health care providers to address tobacco use and an 8-minute introductory video of interviews with smokers	3582 (1.4)
Reading materials	Recommended background readings (eg, PDF versions of textbook chapters and continuing education programs on tobacco cessation)	3451 (1.3)
Administrative tools	End-user license agreement, sample medication order forms, tracking forms, etc.	2213 (0.9)
OSCE[a] case materials	Standardized patient cases, with corresponding scoring rubrics for formative and evaluative exercises	90 (<0.01)

[a]OSCE: objective structured clinical examination; these competency assessment tools became available on the website in 2018.

Figure 3. Number of files downloaded and number of logins, per year (April 1, 2004 to March 31, 2019).



Discussion

Principal Findings

This study contributes important knowledge to the literature regarding the extent to which health professional educators, clinicians, and students utilize a website that was designed to house and disseminate educational materials for tobacco cessation. The study complements our concurrent research evaluating the Rx for Change program, thus providing a more complete picture of the program's reach and long-term impact [33]. Although an abundance of existing literature describes web-based interventions for tobacco cessation [34], to our knowledge, there are no studies that characterize internet-based access to tools designed to facilitate faculty and students in their teaching and learning roles and clinicians in their patient care roles. Current literature addressing professional educational websites other than tobacco cessation is also scarce. We identified 3 websites that house teaching materials (pharmacogenomics, infectious diseases, and diabetes mellitus) [35-37], but utilization of these sites have not been described in the literature. In addition to widespread use of the website over a period of 15 years, the Rx for Change materials have been used in a variety of tobacco cessation studies across several health disciplines [38-51]. Recently, the long-term impact of the train-the-trainer programs on faculty development and Rx for Change implementation in pharmacy schools was evaluated through application of the RE-AIM framework [52,53].

Rogers' Diffusion of Innovation Theory [29], which was used to develop and disseminate the Rx for Change curriculum, was also used to guide elements of data interpretation. This theory states that new programs are more likely to exhibit enhanced adoption if they possess 5 main characteristics: (1) relative advantage over existing programs; (2) compatibility with existing values, experiences, and needs of potential adopters; (3) how complex the program is to understand and use; (4) trialability, or the extent to which a potential user can test or experiment with a program before committing to adoption; and (5) observability (ie, the extent to which the program provides tangible outcomes). Most users learned about the Rx for Change website from another colleague, which suggests that colleagues perceived the website and its materials to possess a relative advantage over other available sources. This perception is consistent with findings from a prior study, in which the majority of faculty respondents (89.9%) rated the website as either very or extremely useful [53]. Compatibility was shown by the fact that website registrants' most commonly cited intention for use of the curricular materials was to enhance their own knowledge and skills. Trialability and perceived acceptability of the complexity of the Rx for Change program were evident by the large number of registrations and continued use over time. An observable result was the large number of logins and file downloads from the website.

Previous findings suggest that the availability of a website to host shared teaching materials is a useful resource for health professional educators, and users report appreciation for access to regularly updated teaching content [33]. In our study, the most frequent referral source was a faculty member or a colleague (33.4%). These findings are consistent with those identified in the evaluation of a web-based mental health portal, for which the highest utilization was among individuals personally invited to visit the website [54]. Thus, an effective mode of dissemination is learning about the program or its website from a professional or social network. Although no proactive efforts were made to alert users about updates or new content, this is a strategy that could be considered in the future as well as a brief survey of user needs to provide guidance for future program enhancements. Another area of future research is assessing important aspects of the website such as the website's readability, quality of information, credibility, and design.

Limitations

Limitations of this study include a possibility of duplicate users who utilized different email addresses when registering on the website. This was addressed through a manual review, as described in the Methods. Additionally, the number of file downloads found in this study is an underestimate, because videos can be streamed and viewed directly on the website, without downloading. Also, the number of file downloads likely underestimates actual utilization in the classroom or in clinical practice. For example, an instructor or clinician might download the content once and use it on a regular basis until the next update of the program materials, and these implementation activities are not captured by the Rx for Change website. This study does not provide evidence that a shared curriculum website would contribute to changes in the prevalence of tobacco use, although it is well-documented that clinicians have a proven, positive impact on their patients' ability to quit and therefore training is warranted [6]. Finally, because the ability to evaluate the long-term utilization of the shared curricular resources is fully dependent on the ability to maintain the quality and accessibility of the materials, the sustainability of any program is significantly challenged without ongoing funding and personal commitment of the program creators.

Conclusions

The Rx for Change website utilization data demonstrated sustained use, providing immediate access to shared, evidence-based tobacco cessation teaching and practice tools for educators and clinicians since 2004. The website had a broad interprofessional reach, which increases the likelihood of tobacco users receiving assistance from multiple types of health care providers. The consistent utilization over time and large number of downloads provided evidence for the feasibility and utility of a public access website hosting a shared tobacco cessation curriculum for health professionals. The shared curriculum concept, in tandem with a frequently updated website to host curricular materials, can be replicated for other topics of public health importance.

Acknowledgments

Scott Northwood created and has maintained the website since 2004. Drs Noll Campbell and Alan Zillich provided critical feedback on the manuscript. Jodi Prochaska, Frank Vitale, and members of the University of California San Francisco Smoking Cessation Leadership Center have created content for the Rx for Change website and have promoted the program's use for training health professionals for nearly 2 decades.

The Rx for Change program has been funded by the National Cancer Center, grants R25 CA 90720, R25 CA 174665, and R25 CA 236637 to KSH.

Conflicts of Interest

RLC and KSH created and maintain the Rx for Change program and the curriculum website.

References

1. Tobacco Fact Sheets. World Health Organization. 2019. URL: https://www.who.int/news-room/fact-sheets/detail/tobacco [accessed 2021-04-27]
2. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention; 2014.
3. Cornelius ME, Wang TW, Jamal A, Loretan CG, Neff LJ. Tobacco Product Use Among Adults - United States, 2019. MMWR Morb Mortal Wkly Rep 2020 Nov 20;69(46):1736-1742 [FREE Full text] [doi: 10.15585/mmwr.mm6946a4] [Medline: 33211681]
4. Hatsukami DK, Carroll DM. Tobacco harm reduction: Past history, current controversies and a proposed approach for the future. Prev Med 2020 Nov;140:106099. [doi: 10.1016/j.ypmed.2020.106099] [Medline: 32335031]
5. Campaign for Tobacco-Free Kids. URL: http://tobaccofreekids.org/research/factsheets/pdf/0097.pdf [accessed 2021-04-27]
6. Fiore M, Jaén C, Baker T. Treating Tobacco Use and Dependence: 2008 Update: Clinical Practice Guideline. Agency for Healthcare Research and Quality. 2008. URL: https://www.ahrq.gov/prevention/guidelines/tobacco/clinicians/update/index.html [accessed 2021-04-27]
7. Smoking Cessation: A Report of the Surgeon General. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. URL: https://www.hhs.gov/sites/default/files/2020-cessation-sgr-full-report.pdf [accessed 2021-04-27]
8. Marcy TW, Skelly J, Shiffman RN, Flynn BS. Facilitating adherence to the tobacco use treatment guideline with computer-mediated decision support systems: physician and clinic office manager perspectives. Prev Med 2005 Aug;41(2):479-487. [doi: 10.1016/j.ypmed.2004.11.026] [Medline: 15917044]

9. Satterfield JM, Gregorich SE, Kalkhoran S, Lum PJ, Bloome J, Alvarado N, et al. Computer-Facilitated 5 A's for Smoking Cessation: A Randomized Trial of Technology to Promote Provider Adherence. Am J Prev Med 2018 Jul;55(1):35-43 [FREE Full text] [doi: 10.1016/j.amepre.2018.04.009] [Medline: 29929682]
10. Rx for Change: Clinician-Assisted Tobacco Cessation program, 1999-2021. URL: https://rxforchange.ucsf.edu [accessed 2021-04-27]
11. Ferry LH, Grissino LM, Runfola PS. Tobacco dependence curricula in US undergraduate medical education. JAMA 1999 Sep 01;282(9):825-829. [doi: 10.1001/jama.282.9.825] [Medline: 10478687]
12. Spangler JG, George G, Foley KL, Crandall SJ. Tobacco intervention training: current efforts and gaps in US medical schools. JAMA 2002 Sep 04;288(9):1102-1109. [doi: 10.1001/jama.288.9.1102] [Medline: 12204079]
13. Montalto NJ, Ferry LH, Stanhiser T. Tobacco dependence curricula in undergraduate osteopathic medical education. J Am Osteopath Assoc 2004 Aug;104(8):317-323. [Medline: 15345701]
14. Loranger M, Simms K, Pipe A. Smoking cessation counselling training in the pre-clerkship curriculum of Canadian medical schools: A national survey. Can Med Educ J 2018 May;9(2):e5-e10 [FREE Full text] [Medline: 30018679]
15. Richmond R, Zwar N, Taylor R, Hunnisett J, Hyslop F. Teaching about tobacco in medical schools: a worldwide study. Drug Alcohol Rev 2009 Sep;28(5):484-497. [doi: 10.1111/j.1465-3362.2009.00105.x] [Medline: 19737207]
16. Heath J, Andrews J, Thomas SA, Kelley FJ, Friedman E. Tobacco dependence curricula in acute care nurse practitioner education. Am J Crit Care 2002 Jan;11(1):27-33. [Medline: 11785554]
17. Wewers ME, Kidd K, Armbruster D, Sarna L. Tobacco dependence curricula in U.S. baccalaureate and graduate nursing education. Nurs Outlook 2004;52(2):95-101. [doi: 10.1016/j.outlook.2003.09.007] [Medline: 15073590]
18. Sarna L, Danao LL, Chan SSC, Shin SR, Baldago LA, Endo E, et al. Tobacco control curricula content in baccalaureate nursing programs in four Asian nations. Nurs Outlook 2006;54(6):334-344. [doi: 10.1016/j.outlook.2006.09.005] [Medline: 17142152]
19. Chan SS, Sarna L, Danao LL. Are nurses prepared to curb the tobacco epidemic in China? A questionnaire survey of schools of nursing. Int J Nurs Stud 2008 May;45(5):706-713. [doi: 10.1016/j.ijnurstu.2006.12.008] [Medline: 17336307]
20. Hudmon KS, Bardel K, Kroon LA, Fenlon CM, Corelli RL. Tobacco education in U.S. schools of pharmacy. Nicotine Tob Res 2005 Apr;7(2):225-232. [doi: 10.1080/14622200500055392] [Medline: 16036279]
21. El Hajj MS, Awaisu A, Saleh RA, Al Hamad NM, Kheir N, Zeenny RM, et al. Tobacco-related education in schools of pharmacy in the Middle East: a multinational cross-sectional study. Nicotine Tob Res 2018 Apr 02;20(5):561-567. [doi: 10.1093/ntr/ntx031] [Medline: 28164230]
22. Davis JM, Koerber A. Assessment of tobacco dependence curricula in U.S. dental hygiene programs. J Dent Educ 2010 Oct;74(10):1066-1073. [Medline: 20930237]
23. Pignataro RM, Gurka MJ, Jones DL, Kershner RE, Ohtake PJ, Stauber WT, et al. Tobacco cessation counseling training in US entry-level physical therapist education curricula: prevalence, content, and associated factors. Phys Ther 2014 Sep;94(9):1294-1305 [FREE Full text] [doi: 10.2522/ptj.20130245] [Medline: 24830717]
24. Houston LN, Warner M, Corelli RL, Fenlon CM, Hudmon KS. Tobacco education in US physician assistant programs. J Cancer Educ 2009;24(2):107-113. [doi: 10.1080/08858190902854475] [Medline: 19431026]
25. Jordan TR, Khubchandani J, Wiblishauser M, Glassman T, Thompson A. Do respiratory therapists receive training and education in smoking cessation? A national study of post-secondary training programs. Patient Educ Couns 2011 Oct;85(1):99-105. [doi: 10.1016/j.pec.2010.10.022] [Medline: 21106321]
26. Hudmon KS, Mark M, Livin AL, Corelli RL, Schroeder SA. Tobacco education in U.S. respiratory care programs. Nicotine Tob Res 2014 Oct;16(10):1394-1398 [FREE Full text] [doi: 10.1093/ntr/ntu113] [Medline: 25031314]
27. Hudmon KS, Corelli RL, Chung E, Gundersen B, Kroon LA, Sakamoto LM, et al. Development and implementation of a tobacco cessation training program for students in the health professions. J Cancer Educ 2003;18(3):142-149. [doi: 10.1207/S15430154JCE1803_07] [Medline: 14512261]
28. Kelly A. The Curriculum: Theory and Practice, 6th edition. Thousand Oaks, CA: SAGE Publications, Inc; 2009.
29. Rogers E. Diffusion of Innovations, 5th edition. New York, NY: Free Press; 2003.
30. Steinert Y, Mann K, Anderson B, Barnett BM, Centeno A, Naismith L, et al. A systematic review of faculty development initiatives designed to enhance teaching effectiveness: A 10-year update: BEME Guide No. 40. Med Teach 2016 Aug;38(8):769-786. [doi: 10.1080/0142159X.2016.1181851] [Medline: 27420193]
31. VirtualRx: Rx for Change virtual patients, 2016-2021. URL: https://virtualrx.ucsf.edu [accessed 2021-04-27]
32. IBM SPSS Statistics for Windows, Version 26.0. IBM Corporation. Armonk, NY: IBM Corp; 2019. URL: https://www.ibm.com/analytics/spss-statistics-software [accessed 2021-04-27]
33. Elkhadragy N, Corelli RL, Russ AL, Snyder ME, Clabaugh M, Hudmon KS. Faculty perceptions of a tobacco cessation train-the-trainer workshop and experiences with implementation: A qualitative follow-up study. Res Social Adm Pharm 2019 Dec;15(12):1436-1445 [FREE Full text] [doi: 10.1016/j.sapharm.2019.01.005] [Medline: 30737194]
34. Taylor GMJ, Dalili MN, Semwal M, Civljak M, Sheikh A, Car J. Internet-based interventions for smoking cessation. Cochrane Database Syst Rev 2017 Sep 04;9:CD007078 [FREE Full text] [doi: 10.1002/14651858.CD007078.pub5] [Medline: 28869775]

35. Pharmacogenomics Education Program (PharmGenEdTM). University of California San Diego. URL: http://pharmacogenomics.ucsd.edu [accessed 2021-04-27]
36. Infectious Diseases Educator Network (ID-EN). University of California, San Francisco. URL: https://iden.ucsf.edu/ [accessed 2021-04-27]
37. Hall DL, Drab SR, Campbell RK, Meyer SM, Smith RB. A Web-based interprofessional diabetes education course. Am J Pharm Educ 2007 Oct 15;71(5):93 [FREE Full text] [doi: 10.5688/aj710593] [Medline: 17998990]
38. Kelley FJ, Heath J, Crowell N. Using the Rx for Change tobacco curriculum in advanced practice nursing education. Crit Care Nurs Clin North Am 2006 Mar;18(1):131-8, xiv. [doi: 10.1016/j.ccell.2005.11.003] [Medline: 16546016]
39. Khan N, Anderson JR, Du J, Tinker D, Bachyrycz AM, Namdar R. Smoking cessation and its predictors: results from a community-based pharmacy tobacco cessation program in New Mexico. Ann Pharmacother 2012 Sep;46(9):1198-1204. [doi: 10.1345/aph.1P146] [Medline: 22911338]
40. Chen TC, Hamlett-Berry KW, Watanabe JH, Bounthavong M, Zillich AJ, Christofferson DE, et al. Evaluation of multidisciplinary tobacco cessation training program in a large health care system. American Journal of Health Education 2015 May 08;46(3):165-173. [doi: 10.1080/19325037.2015.1023475]
41. Kristina SA, Thavorncharoensap M, Pongcharoensuk P, Prabandari YS. Impact of smoking cessation training for community pharmacists in Indonesia. Asian Pac J Cancer Prev 2015;16(8):3319-3323 [FREE Full text] [doi: 10.7314/apjcp.2015.16.8.3319] [Medline: 25921138]
42. Surachman F, Anggadiredja K, Rahmawati SF, Zazuli Z. Smoking cessation counseling program: a pilot study on college smokers. KLS 2019 Feb 28;4(10):411-419. [doi: 10.18502/kls.v4i10.3746]
43. Prochaska JJ, Benowitz NL, Glantz SA, Hudmon KS, Grossman W. Cardiology Rx for Change: improving clinical attention to tobacco use and secondhand smoke exposure in cardiology. Clin Cardiol 2011 Dec;34(12):738-743 [FREE Full text] [doi: 10.1002/clc.20982] [Medline: 21987417]
44. Waheedi M, Al-Tmimy AM, Enlund H. Preparedness for the smoking cessation role among health sciences students in Kuwait. Med Princ Pract 2011;20(3):237-243 [FREE Full text] [doi: 10.1159/000321273] [Medline: 21454993]
45. Williams DM. Preparing pharmacy students and pharmacists to provide tobacco cessation counselling. Drug Alcohol Rev 2009 Sep;28(5):533-540. [doi: 10.1111/j.1465-3362.2009.00109.x] [Medline: 19737211]
46. Schmelz AN, Nixon B, McDaniel A, Hudmon KS, Zillich AJ. Evaluation of an online tobacco cessation course for health professions students. Am J Pharm Educ 2010 Mar 10;74(2):36 [FREE Full text] [doi: 10.5688/aj740236] [Medline: 20414451]
47. Heath J, Kelley FJ, Andrews J, Crowell N, Corelli RL, Hudmon KS. Evaluation of a tobacco cessation curricular intervention among acute care nurse practitioner faculty members. Am J Crit Care 2007 May;16(3):284-289. [Medline: 17460322]
48. Butler KM, Rayens MK, Zhang M, Maggio LG, Riker C, Hahn EJ. Tobacco dependence treatment education for baccalaureate nursing students. J Nurs Educ 2009 May;48(5):249-254. [Medline: 19476029]
49. Hudmon KS, Vitale FM, Elkhadragy N, Corelli RL, Strickland SL, Varekojis SM, et al. Evaluation of an interprofessional tobacco cessation train-the-trainer program for respiratory therapy faculty. Respir Care 2021 Mar;66(3):475-481. [doi: 10.4187/respcare.07791] [Medline: 32900914]
50. Amole J, Heath J, Joshua TV, McLear B. Online tobacco cessation education to optimize standards of practice for psychiatric mental health nurses. Nurs Clin North Am 2012 Mar;47(1):71-79. [doi: 10.1016/j.cnur.2011.10.006] [Medline: 22289399]
51. Prochaska JJ, Fromont SC, Hudmon KS, Cataldo JK. Designing for dissemination: development of an evidence-based tobacco treatment curriculum for psychiatry training programs. J Am Psychiatr Nurses Assoc 2009 Feb;15(1):24-31 [FREE Full text] [doi: 10.1177/1078390308329536] [Medline: 19587844]
52. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. Am J Public Health 1999 Sep;89(9):1322-1327. [doi: 10.2105/ajph.89.9.1322] [Medline: 10474547]
53. Elkhadragy N, Corelli RL, Zillich AJ, Campbell NL, Hudmon KS. Long-term evaluation of a train-the-trainer workshop for pharmacy faculty using the RE-AIM framework. Res Social Adm Pharm 2020 Nov 30:1. [doi: 10.1016/j.sapharm.2020.11.018] [Medline: 33551208]
54. Song MJ, Ward J, Choi F, Nikoo M, Frank A, Shams F, et al. A Process Evaluation of a Web-Based Mental Health Portal (WalkAlong) Using Google Analytics. JMIR Ment Health 2018 Aug 20;5(3):e50 [FREE Full text] [doi: 10.2196/mental.8594] [Medline: 30126832]

Abbreviations

ANDS: alternative nicotine delivery systems
OSCE: objective structured clinical examination

Edited by G Eysenbach; submitted 27.05.20; peer-reviewed by S Bidmon, A Abubakar; comments to author 07.09.20; revised version received 31.12.20; accepted 13.04.21; published 25.05.21.

Please cite as:
Elkhadragy N, Aviado J, Huang H, Corelli RL, Hudmon KS
Shared Tobacco Cessation Curriculum Website for Health Professionals: Longitudinal Analysis of User and Utilization Data Over a Period of 15 Years
JMIR Med Educ 2021;7(2):e20704
URL: https://mededu.jmir.org/2021/2/e20704
doi:10.2196/20704
PMID:34032582

Original Paper

Using a Web-Based Platform as an Alternative for Conducting International, Multidisciplinary Medical Conferences During the Novel COVID-19 Pandemic: Analysis of a Conference

Po-Jen Ko[1,2*], MD; Sheng-Yueh Yu[1*], MD; John Chien-Hwa Chang[3,4*], MD; Ming-Ju Hsieh[2,5*], MD; Sung-Yu Chu[6*], MD; Jimmy Wei-Hwa Tan[7*], MD; Wan-Ling Cheng[8*], RPN; Pei Ho[9*], FHKAM

[1]Division of Thoracic & Cardiovascular Surgery, Chang Gung Memorial Hospital Linkou Main Branch and Chang Gung University, Taoyuan, Taiwan
[2]College of Medicine, School of Medicine, Chang Gung University, Linkou, Taiwan
[3]Division of Cardiovascular Surgery, Dalin Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Dalin, Taiwan
[4]College of Medicine, School of Medicine, Tzu Chi University, Hualien, Taiwan
[5]Department of Surgery, Chang Gung Memorial Hospital Linkou Main Branch and Chang Gung University, Taoyuan, Taiwan
[6]Department of Medical Imaging and Intervention, Chang Gung Memorial Hospital Linkou Main Branch and Chang Gung University, Taoyuan, Taiwan
[7]Department of Cardiovascular Surgery, Tainan Municipal An-Nan Hospital, China Medical University, Tainan, Taiwan
[8]Department of Nursing, Chang Gung Memorial Hospital Linkou Main Branch and Chang Gung University, Taoyuan, Taiwan
[9]Department of Cardiac, Thoracic and Vascular Surgery, National University Health System, Singapore, Singapore
*all authors contributed equally

Corresponding Author:
Pei Ho, FHKAM
Department of Cardiac, Thoracic and Vascular Surgery
National University Health System
Level 9, National University Health System Tower Block
1E Kent Ridge Road
Singapore, 119228
Singapore
Phone: 65 67722002
Fax: 65 67766475
Email: pei_ho@nuhs.edu.sg

Abstract

Background: The COVID-19 pandemic has stunted medical education activities, resulting in most conferences being cancelled or postponed. To continue professional education during this crisis, web-based conferences can be conducted via livestream and an audience interaction platform as an alternative.

Objective: The unprecedented COVID-19 pandemic has affected human connections worldwide. Conventional conferences have been replaced by web-based conferences. However, web-based conferencing has its challenges and limitations. This paper reports the logistics and preparations required for converting an international, on-site, multidisciplinary conference into a completely web-based conference within 3 weeks during the pandemic.

Methods: The program was revised, and a teleconference system, live recording system, director system setup, and broadcasting platform were arranged to conduct the web-based conference.

Results: We used YouTube (Alphabet Inc) and WeChat (Tencent Holdings Limited) for the web-based conference. Of the 24 hours of the conventional conference, 21.5 hours (90%) were retained in the web-based conference via live broadcasting. The conference was attended by 71% (37/52) of the original international faculties and 71% (27/38) of the overall faculties. In total, 61 out of 66 presentations (92%) were delivered. A special session—"Dialysis access management under the impact of viral epidemics"—was added to replace precongress workshops and competitions. The conference received 1810, 1452, and 1008 visits on YouTube and 6777, 4623, and 3100 visits on WeChat on conference days 1, 2, and 3, respectively.

Conclusions: Switching from a conventional on-site conference to a completely web-based format within a short period is a feasible method for maintaining professional education in a socially responsible manner during a pandemic.

(JMIR Med Educ 2021;7(2):e23980) doi:10.2196/23980

KEYWORDS

web-based conference; live broadcast; medical education; dialysis access; coronavirus; COVID-19; conference; social media; web-based platform; internet; interaction; teleconference

Introduction

The COVID-19 outbreak was first reported in Wuhan, China, in December 2019, and it rapidly developed into a pandemic within 3 months [1]. It poses a significant threat to global health. Travel restrictions, bans on mass gatherings, and social distancing are some of the main control measures that have been adopted in many countries. As a consequence, almost all medical conferences have been cancelled or postponed since February 2020.

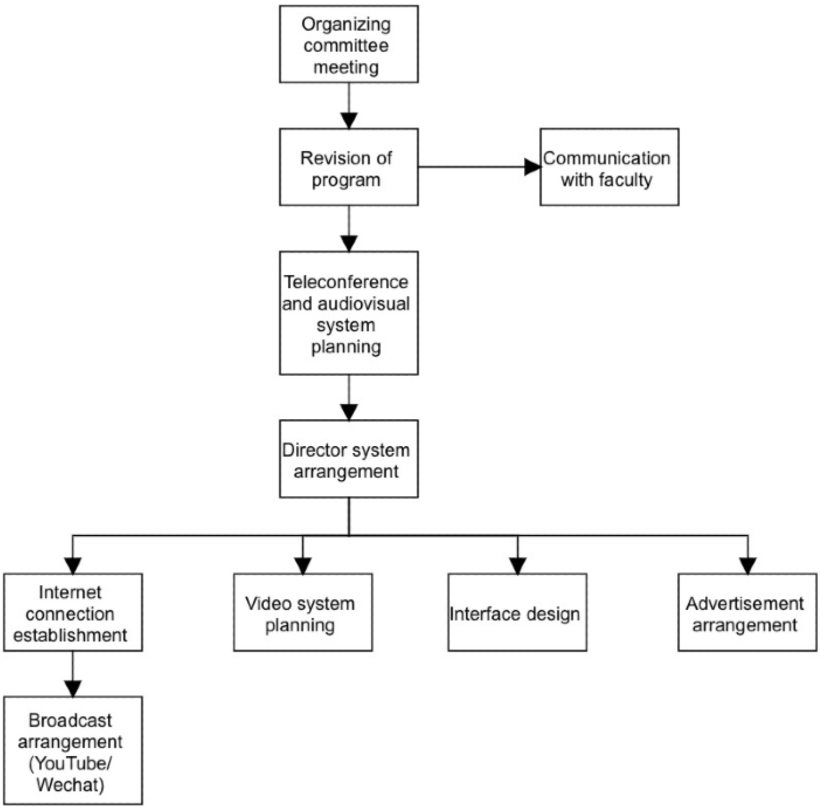
Dialysis Access Synergy (DASy)—the official academic conference of the Society of Dialysis Access Specialists (SoDAS) that was organized in conjunction with the Taiwan Association of Vascular and Access Health and Chang Gung University—is a multidisciplinary international meeting that focuses on dialysis access. The conference was scheduled to be held from March 13 to March 15, 2020, in Taoyuan, Taiwan. By mid-February 2020, 90 international and local faculties had committed to participating in the on-site meeting. More than 300 delegates had registered for the conference. However, in late January 2020, the Taiwan government imposed stepwise strategies to contain the viral outbreak, including the Entry Quarantine System, which was implemented on February 14 and targeted many Asian countries [2]. These travel restrictions prevented participants from pandemic-affected countries from attending the conference. Furthermore, those arriving from regions that were not covered by the Entry Quarantine System had an elevated risk of contracting COVID-19 during travel or conference gatherings. The goal of advancing professional education conflicted with the goal of curbing the pandemic.

Due to the rapidly evolving global situation, the DASy organizing committee and SoDAS executive committee had to choose between abandoning the conference after a year-long preparation period or continuing with the planned conference and bearing the substantial health risk. Eventually, the committees chose to continue with the conference as scheduled but converted it into a completely web-based format by using teleconference technology and livestreaming the conference over social media. The entire switch was accomplished within 3 weeks. In this paper, we share our experience with this process.

Methods

Several logistical and practical challenges must be resolved to convert an on-site, in-person conference to a completely web-based format. Such challenges include program revision; venue adjustment; teleconference, audiovisual, recording, and live broadcasting arrangements (Figure 1); and the promotion of the conference and audience engagement.

Figure 1. Flowchart of the logistical issues involved in converting an on-site meeting into a web-based conference.



Program Revision

During the pandemic, many faculty members who were clinicians were busy with the management of the sudden health crisis in their home countries and were unable to prepare for the conference. In addition, they may have been unable to join the real-time teleconference discussion because of time zone differences or work schedule conflicts. Facilitating efficient communication for engaging the faculty members and for confirming their degree of commitment was the first task of the conversion to a web-based conference.

Teleconferencing has its limitations. Hands-on skills teaching typically cannot be effectively conducted via a web-based platform. Dialysis access involves many procedural and interventional skills. The DASy committee removed the precongress workshops, which was the main session for skills training. Conversely, after assessing the immanent need of medical knowledge during the unprecedented COVID-19 health crisis, the committee added a special session—“Dialysis access management under the impact of viral epidemics.” In this ad hoc session, dialysis access clinicians who were working in the epicenter of Wuhan and other Chinese cities as well as representatives of other countries presented measures that were taken to maintain dialysis access and protect health care worker safety. Furthermore, national policy, institutional workflow, protocols, and patient flow control were discussed.

Teleconference Platform

The teleconference required a real-time stable system, audiovisual clarity, a user-friendly platform, the accommodation of numerous participants, and broadcasting ease. The organizing team reviewed several available options and decided to use the Zoom cloud meeting system (Zoom Video Communications Inc). Conference speakers and session panelists were required to download the Zoom meeting app on their computers or mobile phones. A total of 2 Zoom cloud meeting rooms were established—1 for the actual conference and 1 for conference preparation. The preparation room was used to ensure that speakers were connected. The actual conference room was used during talks and discussions and was broadcasted live. A rehearsal, which involved the organizing host, audiovisual team, broadcast director, and 14 available faculty members, was conducted 1 week before the actual meeting.

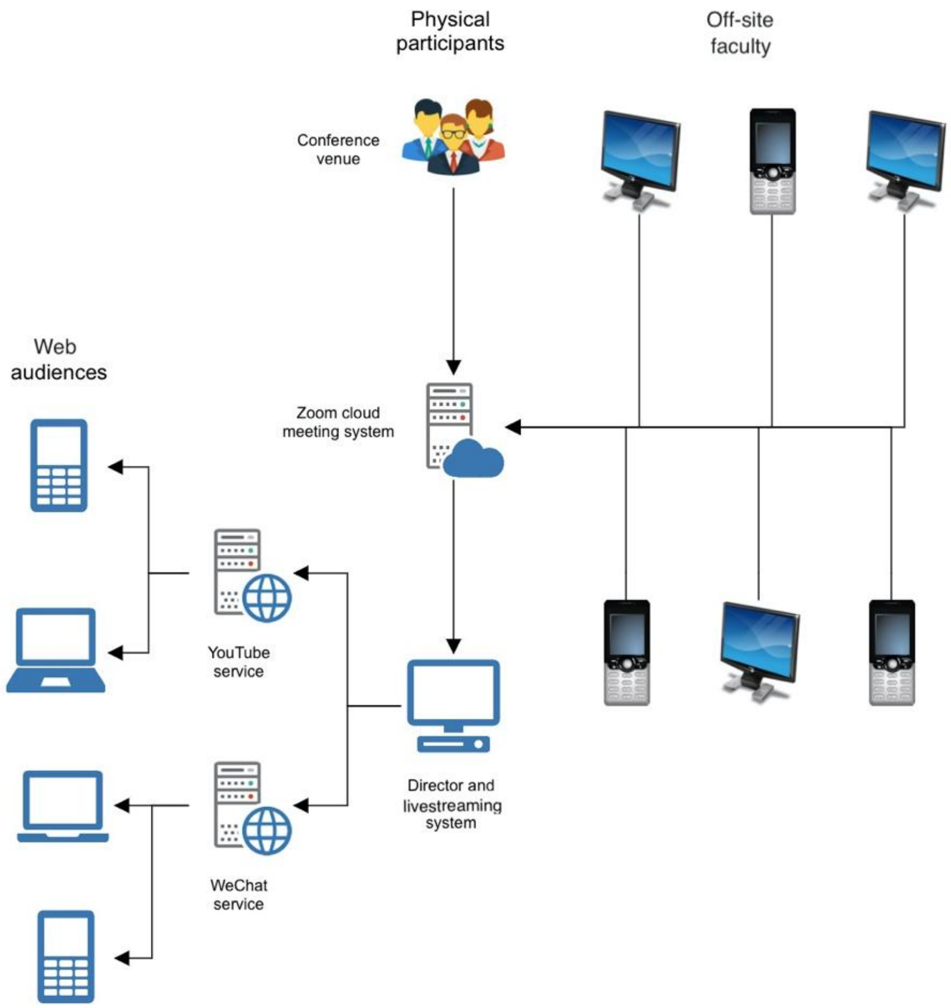
Venue

A web-based conference requires a much smaller venue than a physical conference. Hence, a large auditorium was not required, and a 90-m^2 room in the Fullon Hotel Linkou at Taoyuan city was used instead. This new venue housed the 10 to 15 organizers, local faculty members, and the audiovisual team and their equipment. The venue setup included a presentation podium, a table for chairpersons, and a table for moderators (who were physically present in Taiwan). Adequate social distancing was required inside the meeting room. The previously planned industry sponsor exhibition hall and slide preview room were omitted. Short videos that introduced sponsors’ devices were shown between the conference sessions. Another small room was required to accommodate the broadcast director, his console, and the conference equipment.

Teleconference Proceedings

The broadcast director was responsible for conference time keeping and audiovisual signal assignment. The camera was positioned to capture the presentation podium, chairpersons, or moderators during the discussion sessions. All faculties were requested to provide a prerecorded presentation to avoid any complications when files were switched during the conference. Few faculties provided their presentations on the meeting date and thus made use of the screensharing function to present live talks. All nonphysically present speakers and moderators joined the meeting through Zoom. The main screen broadcasted the conference agenda and showed the PowerPoint video, which included prerecorded narration; real-time faculty presentations; the master screen of all faculties who had logged onto Zoom; or Zoom images of selected faculty members during question-and-answer sessions. In the preparation room, the assistant of the broadcast director liaised with faculty members to prepare them for joining the meeting at the appropriate time. Afterward, the conference continued in accordance with the program agenda and was livestreamed to the web audience (Figure 2).

Figure 2. A schematic of the process of broadcasting a live, web-based conference by using teleconferencing technology.



Live Broadcasting

To reach a worldwide audience and achieve educational goals, the DASy and SoDAS committees decided to provide a free live broadcast over two easily accessible social media platforms—YouTube (Alphabet Inc) and WeChat (Tencent Holdings Limited). Links to the livestream of DASy 2020 were generated and disseminated 10 days before the conference.

Web-Based Conference Promotion and Audience Engagement

Teleconferencing can be promoted through email communication, website announcements, and social media chat groups. Due to time constraints, promotion opportunities for the web-based DASy conference were limited. Nonetheless, the Japan Endovascular Treatment website announced the web-based DASy 2020 conference to its members as a gesture of support.

During the live broadcast, both the YouTube and WeChat platforms provided a real-time, web-based, text-response mechanism. A selected member among the chairpersons was responsible for collecting the questions and comments from the web audience and discussing them during the session. This was done to maximize the engagement of the web audience during the event.

Both the YouTube and WeChat platforms allowed individuals to view the conference regardless of whether they had a registered account. On the YouTube platform, the number of visits and gross geographic locations were recorded, and feedback was provided to the organizers. On the WeChat platform, in addition to the number of visits and geographic locations, the service provider that was responsible for setting up the livestream captured users' first and last login times and their cumulative viewing duration.

Results

The DASy 2020 conference was held in Taiwan as scheduled and broadcasted worldwide. The total duration of this web-based conference was 2.5 days. The conference had a total livestreaming time of 21 hours and 33 minutes (the original on-site conference time was 24 hours). A 2-hour session titled "Dialysis access management under the impact of viral epidemics" involved 6 speakers from 4 countries, including Wuhan, China, and resulted in stimulating discussions on this topic. The precongress workshops and grand challenge competitions were cancelled.

In total, 52 international faculties and 38 local Taiwanese faculties confirmed that they were going to attend the original physical meeting. The web-based conference was attended by

38 overseas faculty members (37 web attendees and 1 physically present attendee) and 27 local faculties (13 web attendees and 14 physically present attendees). The international faculties that participated were from Australia, Canada, China, Germany, Greece, the Hong Kong Special Administrative Region, Japan, Malaysia, Singapore, South Korea, Thailand, and the United States. The only international faculty that was physically present was from Indonesia; at the time of the conference, the impact of the pandemic was less serious in South East Asia. Switching the conference to a web-based format resulted in the successful, active participation of 71% (37/52) of our international faculties and 71% (27/38) of the overall faculties in the conference during the COVID-19 crisis. Faculty members were from multiple disciplines and included vascular surgeons, nephrologists, intervention radiologists, urologists, dialysis nurses, and engineers. Originally, 66 presentations were planned for the main conference. However, with the web-based format, 61 out of 66 planned presentations (92%) were delivered. None of the main conference sessions were cancelled.

On the first day of the event, the conference received 1810 and 6777 visits on YouTube and WeChat, respectively. On the second and third days, the conference received 1452 and 1008 visits on YouTube, respectively, and 4623 and 3100 visits on WeChat, respectively. The total number of visits to the DASy 2020 live broadcast was 13,302. The visits continued to increase during the conference livestream. Individuals from Asia, the Middle East, Australia, Europe, and North America attended the web-based conference.

On the WeChat platform, 1605 individuals with a registered account viewed the live broadcast. Of these individuals, 312 watched the broadcast for >10 minutes. The numbers of identified users who had watched the livestream for 10 minutes to 1 hour, 1 to 3 hours, 3 to 10 hours, and >10 hours were 174, 69, 49, and 20, respectively. On the basis of the first and last login dates of the identified users, 26% (82/312) attended all 3 days of the conference, 27% (84/312) attended 2 of the 3 conference days, and 47% (146/312) only attended 1 conference day.

Discussion

Principal Findings

Globalization, crossover, and multidisciplinary collaboration are effective strategies for advancing health care services in various fields. These require human interaction—preferably, face-to-face interactions—in varying group sizes. With the ease of travel and simplification of short-term entry requirements in many countries, international medical conferences represent an essential modality of professional education as well as incubators for new ideas about service improvement and scientific research. DASy, which is a multidiscipline, multinational, dialysis access–focused meeting, has embraced this concept. The DASy program involves auditorium presentations, podium discussions, hands-on skills training, and competitions based on specific themes. The preparatory work of DASy 2020 started in April 2019. However, the meeting time coincided with the COVID-19 outbreak. This potentially lethal infectious disease posed huge challenges to providing health care education through conventional meetings. Since February 2020, most international medical conferences have been either cancelled or postponed [3,4]. Indeed, the spread of COVID-19 has been reported to be attributable to business meetings [5]. The health care community could opt to forgo training and education during this pandemic or endanger participants' lives with mass gatherings. We considered neither of these approaches desirable. Therefore, we attempted to convert a physical conference into a completely web-based format and aimed to continue the effort of promoting medical education without imposing additional risks to the participants. Moreover, this approach fulfilled our social responsibility of restricting disease transmission.

The COVID-19 outbreak resulted from a novel strain of coronavirus with poorly characterized virulence, transmission modes, and infectivity. It first affected the city of Wuhan. Afterward, it spread throughout China before affecting nearly the whole world. The outbreak statistics, travel warnings, travel bans, and compulsory quarantine requirements in various countries have changed rapidly. With such an unprecedented infectious disease crisis, time was a major challenge for conference organizers. However, the time to act played a vital role in managing such a challenge. For DASy 2020, although the organizing committee discussed the option of holding the meeting on the internet, the decision to do so was made only 3 weeks before the meeting. To achieve this task within 3 weeks, the organizing team required strong support from the faculty members, the adoption of readily available telecommunication and live broadcast technology, information technology and audiovisual experts, and efficient promotion.

Teleconferencing technology has been increasingly used in patient care and medical education and has been proven to be beneficial [6,7]. Good program content and quality audiovisual platforms are essential elements of web-based conferences [8]. To minimize the number of potential technical and reception interruptions, all participating faculties were asked to upload a prerecorded PowerPoint file with narration in advance. The few speakers who could not do so delivered their talks via livestreaming through the Zoom system and shared their screen. The use of the preparation room helped to address any complications during the actual conference.

Many social media and platforms support livestreaming and instant chat functions, including YouTube, Facebook, Instagram, Twitter, Vimeo, and Podcasts. YouTube was selected because it is among the top 2 platforms in terms of user penetration in Western countries [9]. Although YouTube is readily accessible and is a popular platform for viewing video content in many parts of the world, it is inaccessible in some Asian countries such as China, which has seen a rapid increase in the need for dialysis over the past decade [10]. Hence, WeChat was selected as an additional broadcast platform. WeChat is a multifunctional social media app that is user friendly and popular in China. Other options included Tencent online video, Youku, Taobao live, Sina Weibo with Tencent online video, and Taobao live with additional payment functions. By broadcasting simultaneously over these the YouTube and WeChat platforms, organizers maximized the accessibility of the conference for audiences worldwide. Therefore, during the 2.5 days of the conference, a total of 13,302 visits were recorded, which was considerably higher than the number of previous DASy conference attendees (350-400 delegates). Thus, more interested individuals may be reached through web-based conferences than with similar on-site conferences. However, free registration, the convivence of web-based viewing, and distractions from individuals' environments could result in a wide range of attention to conference presentations. On the basis of the WeChat data, numerous individuals viewed the conference for <10 minutes. Although these individuals contributed to visit counts, they were unlikely to have seriously attended the conference. Nonetheless, the number of web participants who viewed the conference for >10 minutes (n=312) was still approximately 15 times the number of on-site conference delegates in 2019, which was approximately 20.

Since the occurrence of the COVID-19 pandemic in early 2020, the landscape of medical conferences has considerably changed (ie, from being postponed or cancelled to being conducted via web-based methods). The methods and technology used for conducting web-based meetings have consequently evolved and diversified within a short period. Conference organizers may choose the format and platform that best suits the following three objectives: (1) providing knowledge and information on what they aim to convey, such as didactic lectures, focused expert discussions, live procedures, or competitions; (2) reaching their target audience size and geographical location; and (3) obtaining funding and resources. The platforms that are being used for web-based conferences include comprehensive commercial solutions, mixed commercial solutions, and custom-made platforms. Comprehensive commercial solutions (eg, EventMobi and Remo Conference) can handle many aspects of web-based conferences, including registration, web-based conference spaces, event app building, instant polling and question-and-answer sessions, in-app chats, interactions with sponsors, and data analytics. With regard to mixed commercial solutions (eg, Zoom conferences and WeChat livestreaming), conference organizers could select a specific platform for web-based conferences, livestreams, registration, and other functions based on the requirement of the individual event. For recurring web-based conferences or workshops with specific audiovisual or interaction requirements, a custom-made platform may be preferred. The time and cost required for building these three types of web-based platforms also vary. Depending on the situation of the pandemic, some medical conferences may also consider using a hybrid solution (ie, integrating on-site and web-based meetings). Facilitating interactions between on-site and off-site faculties and participants requires careful planning.

Although web-based conferences could attract numerous audience members across a wide geographic area, limitations remain. First, skills training is an important objective of medical conferences; it is usually conducted in small group workshops and is seldom successfully delivered through a web-based modality. Second, vigorous interactive discussions among the faculties and delegates, which are common in conferences, are difficult to replicate in web-based platforms. Third, instant polling from the delegates (web audience) for opinion and practice surveys was impossible to conduct over the platforms used for DASy 2020. Obtaining conference evaluations and feedback is difficult. Fourth, delegates could not evaluate new devices and technology that were relevant to their practices and engage with industry representatives during the web-based conference. Furthermore, whether participants were exempted from work hours at their workplace for the web-based conference was uncertain.

Some of these limitations might be overcome with advances in technology for web-based meetings. For example, web-based controlled simulator training might be used for skill development, electronic polling may be conducted through a mobile app or specifically designed platform, and industry booths could incorporate video demonstrations. However, specific limitations with regard to web-based conferencing are likely to arise in the foreseeable future. Therefore, web-based conferences cannot efficiently replace on-site meetings but could be a feasible and reliable alternative during unpredictable times, such as the COVID-19 pandemic. Indeed, given the aforementioned advantages, web-based conferences could be incorporated into all on-site conferences wherever possible. Attention should be paid by conference organizers to web-based conference delegates' experiences, engagement, interactions, and feedback, so as to maximize the benefits of a web-based platform. Moreover, on-site conferences may incorporate some web-based presentations and discussions by prominent faculties that have difficulty with physically attending the meeting. This would enable the conference organizers to enrich the educational content of the meeting in a highly versatile manner.

The organizing committee understood the limitations of web-based conferencing. Hands-on courses and the grand challenge competition were cancelled to make room for topics that were the most relevant to worldwide dialysis health care workers facing the imminent threat of COVID-19. The "Dialysis access management under the impact of viral epidemics" session on the first day of the event involved the first-hand experiences of faculty members from various areas that were hit hard by COVID-19, particularly Wuhan. Meeting analytics revealed that a much higher number of visits to the web-based conference occurred on day 1 than on days 2 and 3. This reflected the world's interest in the topics that were covered during the day-1 session.

Time zone differences represented another challenge for the speakers at DASy 2020. Adjusting the program sequence may have reduced the extent of the problem by some extent. At DASy 2020, several speakers remained on Zoom during out-of-work hours; 1 faculty member stayed up until 3 AM (local time). Several speakers opted to submit audio-recorded presentations only because they were unable to join the live sessions.

The internet was derived from technology that was invented by the US government to cope with the threat of the Soviet Union during the Cold War era [11]. During the COVID-19 pandemic, pathogens are the major problem. Internet technologies are extremely effective tools for tackling some of the major challenges posed by pandemics. Maintaining the ability to disseminate high-quality medical education can be achieved through web-based conferencing, even during an unexpected, sudden, global health crisis.

Due to the time and budget constraints of the conversion to a web-based conference, web-based polling and audience feedback mechanisms were not implemented. The conference live broadcast was open to all people and did not require preregistration. Thus, a postconference follow-up was impossible. Furthermore, the demographic and viewing data of audience members were incomplete. We suggest that a feedback mechanism and polling system should be considered for every web-based event.

Conclusion

On the basis of our experience with DASy 2020, switching a conference from on-site operations to web-based operations within a relatively short period while maintaining its quality is possible. A web-based medical conference that was conducted during the pandemic delivered the educational goal without risking the safety of individuals. We recommend that organizing committees of future medical conferences should consider switching to a web-based format in the event of unexpected epidemics of infectious diseases. Furthermore, we recommend that all medical conferences broadcast at least a portion of their meeting content via the internet to broaden their educational value worldwide.

Acknowledgments

The authors deeply appreciate the dedication of the DASy 2020 faculty members.

Conflicts of Interest

None declared.

References

1. Hui DS, Azhar EI, Madani TA, Ntoumi F, Kock R, Dar O, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - The latest 2019 novel coronavirus outbreak in Wuhan, China. Int J Infect Dis 2020 Feb;91:264-266 [FREE Full text] [doi: 10.1016/j.ijid.2020.01.009] [Medline: 31953166]
2. Wang CJ, Ng CY, Brook RH. Response to COVID-19 in Taiwan: Big Data Analytics, New Technology, and Proactive Testing. JAMA 2020 Apr 14;323(14):1341-1342. [doi: 10.1001/jama.2020.3151] [Medline: 32125371]
3. Conference calendar. Endovascular Today. 2020. URL: https://evtoday.com/calendar/2020 [accessed 2020-03-23]
4. Gravitz L, Frellick M. More medical conferences fall to Coronavirus. Medscape. 2020 Mar 09. URL: https://www.medscape.com/viewarticle/926359 [accessed 2020-03-23]
5. Mei TT, Tay TF. Coronavirus: Gas analysis conference at Grand Hyatt Singapore linked to infections. The Straits Times. 2020 Feb 08. URL: https://www.straitstimes.com/singapore/coronavirus-gas-analysis-conference-at-grand-hyatt-singapore-hotel-linked-to-infections [accessed 2020-03-23]
6. Demartines N, Mutter D, Vix M, Leroy J, Glatz D, Rösel F, et al. Assessment of telemedicine in surgical education and patient care. Ann Surg 2000 Feb;231(2):282-291 [FREE Full text] [doi: 10.1097/00000658-200002000-00019] [Medline: 10674622]
7. Mihailidou AS, McCall D, Hiremath S, Costello B, Tunuguntla A, Mihailidis H. Use of social media at cardiovascular congresses: Opportunities for education and dissemination. Curr Cardiol Rev. Epub ahead of print 2020 Feb 05 [FREE Full text] [doi: 10.2174/1573403X16666200206103328] [Medline: 32026782]
8. Ho SH, Rerknimitr R, Kudo K, Tomimatsu S, Ahmad MZ, Aso A, et al. Telemedicine for gastrointestinal endoscopy: The Endoscopic Club E-conference in the Asia Pacific Region. Endosc Int Open 2017 Apr;5(4):E244-E252 [FREE Full text] [doi: 10.1055/s-0043-102935] [Medline: 28382322]
9. Gomes M. YouTube Live vs Facebook Live Comparison – Which is best for live streaming? ManyCam. 2018 Apr 10. URL: http://blog.manycam.com/youtube-live-vs-facebook-live-comparison/#.XnlLeiV-UlQ [accessed 2020-03-23]
10. Zou Y, Hong D, He Q, Wen Y, Li G. Epidemiology investigation and analysis of patients with hemodialysis in Sichuan province of China. Ren Fail 2019 Nov;41(1):644-649 [FREE Full text] [doi: 10.1080/0886022X.2019.1612429] [Medline: 31296088]
11. Naughton J. The evolution of the Internet: from military experiment to general purpose technology. Journal of Cyber Policy 2016 May 08:5-28 [FREE Full text] [doi: 10.1080/23738871.2016.1157619]

Abbreviations

DASy: Dialysis Access Synergy
SoDAS: Society of Dialysis Access Specialists

Edited by G Eysenbach; submitted 31.08.20; peer-reviewed by ARHB Ramli, I Paraskakis; comments to author 16.10.20; revised version received 30.10.20; accepted 13.04.21; published 09.06.21.

Please cite as:
Ko PJ, Yu SY, Chang JCH, Hsieh MJ, Chu SY, Tan JWH, Cheng WL, Ho P
Using a Web-Based Platform as an Alternative for Conducting International, Multidisciplinary Medical Conferences During the Novel COVID-19 Pandemic: Analysis of a Conference
JMIR Med Educ 2021;7(2):e23980
URL: https://mededu.jmir.org/2021/2/e23980
doi:10.2196/23980
PMID:33970866

Original Paper

Knowledge and Attitude Toward Evidence-Based Medicine and Associated Factors Among Medical Interns in Amhara Regional State Teaching Hospitals, Northwest Ethiopia: Cross-sectional Study

Delelegn Emwodew[1], MPH; Tesfahun Melese[2], PhD; Adamu Takele[2], MPH; Nebiyu Mesfin[3], MD; Binyam Tariku[1], MPH

[1]School of Public Health, Dilla University, Dilla, Ethiopia
[2]Institute of Public Health, University of Gondar, Gondar, Ethiopia
[3]School of Medicine, University of Gondar, Gondar, Ethiopia

Corresponding Author:
Delelegn Emwodew, MPH
School of Public Health
Dilla University
Dilla University Hospital
PO Box 419
Dilla
Ethiopia
Phone: 251 97 606 1907
Email: delelegn1244@gmail.com

Abstract

Background: Evidence-based medicine (EBM) is widely accepted in medicine. It is necessary to improve the knowledge and attitudes of medical students in the use of evidence. In Ethiopia, little is known about medical students' knowledge and attitudes toward EBM.

Objective: This study aimed to assess the knowledge and attitudes toward EBM and its associated factors among medical interns in teaching hospitals.

Methods: A cross-sectional survey was conducted using a random sample of medical interns in teaching hospitals in Ethiopia. Multivariable logistic regression analyses were used to identify the factors associated with the knowledge and attitudes toward EBM. Adjusted odds ratio (AOR) with 95% confidence interval and $P \leq .05$ was used to quantify strength of association between variables.

Results: Out of a sample of 423 medical interns, 403 completed the questionnaire (95.3% response rate). Overall, 68.0% (274/403 of respondents had a favorable attitude toward EBM and 57.1% (230/403) had good knowledge of EBM. The majority (355/403, 88.1%) of participants had internet access. Only 19.6% (79/403) of respondents had received EBM-related training. Respondents' knowledge of EBM was associated with previous EBM training (AOR 2.947, 95% CI 1.648-5.268, $P<.001$), understanding of sensitivity (AOR 2.836, 95% CI 1.824-4.408, $P=.003$), and internet access (AOR 2.914, 95% CI 1.494-5.685, $P=.002$). The use of an electronic database as a source of information (AOR 1.808, 95% CI 1.143-2.861, $P=.01$) and understanding of absolute risk reduction (AOR 2.750, 95% CI 1.105-6.841, $P=.03$) were predictors of positive attitudes.

Conclusions: This study demonstrates a lack of formal EBM training and awareness of basic concepts of EBM among medical interns. Medical intern attitudes toward EBM are relatively good. To enhance EBM knowledge and skills, formal teaching of EBM should be integrated into medical education.

(JMIR Med Educ 2021;7(2):e28739) doi:10.2196/28739

KEYWORDS

knowledge; attitude; evidence-based medicine; teaching hospitals

Introduction

Evidence-based medicine (EBM) is the systematic identification, evaluation, and use of up-to-date research evidence as the basis for clinical decisions [1]. The practice of EBM means integrating clinical expertise and the best available evidence with the ideas, concerns, and expectations of individual patients [2,3]. It includes 5 steps: formulating clinical questions, finding and retrieving evidence, critically appraising evidence, applying evidence, and evaluating performance [4]. EBM has the potential to improve the continuity and uniformity of care through the development of common approaches and guidelines [5,6]. It can help clinicians make better use of limited resources by enabling them to evaluate the clinical- and cost-effectiveness of treatments and services [6].

Several studies have examined the familiarity, awareness, and attitudes toward EBM among medical students [7,8]. A study conducted in Iran shows that most medical students do not have enough knowledge of basic concepts and familiarity with the term EBM [9]. Similarly, poor EBM knowledge among medical students was found in Switzerland [10]. The attitude toward EBM was generally positive among medical and health science students in Hungary [11]. In contrast, medical students' knowledge and attitude toward EBM were low in Saudi Arabia [12].

Most medical schools teach EBM as a major component of their medical curriculum [13,14]. "In Africa, EBM is emphasized in countries such as South Africa, Ethiopia, Kenya, Nigeria, Egypt, Botswana, Burundi, and Malawi" [15,16]. Several universities in different African countries offer EBM courses, but most are located in South Africa [15]. Most Ethiopian physicians have unmet training needs concerning EBM and seek support for an improved education system to provide quality evidence-based health care [17,18].

For the training of physicians, it is essential to perform needs assessments and evaluate the level of knowledge and their attitudes. "In Ethiopia, EBM teaching has not yet become part of the undergraduate medical education, which has led to gaps in knowledge, skills, and attitudes toward EBM. Particularly, little is known about medical students' knowledge and attitudes toward EBM [19]. Therefore, the current state of EBM must be understood to plan long-term educational programs" [20]. Our study aimed to assess knowledge and attitudes toward EBM and associated factors among medical interns in teaching hospitals in northwestern Ethiopia.

Methods

Study Area and Period

The study was conducted at the University of Gondar and Tibebe Ghion teaching hospitals in the Amhara region of the northwestern province of Ethiopia between March and April 2020. The Amhara region is located in the northwestern and northern parts of Ethiopia. It has 10 administrative zones, 181 woredas (districts), and 78 urban centers. According to the 2019 Amhara Regional Health Office, there are two teaching hospitals in the area, the University of Gondar and Tibebe Ghion. These teaching hospitals are training centers for undergraduate medical students and others who are responsible for solving public health problems across the country.

Study Design and Population

A cross-sectional study design was employed. Participants of this study were all medical interns in teaching hospitals of the northwestern province of Ethiopia. Medical interns who were on sick leave and those with a week off during the study period were excluded.

Sample Size and Sampling Procedure

The sample size was determined using the single population proportion formula n = (Zα/2) 2*P* (1–p) / d2; where, n = sample size, Zα/2 (1.96): significance level at α=.05, p: proportion for knowledge and attitude = 50%, and d: margin of error (.05). After adding a 10% nonresponse rate, the final sample size was 423.

By taking a list of medical interns from each hospital, we determined the proportionate sample to be taken to estimate the number of study participants per hospital using the formula = (n)×(nf) / N where n = the number of medical interns at each hospital, nf = total sample size, and N = total number of medical interns at the two hospitals. After that, based on their population, a simple random sampling method was used.

Measurements and Data Collection Methods

Data were collected using a 6-section self-administered questionnaire: sociodemographic information, EBM knowledge, attitudes toward EBM, information source preferences, awareness of EBM resources, and understanding of statistical terms. The questionnaire was taken from previous studies because these previous works had already been validated [21,22]. Data were collected by 6 health informatics (BSc) students. Respondents' attitudes were rated on 11 questions on 5-point Likert scales. All individual responses to attitudinal questions were calculated to obtain total scores; after that, the mean score was calculated to be classified as favorable (if respondents scored average or above) or unfavorable (if participants received less than average score). Also, knowledge level was measured by calculating the average value of 14 items and was rated as good (if respondents scored the mean value or above of correctly replied questions) or poor (if participants scored below the mean score of correctly replied questions).

Data Quality Assurance and Management

One-day training was provided for the data collectors and supervisors on how the data should be obtained and recorded. Ongoing follow-up and supervision were performed by supervisors and the principal investigator throughout the data collection process. The data were checked daily for completeness and consistency.

A pretest of the questionnaire was conducted prior to the actual data collection in 5% of the sample in Tikur Anbessa Hospital, which was not included in the study. Using data obtained from the pretest, the questionnaire was tested for reliability (internal consistency) using the Cronbach alpha test. The reliability of the knowledge questions had a Cronbach alpha value of .84 and the attitude had a Cronbach alpha value of .76. These figures indicate that the questionnaire is very reliable.

Data Processing and Analysis

The data collected was coded and entered in the freely available public health software Epi Info version 7.1 and analyzed using SPSS (version 20.1, IBM Corp). Descriptive analysis was used to compute the mean, standard deviation, frequency, and percentage of each variable. The Spearman rank correlation coefficient test was used to test the bivariate correlation between outcome and predictor variables. The choice of variables to be included in the final model was made by examining the correlations between the independent variables to remove the variables with the strong association. Finally, multivariable logistic regression analysis was used to identify factors associated with the knowledge and attitude of medical interns. Factors with significant associations were identified based on adjusted odds ratio (AOR) with a 95% confidence interval and $P \leq .05$.

Ethical Statement

This study was approved by the University of Gondar Institute of Public Health Research Ethics Committee (no. IPH837) and followed the guidelines of the Helsinki Declaration. All participants were given written informed consent before enrollment in the study. Medical interns were informed of their absolute right to skip any questions or not participate in the study. Confidentiality was maintained throughout the study, and respondents were assured that the results would be used for research purposes only.

Results

Sociodemographic Characteristics

From a sample of 423 medical interns, 403 completed a questionnaire (response rate 95.3%). Of the 403 participants in the study, 291 (72.2%) were male. The majority (296/403, 73.4%) of participants were from the University of Gondar teaching hospital, and the remainder were from Tibebe Ghion teaching hospital. Most (324/403, 80.4%) of the respondents had never received EBM-related training. Most (276/403, 68.5%) of the participants had a computer and 88.1% (355/403) had access to the internet (Table 1).

Table 1. Sociodemographic characteristics of medical interns in northwest Ethiopia in 2020 (n=403).

Variables	University of Gondar (n=296), n (%)	Tibebe Ghion (n=107), n (%)
Sex		
Male	221 (74.4)	70 (65.4)
Female	75 (25.3)	37 (34.6)
Previous EBM[a] training		
Yes	65 (22.0)	14 (13.1)
No	231 (78.0)	93 (86.9)
Have a computer		
Yes	210 (70.9)	66 (61.7)
No	86 (29.1)	41 (38.3)
Have internet access		
Yes	259 (87.5)	96 (89.7)
No	37 (12.5)	11 (10.3)

[a]EBM: evidence-based medicine.

Knowledge About EBM

Of the participants, 57.1% (230/403) had a good knowledge of EBM with a mean score of 6.6 (SD 3.62). Just over half (226/403, 56.1%) of the participants responded correctly that EBM is a combination of good research evidence and clinical expertise. Similarly, 55.1% (222/403) were aware of the need for critical assessment skills to assess the quality of research papers, and 52.6% (212/403) agreed that the EBM practice required proper identification and clinical questioning. However, only 26.8% (108/403) responded correctly that a literal search using medical subject heading (MeSH) terms would reveal fewer articles than the actual search using a simple keyword (Table 2).

Table 2. Knowledge of EBM among medical interns in northwest Ethiopia, 2020 (n=403).

Knowledge assessment items	Correct, n (%)	Incorrect, n (%)
EBM[a] is the integration of best research evidence with clinical expertise and patient values and preferences.	226 (56.1)	177 (43.9)
A literature search using MeSH[b] terms would yield fewer articles than a basic search using general terms.	108 (26.8)	295 (73.2)
A literature search using the Boolean operator "OR" would reduce the number of citations.	108 (26.8)	295 (73.2)
Research using clinical trials is generally more reliable than research using the observational method.	210 (52.1)	193 (47.9)
Clinical trials and observational methods are equally valid in establishing treatment effectiveness.	183 (45.4)	220 (54.6)
Evidence and patients are equally important to make clinical decisions.	184 (45.7)	219 (54.3)
Evidence alone is not enough to make a good clinical decision.	222 (55.1)	181 (44.9)
Within EBM, expert opinion is not considered as a form of evidence.	147 (36.5)	256 (63.5)
The practice of EBM requires the appropriate identification and formulation of clinical questions.	212 (52.6)	191 (47.4)
An etiological question is best answered through the use of a cohort study.	189 (46.9)	214 (53.1)
In therapy questions, a randomized controlled trial provides the best information to make a good clinical decision.	196 (48.6)	207 (51.4)
Understanding of patient preferences is essential for identifying the best available treatment.	217 (53.8)	186 (46.2)
EBM requires the use of critical appraisal skills to ensure the quality of all the research papers retrieved.	222 (55.1)	181 (44.9)
Critically appraised evidence should be appropriately applied to the patient using clinical experience.	231 (57.3)	172 (42.7)

[a]EBM: evidence-based medicine.

[b]MeSH: medical subject heading.

Attitude Toward EBM

Among the total participants, 68.0% (274/403) had a favorable attitude toward EBM with an attitude mean score of 9.7 (SD 1.65). The majority (380/403, 94.3%) of participants believe that the EBM practice is a useful tool for clinical decision making and 91.3% (368/403) agreed that the EBM practice improves patient care (Table 3).

Table 3. Attitude toward EBM among medical interns in northwest Ethiopia, 2020 (n=403).

Attitude assessment items	Agree, n (%)	Disagree, n (%)
Using results from research is important for the development of my professional practice.	382 (94.8)	21 (5.2)
The practice of EBM[a] is a helpful tool for decision making in my clinical practice.	380 (94.3)	23 (5.7)
The practice of EBM helps me to care for people in the same way and with the same efficiency.	313 (77.7)	90 (22.3)
The practice of EBM improves the quality of my work.	350 (86.8)	53 (13.2)
The practice of EBM can reduce health care cost.	302 (74.9)	101 (25.1)
The application of EBM is necessary for my work.	365 (90.6)	38 (9.4)
The practice of EBM improves patient care.	368 (91.3)	35 (8.7)
I believe EBM improves the quality and results of my clinical interventions.	358 (88.8)	45 (11.2)
I consider research findings useful in my daily practice.	358 (88.8)	45 (11.2)
I am interested in learning or improving the skills necessary to incorporate EBM into my work.	371 (92.1)	32 (7.9)
I need to increase the use of evidence in my daily work.	383 (95.0)	20 (5.0)

[a]EBM: evidence-based medicine.

Preference of Information Sources

Most (366/403, 90.8%) participants had read the medical textbook in search of information. Also, 81.4% (328/403) of participants consulted colleagues and 75.0% (306/403) consulted senior doctors when seeking information. However, only 40.4% (163/403) had read articles found by searching an electronic database to guide their clinical decision (Table 4).

Table 4. Preference of information sources among medical interns in northwest Ethiopia, 2020 (n=403).

Information sources	Yes, n (%)	No, n (%)
Read medical textbook.	366 (90.8)	37 (9.2)
Read printed research articles.	125 (31.0)	278 (69.0)
Refer to clinical practice guidelines.	255 (63.3)	148 (36.7)
Read articles found by searching of electronic databases.	163 (40.4)	240 (59.6)
Refer to medical apps.	222 (55.1)	181 (44.9)
Consult colleagues.	328 (81.4)	75 (18.6)
Consult senior doctors.	306 (75.9)	97 (24.1)

Awareness of EBM Resources

Only a minority of respondents were aware of EBM resources (Table 5). Some participants were aware of PubMed (56/403, 13.9%), Clinical Evidence (from BMJ Publishing Group; 35/403, 8.7%), and Cochrane Database of Systematic Reviews (26/403, 7.2%). Only a few knew about Bandolier (20/403, 5.0%) and the Database of Abstracts of Reviews of Effects (DARE; 14/403, 3.5%).

Table 5. Awareness of EBM resources among medical interns in northwest Ethiopia, 2020 (n=403).

Evidence-based medicine resources	Aware, n (%)	Unaware, n (%)
Centre for Evidence-Based Medicine	21 (5.2)	382 (94.8)
American College of Physicians Journal Club	20 (5.0)	383 (95.0)
Cochrane Database of Systematic Reviews	29 (7.2)	374 (92.8)
Database of Abstracts of Reviews of Effects	14 (3.5)	389 (96.5)
Bandolier	20 (5.0)	383 (95.0)
PubMed	56 (13.9)	347 (86.1)
Clinical Evidence (from BMJ Publishing Group)	35 (8.7)	368 (91.3)
Evidence-Based Medicine (from BMJ Publishing Group)	19 (4.7)	384 (95.3)

Understanding Statistical Terms

Only some of the respondents had an understanding of statistical terms used in EBM such as relative risk (150/403, 37.2%), *P* value (145/403, 36.0%), sensitivity (143/403, 35.5%), and others. Despite this, the medical interns had a good understanding of relative risk reduction (47/403, 11.7%) and absolute risk reduction (40/403, 9.9%; Table 6).

Table 6. Understanding of statistical terms among medical interns in northwest Ethiopia, 2020 (n=403).

Statistical terms	Understand, n (%)	Don’t understand, n (%)
Absolute risk reduction	40 (9.9)	363 (90.1)
Relative risk reduction	47 (11.7)	356 (88.3)
Number needed to treat	58 (14.4)	345 (85.6)
Confidence interval	132 (32.8)	271 (67.2)
P value	145 (36.0)	258 (64.0)
Sensitivity	143 (35.5)	260 (64.5)
Specificity	138 (34.2)	265 (65.8)
Likelihood ratio	91 (22.6)	312 (77.4)
Relative risk	150 (37.2)	253 (62.8)
Odds ratio	140 (34.7)	263 (65.3)

Factors Associated With EBM Knowledge

In bivariate analysis, variables such as having a computer (*P*=.001), EBM training (*P*=.000), internet access (*P*=.000), awareness of Bandolier (*P*=.006), awareness of PubMed (*P*=.001), awareness of DARE (*P*=.004), understanding of relative risk reduction (RRR) (*P*=.001), understanding of sensitivity (*P*=.000), and understanding of odds ratio (*P*=.000) indicate significant associations at *P*<.01 significance level.

In the multivariable analysis, EBM training, internet access, PubMed awareness, understanding of sensitivity, and RRR showed significant association with medical interns' knowledge of EBM. The chances of having good EBM knowledge among medical interns who took EBM training were 2.9 times (AOR 2.947, 95% CI 1.648-5.268) higher than those who did not take EBM training. Medical interns with internet access were 2.9 times (AOR 2.914, 95% CI 1.494-5.685) more likely to have better EBM knowledge compared to those without internet access.

Respondents who knew PubMed were 2.9 times (95% CI 1.4-6.0) more likely to have a better knowledge of EBM than those who did not. Participants who understood sensitivity were 2.8 times (AOR 2.836, 95% CI 1.824-4.408) more likely to have a good EBM knowledge compared to those who did not understand the sensitivity. Medical interns who understood the RRR were 2.7 times (AOR 2.760, 95% CI 1.85-6.431) more likely to have a good EBM knowledge compared to those who did not (Table 7).

Table 7. Factors associated with EBM knowledge among medical interns in northwest Ethiopia, 2020 (n=403).

Variable	Knowledge level		COR[a] (95% CI)	AOR[b] (95% CI)	*P* value
	Poor, n (%)	Good, n (%)			
EBM[c] training	—[d]	—	3.1 (1.7-5.5)	2.9 (1.6-5.2)	<.001
No	155 (89.6)	169 (73.5)	—	—	—
Yes	18 (10.4)	61 (26.5)	—	—	—
Internet access	—	—	3.4 (1.8-6.4)	2.9 (1.5-5.7)	.002
No	33 (19.1)	15 (6.5)	—	—	—
Yes	140 (89.9)	215 (93.5)	—	—	—
PubMed	—	—	3.6 (1.5-7.2)	2.9 (1.4-6.0)	.003
Unaware	162 (93.6)	185 (80.4)	—	—	—
Aware	11 (6.4)	45 (19.6)	—	—	—
Sensitivity	—	—	2.9 (1.8-4.5)	2.8 (1.8-4.4)	.000
Don't understand	134 (77.5)	126 (54.8)	—	—	—
Understand	39 (22.5)	104 (45.2)	—	—	—
Relative risk reduction	—	—	4.2 (1.9-9.3)	2.7 (1.8-6.4)	.019
Don't understand	165 (95.4)	191 (83.0)	—	—	—
Understand	8 (4.6)	39 (17.0)	—	—	—

[a]COR: crude odds ratio.
[b]AOR: adjusted odds ratio.
[c]EBM: evidence-based medicine.
[d]Not applicable.

Factors Associated With Attitude Toward EBM

In the bivariate analysis, the use of an electronic database (P=.002) showed significant correlations at the P<.01 level. EBM knowledge (P=.02) and absolute risk reduction (ARR) (P=.01) understanding indicate significant association at P<.05 levels. In the multivariable analysis, EBM knowledge, understanding of ARR, and the use of electronic databases were factors significantly associated with attitudes toward EBM.

The probability of having a positive EBM attitude among medical interns who understood ARR was 2.7 times (AOR 2.750, 95% CI 1.105-6.841) higher than those not understood. Respondents who used an electronic database to make clinical decisions were 1.8 times (AOR 1.808, 95% CI 1.143-2.861) more likely to have a positive attitude toward EBM compared to those who did not use electronic databases. Participants with good EBM knowledge were 1.6 times (AOR 1.610, 95% CI 1.004-2.493) more likely to have a positive attitude toward EBM compared to those with less EBM knowledge (Table 8).

Table 8. Factors associated with attitude toward EBM among medical interns in northwest Ethiopia, 2020 (n=403).

Variable	Attitude level		COR[a] (95% CI)	AOR[b] (95% CI)	*P* value
	Unfavorable, n (%)	Favorable, n (%)			
EBM[c] knowledge	—[d]	—	1.6 (1.1-2.5)	1.6 (1.0-2.5)	.03
Poor	66 (51.2)	107 (39.1)	—	—	—
Good	63 (48.8)	167 (60.9)	—	—	—
Use electronic database	—	—	2 (1.3-3.1)	1.8 (1.1-2.9)	.01
No	91 (70.5)	149 (54.4)	—	—	—
Yes	38 (29.5)	125 (45.6)	—	—	—
Absolute risk reduction	—	—	2.9 (1.2-7.1)	2.7 (1.1-6.8)	.03
Don't understand	123 (95.3)	240 (87.6)	—	—	—
Understand	6 (4.7)	34 (12.4)	—	—	—

[a]COR: crude odds ratio.
[b]AOR: adjusted odds ratio.
[c]EBM: evidence-based medicine.
[d]Not applicable.

Discussion

Principal Findings

The results of this study revealed that medical interns have limited knowledge of the basics of EBM but have relatively positive attitudes. We have found medical interns more widely used and more reliant on printed textbooks and consulting with senior doctors when seeking information. Also, they had little awareness of EBM resources and lacked sufficient understanding of statistical terms. The output from the multivariable analysis identified EBM training, internet access, awareness of PubMed, understanding of sensitivity, and RRR as significant predictors of medical interns' knowledge of EBM.

This study showed that only 13.9% of participants knew about PubMed. Similarly, some studies have shown a low level of awareness of EBM resources among medical students [9,12]. Also, only 8.7% of medical interns were aware of Clinical Evidence (from the BMJ Publishing Group). In contrast, a study on knowledge, attitudes, and barriers to EBM in residents reported that 31.6% of participants knew about the Clinical Evidence website [23]. This difference may be because the concept of EBM is still a new term among the medical interns included in this study. This has shown that the teaching hospitals included in this study have done little to raise awareness among medical interns about EBM resources.

Correspondingly, the findings from this study show that 90.1% of participants did not understand ARR and 85.6% do not understand the number needed to treat. This could be because the majority (80.4%) of participants included in this study did not have any EBM-related training. This has shown that little has been done to increase knowledge and skills about EBM among medical students. Therefore, medical students should be trained about statistical terms used in EBM.

In this study, 57.1% of participants had a good knowledge of EBM. Nearly half (55.1%) of respondents correctly answered that critical appraisal skills are necessary to ensure the quality of research papers, and 52.6% correctly answered that EBM practice requires proper identification and formation of clinical questions. This is consistent with a study of EBM in medical students in Switzerland [24]. In contrast, a survey of knowledge, attitudes, and behaviors of medical students in Ireland showed that almost all (97%) participants were aware of the need for critical appraisal skills to ensure the quality of all research papers, and the majority (94%) were aware that the EBM practice required proper identification and clinical questioning [25]. These differences may be due to the lack of formal EBM training in teaching hospitals included in this study. Experimental evidence from Mexico suggested that the formal student training in EBM improved the knowledge and skills of medical students with EBM [26].

The results of this study revealed that the majority (68.0%) of participants had a positive attitude toward EBM. These findings were consistent with evidence from other studies [27]. This could be the first step in motivation and was a good sign to promote EBM teaching in the medical student curriculum. Similarly, a study conducted on knowledge and attitudes of EBM among Jordanian physicians showed that 63.5% of participants had a positive attitude of EBM [28]. In contrast, a study conducted among Saudi Arabian medical students reported unwelcome attitudes toward EBM [12]. Of our participants, 91.3% agreed that practicing EBM improves patient care. Similarly, a study conducted on the knowledge and attitude of EBM in Iran has shown that 92.6% of physicians believe that practicing EBM improves patient management [29]. Also, 94.3% of participants included in our study believed that the EBM practice was a useful tool for clinical decision making. This was higher than a study conducted on the knowledge and attitude of evidence-based practice in which 80% of participants believed that EBM helps with treatment decisions.

Several factors affected EBM knowledge: internet access, EBM training, PubMed awareness, and familiarity with sensitivity.

This finding was consistent with previous studies in Ethiopia, which identified lack of training as the most significant factor associated with physicians' and nurses' knowledge of EBM [30]. A study conducted in Saudi Arabia also found a significant increase in knowledge between academic levels, seminar attendees, and nonattendees [31]. The study also found that EBM knowledge, awareness of ARR, and the use of the electronic database as a source of information were factors that positively affected medical intern attitudes toward EBM. An observational study from Yemen found a significant association of age with the positive attitude of physicians toward EBM, while this study found no significant association [32]. The di erence between studies could be attributed to di erent samples as this study included medical interns who are in a similar age group.

The concept of EBM was still unfamiliar among medical interns included in this study due to a lack of formal training. This will require a national policy for the EBM program in medical universities and needs to be addressed at all levels of medical education in Ethiopia. Numerous studies have shown that incorporating EBM into the medical curriculum enhances medical students' skill in forming clinical questions, searching for evidence, and evaluating the evidence [33-36]. Also, medical students' knowledge and attitudes improved after EBM training [26,37].

Strength and Limitations

The strong point of the study was that the survey tool was adapted from a previously used and standardized EBM measurement tool. This is the first study to investigate medical interns' knowledge and attitude of EBM in teaching hospitals of northwest Ethiopia. There are some limitations to this study. First, it is subject to questionnaire study and response bias. We were able to reduce response bias by getting very good response rates. Second, the study was conducted only in teaching hospitals, which may affect the generalizability of the findings to other settings. Finally, there were few women in the sample, which may be due to the small number of female students at medical universities in Ethiopia.

Conclusions

Attitudes toward EBM were often favorable among medical interns in northwestern Ethiopia. However, the interns lacked appropriate EBM training, awareness of EBM resources, and understanding of methodological terms. This information will help in providing appropriate practical training on EBM and enable medical interns to apply EBM when making treatment decisions to provide the best medical care for patients. Teaching hospitals should teach EBM to undergraduate medical students to improve the quality of health care and ensure that students have the knowledge and skills needed to use EBM in actual clinical practice.

Therefore, it is recommended that EBM be included in a variety of teaching activities such as small group teaching, task assignments, morning seminars, and ward rounds with ongoing assessment by academic instructors. In addition, training students to thoroughly search EBM resources such as electronic databases of systematic reviews on a daily or weekly basis is essential for teaching. Additional studies are needed to assess the level of knowledge and attitudes of medical students about EBM at Ethiopian medical universities.

Acknowledgments

We would like to thank the Institute of Public Health at the University of Gondar for funding the data collection and analysis of this study. Our heartfelt thanks go to the supervisors and data collectors for their support in the data collection process. We also thank the medical interns for their participation in the study.

Authors' Contributions

DE and BT collected and analyzed the data. TM, AT, and NM validated the analysis method. DE wrote the manuscript with input from all authors. All authors contributed greatly to the development of the study design, analysis, and interpretation of the findings. All authors read and approved the final manuscript.

Conflicts of Interest

None declared.

Multimedia Appendix 1
Survey questionnaire.
[DOCX File , 23 KB - mededu_v7i2e28739_app1.docx]

References

1. Straus S, McAlister F. Evidence-based medicine: a commentary on common criticisms. CMAJ 2000 Oct 03;163(7):837-841 [FREE Full text] [Medline: 11033714]
2. Maggio LA, Kung JY. How are medical students trained to locate biomedical information to practice evidence-based medicine? A review of the 2007-2012 literature. J Med Libr Assoc 2014 Jul;102(3):184-191 [FREE Full text] [doi: 10.3163/1536-5050.102.3.008] [Medline: 25031559]

3. Sackett D, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence based medicine: what it is and what it isn't. BMJ 1996 Jan 13;312(7023):71-72 [FREE Full text] [doi: 10.1136/bmj.312.7023.71] [Medline: 8555924]
4. Dawes M, Summerskill W, Glasziou P, Cartabellotta A, Martin J, Hopayian K, Second International Conference of Evidence-Based Health Care Teachers and Developers. Sicily statement on evidence-based practice. BMC Med Educ 2005 Jan 05;5(1):1 [FREE Full text] [doi: 10.1186/1472-6920-5-1] [Medline: 15634359]
5. Al Omari M, Khader Y, Jadallah K, Dauod A, Al-Shdifat A. Awareness, attitude and practice of evidence-based medicine among primary health care doctors in Jordan. J Eval Clin Pract 2009 Dec;15(6):1131-1136. [doi: 10.1111/j.1365-2753.2009.01223.x] [Medline: 20367716]
6. Lewis S, Orland B. The importance and impact of evidence-based medicine. J Manag Care Pharm 2004 Sep;10(5 Suppl A):S3-S5. [doi: 10.18553/jmcp.2004.10.S5-A.S3] [Medline: 15369418]
7. Alahdab F, Firwana B, Hasan R, Sonbol MB, Fares M, Alnahhas I, et al. Undergraduate medical students' perceptions, attitudes, and competencies in evidence-based medicine (EBM), and their understanding of EBM reality in Syria. BMC Res Notes 2012 Aug 12;5(1):431 [FREE Full text] [doi: 10.1186/1756-0500-5-431] [Medline: 22882872]
8. Ilic D, Forbes K. Undergraduate medical student perceptions and use of Evidence Based Medicine: a qualitative study. BMC Med Educ 2010 Aug 19;10(1):58 [FREE Full text] [doi: 10.1186/1472-6920-10-58] [Medline: 20718992]
9. Ghahremanfard F, Nassaji M, Mirmohammadkhani M, Tanha A, Mosavi M, Ghaemi A, et al. Knowledge and attitude toward evidence-based medicine among medical students in Semnan, Iran. J Evid Based Med 2014 Feb 23;7(1):32-37. [doi: 10.1111/jebm.12084] [Medline: 25155564]
10. Kaderli R, Burghardt L, Hansali C, Businger A. Students' view of evidence-based medicine: a survey in Switzerland. Arch Clin Exp Surg 2012;1(1):34. [doi: 10.5455/aces.20120217124737]
11. Csertő M, Berényi K, Decsi T, Lohner S. Self-reported attitudes, knowledge and skills of using evidence-based medicine in daily health care practice: a national survey among students of medicine and health sciences in Hungary. PLoS One 2019 Dec 27;14(12):e0225641 [FREE Full text] [doi: 10.1371/journal.pone.0225641] [Medline: 31881036]
12. Aldugieman T, Alanezi R, Alshammari W, Al-Shamary Y, Alqahtani M, Alreshidi F. Knowledge, attitude and perception toward evidence-based medicine among medical students in Saudi Arabia: analytic cross-sectional study. J Family Med Prim Care 2018;7(5):1026-1031 [FREE Full text] [doi: 10.4103/jfmpc.jfmpc_129_18] [Medline: 30598951]
13. Lai NM, Teng CL. Self-perceived competence correlates poorly with objectively measured competence in evidence based medicine among medical students. BMC Med Educ 2011 May 28;11(1):25 [FREE Full text] [doi: 10.1186/1472-6920-11-25] [Medline: 21619672]
14. Tilson JK, Kaplan SL, Harris JL, Hutchinson A, Ilic D, Niederman R, et al. Sicily statement on classification and development of evidence-based practice learning assessment tools. BMC Med Educ 2011 Oct 05;11(1):78 [FREE Full text] [doi: 10.1186/1472-6920-11-78] [Medline: 21970731]
15. Forland F, Rohwer AC, Klatser P, Boer K, Mayanja-Kizza H. Strengthening evidence-based healthcare in Africa. Evid Based Med 2013 Dec 16;18(6):204-206. [doi: 10.1136/eb-2012-101143] [Medline: 23416418]
16. Law T, Lavis J, Hamandi A, Cheung A, El-Jardali F. Climate for evidence-informed health systems: a profile of systematic review production in 41 low- and middle-income countries, 1996-2008. J Health Serv Res Policy 2012 Jan 01;17(1):4-10. [doi: 10.1258/jhsrp.2011.010109] [Medline: 21967823]
17. Abdulwadud O, Tadesse F, Yilma G, Midekssa M, Ibraghimova I. Knowledge and experience with Cochrane and evidence based medicine among health professionals in Debreberhan Referral Hospital in Ethiopia: a cross-sectional survey. Pan Afr Med J 2018;30:162 [FREE Full text] [doi: 10.11604/pamj.2018.30.162.14667] [Medline: 30455791]
18. Worku T, Yeshitila M, Feto T, Leta S, Mesfin F, Mezmur H. Evidence-based medicine among physicians working in selected public hospitals in eastern Ethiopia: a cross-sectional study. BMC Med Inform Decis Mak 2019 Jun 03;19(1):107 [FREE Full text] [doi: 10.1186/s12911-019-0826-8] [Medline: 31159784]
19. Balajić K, Barac-Latas V, Drenjancević I, Ostojić M, Fabijanić D, Puljak L. Influence of a vertical subject on research in biomedicine and activities of The Cochrane Collaboration branch on medical students' knowledge and attitudes toward evidence-based medicine. Croat Med J 2012 Aug;53(4):367-373 [FREE Full text] [doi: 10.3325/cmj.2012.53.367] [Medline: 22911530]
20. Okoromah CAN, Adenuga AO, Lesi FEA. Evidence-based medicine curriculum: impact on medical students. Med Educ 2006 May;40(5):465-466. [doi: 10.1111/j.1365-2929.2006.02454.x] [Medline: 16635133]
21. Fernández-Domínguez J, de Pedro-Gómez J, Morales-Asencio JM, Bennasar-Veny M, Sastre-Fullana P, Sesé-Abad A. Health Sciences-Evidence Based Practice questionnaire (HS-EBP) for measuring transprofessional evidence-based practice: creation, development and psychometric validation. PLoS One 2017 May 9;12(5):e0177172 [FREE Full text] [doi: 10.1371/journal.pone.0177172] [Medline: 28486533]
22. Larsen C, Terkelsen A, Carlsen A, Kristensen H. Methods for teaching evidence-based practice: a scoping review. BMC Med Educ 2019 Jul 11;19(1):259 [FREE Full text] [doi: 10.1186/s12909-019-1681-0] [Medline: 31296212]
23. Al Wahaibi A, Adawi S, Shehhi W, Rizvi SG, Al-Kemyani N, Al-Amrani K, et al. Knowledge and attitudes of Oman medical specialty board residents towards evidence-based medicine. Oman Med J 2014 May 16;29(3):178-184 [FREE Full text] [doi: 10.5001/omj.2014.45] [Medline: 24936266]

24. Rohwer A, Young T, van Schalkwyk S. Effective or just practical? An evaluation of an online postgraduate module on evidence-based medicine (EBM). BMC Med Educ 2013 May 27;13(1):77 [FREE Full text] [doi: 10.1186/1472-6920-13-77] [Medline: 23710548]
25. Stronge M, Cahill M. Self-reported knowledge, attitudes and behaviour towards evidence-based practice of occupational therapy students in Ireland. Occup Ther Int 2012 Mar 20;19(1):7-16 [FREE Full text] [doi: 10.1002/oti.328] [Medline: 22183972]
26. Sánchez-Mendiola M, Kieffer-Escobar L, Marín-Beltrán S, Downing SM, Schwartz A. Teaching of evidence-based medicine to medical students in Mexico: a randomized controlled trial. BMC Med Educ 2012 Nov 06;12(1):107 [FREE Full text] [doi: 10.1186/1472-6920-12-107] [Medline: 23131115]
27. Abeysena C, Jayawardana P, Wickremasinghe R, Wickramasinghe U. Evidence-based medicine knowledge, attitudes, and practices among doctors in Sri Lanka. J Evid Based Med 2010 May;3(2):83-87. [doi: 10.1111/j.1756-5391.2010.01077.x] [Medline: 21349049]
28. Barghouti F, Halaseh L, Said T, Mousa A, Dabdoub A. Evidence-based medicine among Jordanian family physicians: awareness, attitude, and knowledge. Can Fam Physician 2009 Jul;55(7):e6-e13 [FREE Full text] [Medline: 19602641]
29. Rashidbeygi M, Sayehmiri K. Knowledge and attitudes of physicians towards evidence based medicine in Ilam, Iran. Iran Red Crescent Med J 2013 Sep 05;15(9):798-803 [FREE Full text] [doi: 10.5812/ircmj.7204] [Medline: 24616789]
30. Abdulwadud O, Azazh A, Mekasha A, Heye TB, Nigatu B, Debebe F, et al. Cochrane, evidence-based medicine and associated factors: a cross-sectional study of the experiences and knowledge of Ethiopian specialists in training. Afr J Emerg Med 2019 Jun;9(2):70-76 [FREE Full text] [doi: 10.1016/j.afjem.2019.01.005] [Medline: 31193814]
31. Bindawas SM. Evidence-based health care continuing education seminars improve academic staff knowledge and attitudes in Saudi Arabia. Pak J Med Sci 2013 Apr 30;29(3):703-709 [FREE Full text] [doi: 10.12669/pjms.293.3299] [Medline: 24353612]
32. Bin Briek A, Webair HH, Al-Tuhaify MM. Assessment of physicians' attitude, awareness and knowledge of evidence-based medicine: an observation from Yemen. J Fam Med 2014;1(3):5 [FREE Full text]
33. Ahmadi S, Baradaran HR, Ahmadi E. Effectiveness of teaching evidence-based medicine to undergraduate medical students: a BEME systematic review. Med Teach 2015 Jan;37(1):21-30. [doi: 10.3109/0142159X.2014.971724] [Medline: 25401408]
34. Dorsch JL, Aiyer MK, Meyer LE. Impact of an evidence-based medicine curriculum on medical students' attitudes and skills. J Med Libr Assoc 2004 Oct;92(4):397-406 [FREE Full text] [Medline: 15494754]
35. Mitku A, Dessie Z, Muluneh E, Workie D. Prevalence and associated factors of TB/HIV co-infection among HIV infected patients in Amhara region, Ethiopia. Afr Health Sci 2016 Jun 18;16(2):588-595 [FREE Full text] [doi: 10.4314/ahs.v16i2.29] [Medline: 27605976]
36. Sastre EA, Denny JC, McCoy JA, McCoy AB, Spickard A. Teaching evidence-based medicine: impact on students' literature use and inpatient clinical documentation. Med Teach 2011;33(6):e306-e312. [doi: 10.3109/0142159X.2011.565827] [Medline: 21609166]
37. Khader Y, Batayha W, Al-Omari M. The effect of evidence-based medicine (EBM) training seminars on the knowledge and attitudes of medical students towards EBM. J Eval Clin Pract 2011 Aug;17(4):640-643. [doi: 10.1111/j.1365-2753.2010.01604.x] [Medline: 21114803]

Abbreviations

AOR: adjusted odds ratio
ARR: absolute risk reduction
EBM: evidence-based medicine
DARE: Database of Abstracts of Reviews of Effects
MeSH: medical subject heading
RRR: relative risk reduction

Edited by G Eysenbach; submitted 12.03.21; peer-reviewed by M Ahmed Kamal, MA Bahrami; comments to author 26.03.21; revised version received 09.04.21; accepted 16.05.21; published 24.06.21.

Please cite as:
Emwodew D, Melese T, Takele A, Mesfin N, Tariku B
Knowledge and Attitude Toward Evidence-Based Medicine and Associated Factors Among Medical Interns in Amhara Regional State Teaching Hospitals, Northwest Ethiopia: Cross-sectional Study
JMIR Med Educ 2021;7(2):e28739
URL: https://mededu.jmir.org/2021/2/e28739/
doi:10.2196/28739
PMID:34185012

Original Paper

Using a Web-Based Quiz Game as a Tool to Summarize Essential Content in Medical School Classes: Retrospective Comparative Study

Varah Yuenyongviwat[1], MD; Jongdee Bvonpanttarananon[1]

Department of Orthopedics, Faculty of Medicine, Prince of Songkla University, Hatyai, Thailand

Corresponding Author:
Varah Yuenyongviwat, MD
Department of Orthopedics
Faculty of Medicine
Prince of Songkla University
Songkhla
Hatyai, 90110
Thailand
Phone: 66 74451601
Email: varahortho@gmail.com

Abstract

Background: Kahoot! is a web-based technology quiz game in which teachers can design their own quizzes via provided game templates. The advantages of these games are their attractive interfaces, which contain stimulating music, moving pictures, and colorful, animated shapes to maintain students' attentiveness while they perform the quizzes.

Objective: The aim of this study was to evaluate the use of Kahoot! compared with a traditional teaching approach as a tool to summarize the essential content of a medical school class in the aspects of final examination scores and the perception of students regarding aspects of their learning environment and of process management.

Methods: This study used an interrupted time series design, and retrospective data were collected from 85 medical students. Of these 85 students, 43 completed a Kahoot! quiz, while 42 students completed a paper quiz. All students attended a lecture on the topic of bone and joint infection and participated in a short case discussion. Students from both groups received the same content and study material, with the exception that at the end of the lesson, students in the Kahoot! group completed a quiz summarizing the essential content from the lecture, whereas the other group received a paper quiz with the same questions and the teacher provided an explanation after the students had finished. The students' satisfaction was evaluated after the class, and their final examination was held 2 weeks after the class.

Results: The mean final examination score in the Kahoot! group was 62.84 (SD 8.79), compared to 60.81 (SD 9.25) in the control group (P=.30). The students' satisfaction with the class environment, learning process management, and teacher were not significantly different between the 2 groups (all P>.05).

Conclusions: In this study, it was found that using Kahoot! as a tool to summarize the essential content in medical school classes involving a lecture and case discussion did not affect the students' final examination scores or their satisfaction with the class environment, learning process management, or teacher.

(JMIR Med Educ 2021;7(2):e22992) doi:10.2196/22992

KEYWORDS

medical education; medical students; computer games; gaming; web-based; interface; perception; retrospective

Introduction

Game-based learning is a teaching method that integrates games into the learning process. Game-based learning uses "game mechanics," in which tools or applications are used to produce motivation, interactivity, and rewards [1]. Kahoot is a web-based technology quiz game that enables teachers to design their own quizzes in provided game templates. The advantages of this game are its attractive interface, which contains stimulating music, moving pictures and colorful, animated shapes, which can maintain students' attentiveness while they complete the quiz [2,3].

One study reported that the majority of students using Kahoot! reported sentiments such as "I have fun and I learn," and that it reinforced what they had learned in class [4]. However, in health care education, there are limited studies that evaluate using Kahoot! in the classroom as a tool to summarize essential content, as compared with traditional teaching approaches in which students complete the quiz on paper and the teacher summarizes the essential content after the quiz. Therefore, the aim of this study was to evaluate the results of using Kahoot! in the aspects of final examination scores and the perceptions of students regarding the learning environment and process management compared with traditional teaching approaches.

Methods

The design of this study involved an interrupted time series and retrospective data collection. Data from fifth-year medical students who attended a bone and joint infection class in the Orthopedic Department of the Faculty of Medicine, Prince of Songkla University, between April 2017 and March 2019 were retrieved from the undergraduate medical education unit database. We compared students who used Kahoot! in the classroom as a tool to summarize the essential content of the class between April 2018 and March 2019 with students who attended class between April 2017 and March 2018 and who completed a paper quiz with the teacher summarizing the essential content after the quiz as the control group. This study was approved by the Ethics Committee and Institutional Review Board of the Faculty of Medicine, Prince of Songkla University. Consent was waived by the ethics committee. The faculty gave permission for the extraction of this information from the database.

All students attended a lecture on the topic of bone and joint infection and a short case discussion, with each class containing 10-12 students. All students in the Kahoot! group and control group received the same content and study material, with the exception of the end of the lesson, wherein students in the Kahoot! group completed a quiz in Kahoot! to summarize the essential content of the lecture while the other group completed a paper quiz; both quizzes contained the same questions. The quiz for both groups was presented on the screen in front of the classroom. In the Kahoot! group, all students completed the quiz via their mobile phone. Each quiz consisted of a process and time limit; after answering each question, the students progressed to the next question. The rules of the game were that the student who provided the most correct answers was the winner; during the quiz, after answering each question, the total score and the score leader's name were shown. The quiz consisted of 10 questions; each question had four answer choices with a single correct answer, and the teacher provided a short explanation after each question in the Kahoot! group. In the control group, the quiz was completed by the students on paper, and the teacher gave an explanation after students had finished the entire quiz.

The students' satisfaction with the class environment, learning process management, and teacher was evaluated by a numeric rating scale in which 0 represented "least satisfied" and 4 indicated "most satisfied." This assessment was conducted through a web-based evaluation program. The evaluation process was performed after the class, and the results for each student were blinded to the identity of the student to prevent information bias from the student, while the teacher gave feedback. All the students wrote a final examination 2 weeks following the class, with the same examination questions in both groups.

The analyses were conducted using R version 3.1.0 software (R Foundation for Statistical Computing). Student grade point average (GPA), satisfaction in each domain, and examination score were evaluated with the Student *t*-test. The Pearson chi-square test was used for a comparison of gender between the groups. The sample size estimation was performed based on previous student examination scores (mean 63.7, SD 8). For each group, 25 students were required to detect a 10% difference in the examination scores with a significance level set to P=.05 and a power set to 0.8.

Results

A total of 85 students were included in this study. Of these 85 students, 43 played Kahoot! and 42 students used a traditional method. There were no significant differences in gender between the 2 groups (Kahoot! group: 26 female and 17 male students; control group: 29 female and 13 male students, P=.41). The GPAs of the students were also not significantly different between the 2 groups (Kahoot! group: 3.32, SD 0.3; control group: 3.21, SD 0.26; P=.07).

The mean examination score in the Kahoot! group was 62.84 (SD 8.79), compared to 60.81 (SD 9.25) in the control group (P=.30). The students' satisfaction with the class environment, learning process management, and teacher were not significantly different between the 2 groups (Table 1).

Table 1. Mean student satisfaction scores for the 2 groups (N=85). Scores ranged from 0-4, with 0 indicating low satisfaction and 4 indicating high satisfaction.

Variable	Kahoot! group (n=43), mean (SD)	Control group (n=42), mean (SD)	*P* value
Promoting a good learning environment			
Interaction between teachers and students	3.9 (0.38)	3.88 (0.33)	.81
Learning process management			
Learning process management that emphasizes student participation	3.9 (0.3)	3.83 (0.38)	.38
Using media and learning resources	3.75 (0.44)	3.86 (0.35)	.23
Organizing the learning process so that the learned material can be applied	3.93 (0.27)	3.88 (0.33)	.51
Evaluation			
Evaluation during teaching	3.88 (0.33)	3.93 (0.26)	.42
Teacher			
Teaching and personality	3.93 (0.27)	3.88 (0.33)	.68
Encouraging learners to demonstrate proper behavior, including respecting students	3.98 (0.16)	3.88 (0.33)	.11

Discussion

Principal Findings

In our study, we found that the final examination scores for students who used Kahoot! in the classroom as a tool to summarize essential content were slightly higher compared with those of students who learned the same material through traditional teaching approaches and completed the quiz on paper; however, this difference did not reach statistical significance. It should be noted that our results are in contradiction with those in previous reports. In a study of business course students by Bawa [5], it was found that students in classes using Kahoot! had significantly better scores on their final examinations than students in a control group. Nevertheless, there is one study that supports our results. A study of the use of Kahoot! in an introductory-level animal science course by Harrison [6] showed that students in the Kahoot! group did not have significantly higher examination scores compared with students in the control group.

In this study, we found that student satisfaction with the class environment, learning process management, and teacher were not significantly different between the Kahoot! group and control group. This result was the same as that in a previous study of high school students learning Chinese as a foreign language [7]. The results of that study showed that use of Kahoot! by students had no significant effect on student motivation. In other research on the use of Kahoot! compared with traditional methods in an Earth Science class [8], it was also found that there were no significant differences in the students' overall learning motivation or in any of the motivation variables, such as motivation, value, expectation, and emotional experience, between the 2 groups.

Limitations

This study had a number of limitations. First, this study had a limited number of participants; therefore, this study was likely underpowered due to the lower than expected differences in outcomes. Second, the satisfaction evaluated in this study was overall satisfaction with a class that consisted of a lecture, case discussion, and either a Kahoot! quiz or paper quiz. In our study, Kahoot! was only used at the end of the class. We hypothesized that students would prefer Kahoot! to a paper quiz; however, the impact of Kahoot! may not have been large enough to change the overall satisfaction score of the class.

Conclusion

This study found that using Kahoot! as a tool to summarize the essential content in medical school classes that involved both a lecture and case discussion did not affect students' final examination scores. Additionally, it did not affect student satisfaction with the class environment, learning process management, or teacher.

Data Availability

The data sets generated during this study are available from the corresponding author upon reasonable request.

Acknowledgments

Funding for this research was provided by the Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand (63-238-11-1). The funders had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript. The authors wish to thank Andrew Jonathan Tait from the International Affairs Department for his assistance in proofreading the English of this report.

Authors' Contributions

VY contributed to the study design, data collection, statistical analysis, and writing of the paper; JB contributed to the study design, data collection, and writing of the paper.

Conflicts of Interest

None declared.

References

1. Sera L, Wheeler E. Game on: the gamification of the pharmacy classroom. Curr Pharm Teach Learn 2017 Jan;9(1):155-159. [doi: 10.1016/j.cptl.2016.08.046] [Medline: 29180148]
2. Nurse Educator. Kahoot! in the classroom. Nurse Educ 2017;42(6):280. [doi: 10.1097/nne.0000000000000419]
3. Bryant SG, Correll JM, Clarke BM. Fun with pharmacology: winning students over with Kahoot! game-based learning. J Nurs Educ 2018 May 01;57(5):320-320. [doi: 10.3928/01484834-20180420-15] [Medline: 29718527]
4. Fuster-Guilló A, Pertegal-Felices ML, Jimeno-Morenilla A, Azorín-López J, Rico-Soliveres ML, Restrepo-Calle F. Evaluating impact on motivation and academic performance of a game-based learning experience using Kahoot. Front Psychol 2019 Dec 13;10. [doi: 10.3389/fpsyg.2019.02843]
5. Bawa P. Using Kahoot to Inspire. J Educ Technol Syst 2018 Oct 25;47(3):373-390. [doi: 10.1177/0047239518804173]
6. Harrelson P. 724 Methods of daily student engagement in an introductory level animal science course. J Anim Sci 2017 Aug 01;95(suppl_4):352-353. [doi: 10.2527/asasann.2017.724]
7. Liu X. Motivation, learning strategies, and language competency in a technology facilitated Chinese as a second language classroom. Chinese Language Teaching Methodology and Technology 2017;1:1 [FREE Full text]
8. Lee C, Hao Y, Lee KS, Sim SC, Huang C. Investigation of the effects of an online instant response system on students in a middle school of a rural area. Comput Hum Behav 2019 Jun;95:217-223. [doi: 10.1016/j.chb.2018.11.034]

Abbreviations

GPA: grade point average

Edited by G Eysenbach; submitted 28.07.20; peer-reviewed by C Pornrattanamaneewong, P Kulalert; comments to author 21.08.20; revised version received 02.09.20; accepted 13.04.21; published 29.04.21.

Please cite as:
Yuenyongviwat V, Bvonpanttarananon J
Using a Web-Based Quiz Game as a Tool to Summarize Essential Content in Medical School Classes: Retrospective Comparative Study
JMIR Med Educ 2021;7(2):e22992
URL: https://mededu.jmir.org/2021/2/e22992
doi:10.2196/22992
PMID:33913813

Original Paper

Application of the Inverted Classroom Model for Teaching Pathophysiology to Chinese Undergraduate Medical Students: Usability Study

Hui Lin[1], PhD; Xiaoping Zeng[1], PhD; Jun Zhu[1], MD; Zhenzhen Hu[1], PhD; Ying Ying[1], PhD; Yonghong Huang[1], PhD; Hongmei Wang[1], PhD

Department of Pathophysiology, School of Basic Medicine Sciences, Nanchang University, Nanchang, China

Corresponding Author:
Hongmei Wang, PhD
Department of Pathophysiology, School of Basic Medicine Sciences
Nanchang University
461 Bayi Avenue
Nanchang, 33006
China
Phone: 86 13767004966
Email: wanghongmay@hotmail.com

Abstract

Background: The inverted classroom model differs from the traditional teaching model as it reverses the pattern of knowledge transfer and internalization. In recent years, this new teaching model has received much attention in undergraduate medical education. Pathophysiology is a course in the undergraduate Chinese medical curriculum that is critical in bridging basic medical science and clinical medicine.

Objective: The purpose of this study was to investigate the application of inverted classroom in delivering the course on pathophysiology to Chinese undergraduate medical students.

Methods: In the spring semester of 2018, inverted classroom teaching was implemented for second-year clinical medicine students at the College of Medicine at Nanchang University. The topics of hypoxia and respiratory failure were selected for the inverted classroom study. The effect of the inverted classroom on teaching pathophysiology was evaluated using classroom performance metrics, a final examination, and questionnaires.

Results: This study found that students in the inverted classroom group achieved higher scores in their in-course assessments (82.35 [SD 11.45] vs 81.33 [SD 9.51], respectively) and in their final exams (73.41 [SD 10.37] vs 71.13 [SD 11.22], respectively) than those in the traditional lecture-based group, but the scores were not significantly different (P=.13, unpaired two-tailed t test). There was also no significant difference in the distribution of the score segments in the class quiz (P=.09, chi-square test) and in the final exams (P=.25, chi-square test) between the 2 groups. Further, most of the students reported that the inverted classroom increased their learning motivation, made them more confident, and helped them understand the content on pathophysiology better. The students in the inverted classroom also improved in their problem-solving skills and teamwork abilities. However, some students from the inverted classroom group also reported that the self-learning and preparatory work before class increased their learning burden.

Conclusions: This study shows the feasibility and promise of inverted classroom for teaching pathophysiology to undergraduate Chinese medical students. The inverted classroom improves students' learning interests and attitudes toward learning. However, further studies are required to assess the benefits of broader acceptance and implementation of the inverted classroom among Chinese undergraduate medical students.

(JMIR Med Educ 2021;7(2):e24358) doi:10.2196/24358

KEYWORDS

pathophysiology; inverted classroom; teaching reform; questionnaire; medical education; undergraduate

Introduction

The inverted classroom is a pedagogical approach in which students study all the necessary class learning content through educational videos and web-based lectures prior to class [1]. In class, the students and an instructor complete the homework questions and participate in collaborative inquiry and interactive communication such as group presentations and discussions. This teaching model subverts the traditional lecture-based instruction with the principle of “teachers in class, homework after class” [2]. The inverted classroom has become the new teaching model, which is widely accepted around the world, including in undergraduate medical education. The application of the inverted classroom has been described in a wide range of disciplines such as medicine, anatomy, nursing, dentistry, and physiology [1,3-7]. The inverted classroom has several key elements that distinguish it from the traditional teaching model [8-10]. First, the teaching concept is inverted from teacher-centered teaching to student-centered learning, where students engage in active self-learning and instructors provide targeted individual guidance [11-13]. Second, the inverted classroom flips the teaching process, wherein students study new knowledge before class. In class, students engage in group collaborative learning and instructors answer questions, which helps students master content knowledge [14]. The inverted classroom also flips the teaching role. Students become independent learners and the instructor provides resources and organizes classroom activities. The instructor is also responsible for providing individualized guidance and answering questions [15]. In addition, the inverted classroom makes full use of web-based teaching resources and databases for online and offline mixed teaching [16].

The Nanchang University Medical College is a middle-level college that recruits hundreds of medical students each year and has many classes. Pathophysiology is an essential basic course in medical education. It involves the study of etiology, pathogenesis, and metabolic and functional changes in disease. Pathophysiology acts as a bridge course connecting basic medicine and clinical medicine courses [17,18]. Pathophysiology teaching outcomes have a nonnegligible effect on the cultivation of medical students’ clinical ability [19]. However, many problems have been encountered during the traditional mode of pathophysiology education, which relies only on didactic lectures and students’ collective listening in our medical college. The traditional mode of teaching pathophysiology does not stimulate students’ interest or their explorative and innovative thinking and there is insufficient interaction between students and teachers. In addition, based on previous experiences, many medical students found that traditional lecture-based pathophysiology courses were boring and the pathophysiology courses were difficult to focus on.

Currently, the number of high-quality web-based teaching resources is increasing in China. Specifically, the Massive Open Online Course of China and the Zhihuishu website offer free courses, and both these websites provide resource support for the application of the inverted classroom [20]. Our teaching team has many years of experience in teaching with multimedia and has launched many web-based teaching courses. Moreover, students’ learning abilities are improving and their learning styles are becoming increasingly diverse. These factors have laid a solid foundation for the implementation of the inverted classroom for pathophysiology education. Thus, the inverted classroom as a new teaching model could be an effective strategy for teaching pathophysiology. To test this possibility, we explored the feasibility and effectiveness of the inverted classroom for teaching pathophysiology.

Methods

Subjects and Ethical Approval

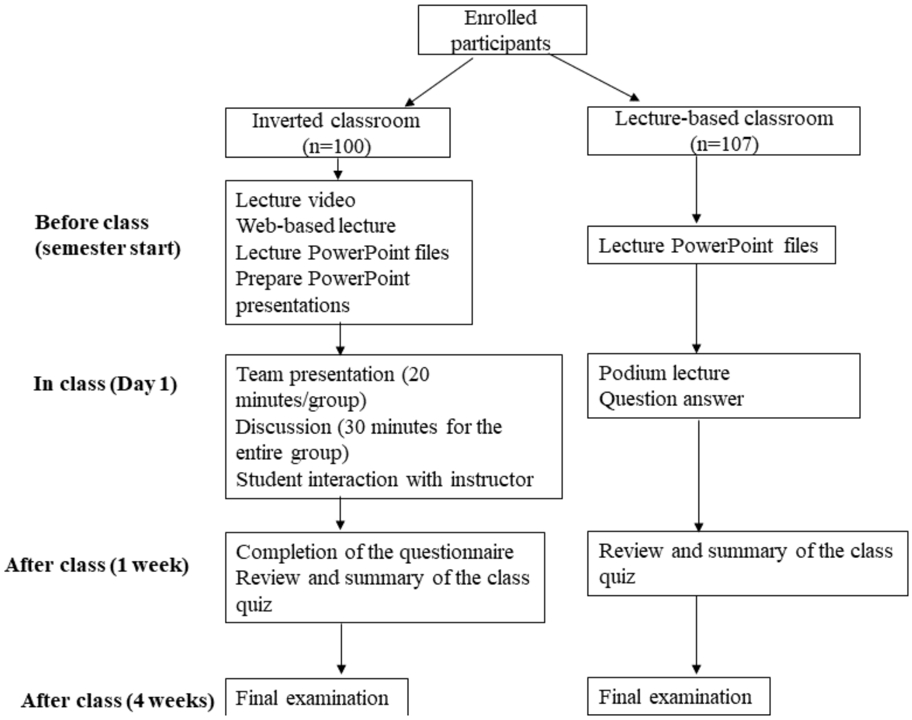
This study was conducted at the College of Medicine at Nanchang University, China; 207 second-year (2017/2018 academic year) students majoring in clinical medicine registered for the pathophysiology course and participated in this study. In their first year, students completed pathology, human anatomy, histology-embryology, medical biology, biochemistry, medical microbiology, parasitology, immunology, genetics, and physiology courses. The final examination scores of the students in these courses were not significantly different. During this study, students studied pathoanatomy, pathophysiology, and pharmacology and had not participated in inverted classrooms before. Students were randomly divided into an inverted classroom group (n=100) and a control group (traditional lecture-based classroom, n=107). The age of the students ranged from 19 to 21 years. There was no difference in the admission scores between the 2 groups. The students’ learning levels and abilities were nearly equal. All students submitted their informed consent before this study, and this study was approved by the Committee of Nanchang University (NCUJGLX-16-86). Completion of the survey was considered implied consent of participation and students’ participation in the survey was optional.

Curriculum Description and Study Design

The eighth edition of Pathophysiology published by People’s Medical Publishing House and edited by Wang Jianzhi and Qian Ruizhe was used for this course [21]. Two sections of the textbook were selected to implement an inverted classroom for this study, namely, hypoxia and respiratory failure. These topics were selected based on feedback from a previous study and the student questionnaire. The hypoxia section consisted of 3 lectures, which covered the classification, etiology, and mechanisms of hypoxia; metabolic and functional alterations in the body; and the prevention and treatment of hypoxia. The respiratory failure section consisted of 4 lectures, which covered the classification, etiology, and pathogenesis of respiratory failure; metabolic and functional alterations in the body; and the prevention and treatment of respiratory failure. Hypoxia and respiratory failure are associated with each other, thereby making these topics easy for students to prepare and implement in an inverted classroom.

In the inverted classroom group (Figure 1), the students were divided into small teams with 7 students per team. For the preclass student preparation, the instructors provided study materials such as web-based lectures (videos), PowerPoint lectures, teaching requirements and objectives, knowledge points, and the materials from the chapters according to the syllabus requirements. The web-based videos included hypoxia and respiratory failure sections, which had been recorded by the faculty in the department and were provided through the Massive Open Online Course of China. Each team had to watch the lecture and prepare a PowerPoint presentation (20 minutes) for in-class discussion. The assignment was posted 1 week before the class. The class started with a brief review and an outline of the lecture by the instructor. Each team made a presentation to introduce the lecture concepts and pose questions. After all the teams completed their presentations, each team answered questions and discussed them for 30 minutes. The instructor also joined the discussion and summarized the concepts at the end. For the traditional lecture-based classroom (Figure 1), the instructor gave a podium-style lecture about hypoxia and respiratory failure. Additionally, the students in this group were also encouraged to watch the web-based lectures and preview the 2 sections.

Figure 1. Flow diagram illustrating the inverted classroom and traditional lecture-based classroom models.



Statistical Analysis

After the class, the knowledge of the students in both the groups was tested on hypoxia and respiratory failure with a quiz to evaluate their performance. A web-based questionnaire using Questionnaire Star was used to collect data on students' feedback about the inverted classroom. In addition, the students' performance was compared based on their final exam scores. All statistical analyses were performed using GraphPad Prism 9 statistical software. Students' scores in the quiz and final examination were compared between inverted classrooms and traditional classrooms by using the unpaired two-tailed *t* test. The distribution of the score segments (<60, 60-69, 70-79, 80-89, 90-100) of the 2 groups was determined using the chi-square test. Results were considered significant at $P<.05$.

Results

Quiz Findings

To evaluate the students' performance, a quiz on hypoxia and respiratory failure was administered immediately after the class. The students in the inverted classroom group received higher scores (82.35 [SD 11.45]) than those in the traditional lecture-based group (81.33 [SD 9.51]), but the difference in the scores was not statistically significant (unpaired two-tailed *t* test, $P=.50$, Figure 2A). Scores were divided into 5 score segments as outlined in Figure 2B. The score distributions in the 2 groups were compared and no statistically significant difference was found in the score segment distribution ($P=.09$, inverted classroom group vs control group, chi-square test). The proportions of students in the inverted class in the 5 performance segments were as follows: 6.0% (6/100, score <60), 8.0% (8/100, score=60-69), 16.0% (16/100, score=70-79), 43.0% (43/100, score=80-89), and 27.0% (27/100, score=90-100). The proportions of the students in the control class in the 5 performance segments were as follows: 4.7% (5/107, score<60), 4.7% (5/107, score 60-69), 16.8% (18/107, score 70-79), 58.9% (63/107, score 80-89), and 14.9% (16/107, score 90-100). The data showed that the proportion of students in the inverted class with scores between 90 and 100 was 12.1% higher than that in the control class. However, the proportion of students in the inverted class with scores between 80 and 89 was 15.6% lower than that in the control class. Then, the final examination scores between the 2 groups were compared. The results showed that the average score of the students in the inverted classroom group (73.41 [SD 10.37]) was higher than that of the students in the traditional lecture-based group (71.13 [SD 11.22], unpaired two-tailed *t* test, $P=.13$, Figure 3A), but this difference was not statistically significant. Moreover, the scores of the students were divided into 5 score segments (Figure 3B) and the distribution was not found to be statistically different ($P=.25$, inverted classroom group vs control group, chi-square test).

However, we found that the proportion of students in the inverted class with scores between 80-89 and 90-100 was 11% and 2% higher than that in the control class, respectively. This finding suggests that students in the inverted classroom group received higher scores than those in the control class group.

Figure 2. A. Comparison of students' test scores in class quiz in the control and inverted classroom groups. An unpaired two-tailed *t* test was used to compare the differences between the 2 groups (*P*=.49). B. Students' grades in the class quiz divided into 5 segments with the proportion of students in each segment.

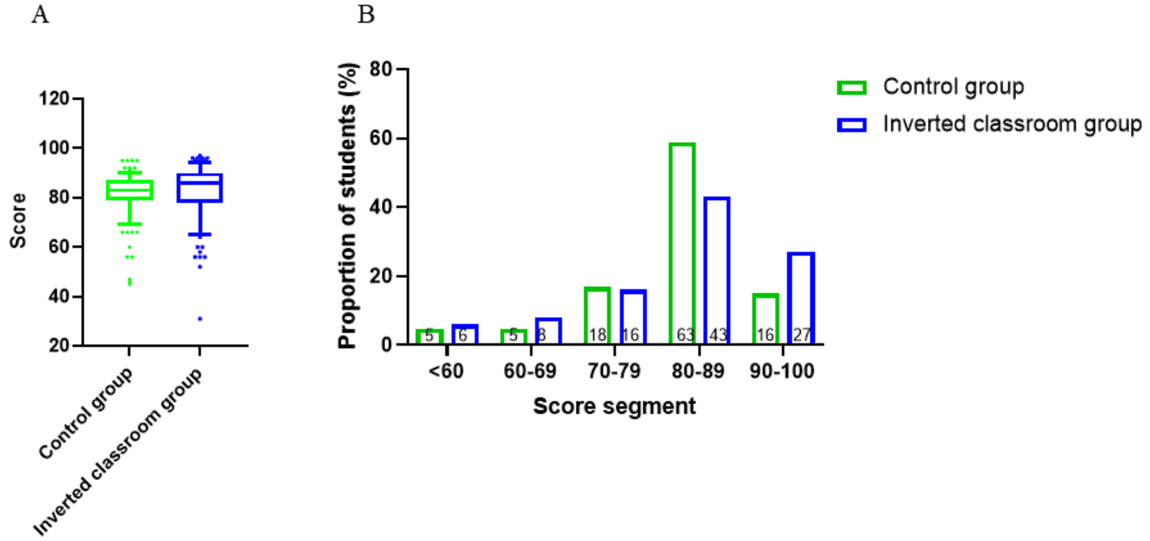
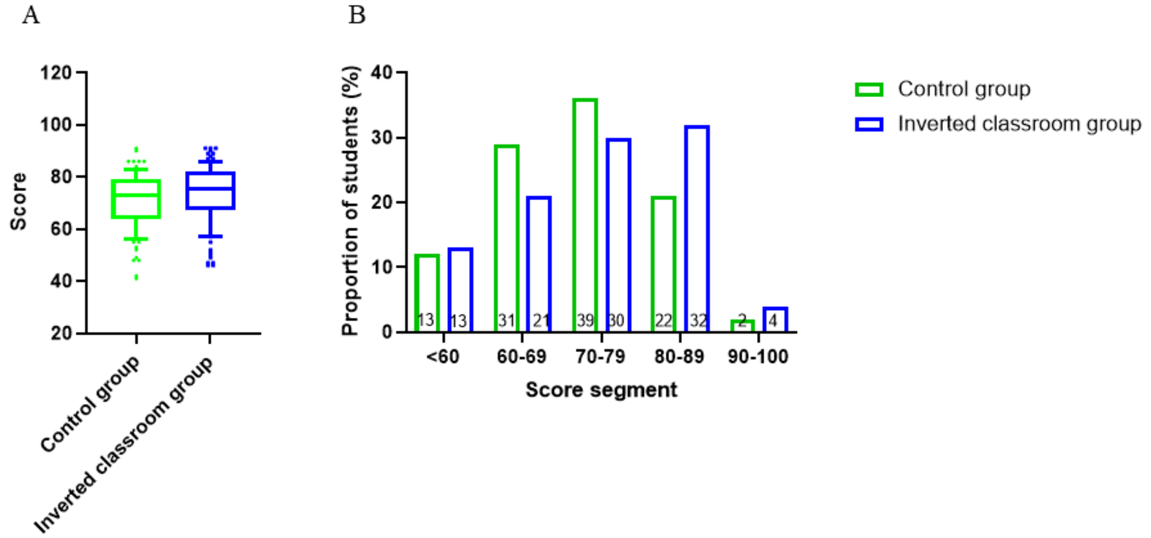


Figure 3. A. Comparison of students' test scores in the final exam in the control and inverted classroom groups. An unpaired two-tailed *t* test was used to compare the differences between the 2 groups (*P*=.13). B. Students' grades in the final exam divided into 5 segments with the proportion of students in each segment.



Questionnaire Analysis

To evaluate the students' attitudes toward and the perspectives of the inverted classroom mode, a web-based survey was administered to the inverted classroom group at the end, and 98 responses were collected. The survey results showed that most students believed that the inverted classroom model increased their opportunities for interactions with their classmates and teachers (Table 1); however, some students noted that a few students did not actively participate in team learning and discussions. Moreover, the survey results showed that the inverted classroom stimulated students' interests and enabled them to have a better grasp of the course content. The inverted classroom improved the students' self-learning and problem-solving abilities. In addition, the inverted classroom improved the quality of teaching and study. Finally, the students also proposed the following constructive suggestions: (1) considering the limited time of students, the instructor should coordinate with instructors of other subjects before conducting the inverted classroom; (2) students should be provided more preparation time; (3) the time for group presentations and discussions immediately after the presentations should be extended, (4) the instructor should resummarize the course content so that the students can better the master course content; and (5) social media such as WeChat and QQ groups should be used to discuss questions during the study, which would also improve interactions with classmates and instructors.

Table 1. Perceptions of the medical students toward the inverted classroom model on selected topics (n=98).

Questions, responses	Values
The traditional teacher-led classroom style guarantees teaching efficiency.	
Agree	49
Neutral	41
Disagree	5
Hard to say	3
The learning style of inverted classroom is very helpful for studying the topics.	
Agree	29
Neutral	43
Disagree	26
The inverted classroom has a positive or negative impact on you.	
Positive, active, and more effective	59
Negative, unable to concentrate	39
The inverted classroom has improved self-active study.	
Yes	76
No	22
Can inverted classroom increase your motivation for learning?	
Agree	62
Disagree	36
Does the self-study before class in the inverted classroom increase your learning burden?	
Yes	39
No	59
In class, can your questions be solved?	
Yes	12
Some are resolved	84
No, not at all	2
The reason for being unable to complete the assignment.	
Not enough time	52
Do not know	52
Do in class	35
Other	10
In self-study, what do you think is most helpful to you?	
Textbook analysis	75
Video lecture	48
Portal learning	34
Others	5
Can you use the time after class to complete the self-study goals assignment?	
Yes	33
Some	35
Finish after required	30
How do you think the inverted classroom contributes to your learning aid?	
Self-learning after class	52
Problem-solving in class	46

Discussion

Principal Findings

The student-centered inverted classroom has been widely used in medical education and is one of the teaching reform models currently being implemented in college [22-24]. In an inverted classroom, students are encouraged to spend their spare time learning and improving their learning efficiency. The inverted classroom also allows students to seek answers based on questions raised during their studies [25]. Moreover, students can develop individual learning plans according to their unique situations, which aids learning efficiency and better academic performance [26,27]. To provide a new teaching model for the pathophysiology course and to promote the development of pathophysiology education, we designed a relatively complete teaching scheme based on the inverted classroom model for the hypoxia and respiratory failure sections of the pathophysiology course. By implementing the inverted classroom, classroom quiz, questionnaire, and final exam, we found that students' performance increased in terms of their abilities and interests, their best efforts, and their presentation of content in the classroom. Collectively, the inverted classroom for pathophysiology education not only strengthened mutual assistance and solidarity among students but also enhanced the interactions between teachers and students.

In the implementation process, we also identified some issues: (1) in group discussion and preparations, the group leaders performed most of the work rather than each student contributing to the team work, (2) students only studied the materials provided by the teacher and did not search for additional supplementary materials, (3) some students with less active learning styles did not study sufficiently before class and did not perform well in the classroom, and (4) some students complained that there were too many courses undergoing teaching reforms; therefore, it took a substantial amount of time to prepare for their classes, which increased their learning burden. Therefore, the student-centered inverted classroom should establish new requirements for student learning, including student learning initiatives and the rational use of learning resources such as media, internet, and electronic books. In this way, students can obtain more knowledge and stimulate their interest and motivation. In inverted classrooms, the student's self-learning ability is strengthened and the knowledge is more effectively retained, as shown by the high scores in the class quiz and final exams. In inverted classrooms, students must pay attention in class as they are actively participating in the presentations and discussions. In contrast, in traditional classrooms, the instructor gives lectures and students are prone to inattention and distraction, with less time for discussion.

The application of the inverted classroom teaching model also introduces additional requirements for instructors. Pathophysiology is an important bridge between basic medicine and clinical medicine. Instructors should be familiar with the entire curriculum system, apply a holistic approach, connect knowledge points in tandem, and guide students in learning the content of each chapter. For instance, hypoxemia occurs in respiratory failure, which also leads to acid-base balance disorders. In addition, instructors should pay attention to the links between various disciplines. To study pathophysiology, students should have knowledge of the normal human body, functions, and metabolism from the point of view of physiology and biochemistry.

Strengths of This Study

The inverted classroom breaks the traditional classroom "teaching-learning" model and effectively compensates for some of the shortcomings of the undergraduate teaching model. This teaching model can improve the quality of pathophysiology education, fulfill the needs of students, and bring medical classroom learning closer to clinical practice. This teaching model inspires students' innovative thinking and cultivates medical talent with high learning ability. The development of an inverted classroom in pathophysiology is conducive to improving a student's self-study ability. Students master not only the knowledge but also the methods of obtaining knowledge, which can better bridge the transition from basic medicine to clinical medicine.

Limitations of This Study

This study had the following limitations. First, the number of students in this study was relatively small. We could have obtained more convincing conclusions from this study had an inverted classroom been conducted with more students. Second, since other courses (apart from pathophysiology) were also taught using the inverted classroom model, the burden of the students increased during this study. In addition, students had only 4 weeks to review and then take the final exam after the course ended. Other factors such as independent study may have also affected the results. Third, we selected only 2 topics in the pathophysiology course for the inverted classroom.

Conclusion

We are still in the preliminary stage of applying student-centered inverted classrooms in teaching pathophysiology. The extensive implementation of inverted classrooms requires further research and exploration. The inverted classroom can provide a new teaching model for pathophysiology and other clinical medicine majors and promote the quality of teaching and the development of curriculums in pathophysiology.

Acknowledgments

We thank all the students for their active participation in this study. This work was supported by grants from Nanchang University (NCUJGLX-16-86).

Authors' Contributions

HL and HW wrote the manuscript and provided data. XZ, JZ, YY, ZH, and YH participated in the inverted classroom. All authors read and approved the final manuscript.

Conflicts of Interest

None declared.

References

1. Xu P, Chen Y, Nie W, Wang Y, Song T, Li H, et al. The effectiveness of a flipped classroom on the development of Chinese nursing students' skill competence: A systematic review and meta-analysis. Nurse Educ Today 2019 Sep;80:67-77. [doi: 10.1016/j.nedt.2019.06.005] [Medline: 31279251]
2. Persky AM, McLaughlin JE. The Flipped Classroom - From Theory to Practice in Health Professional Education. Am J Pharm Educ 2017 Aug;81(6):118 [FREE Full text] [doi: 10.5688/ajpe816118] [Medline: 28970619]
3. Chutinan S, Riedy CA, Park SE. Student performance in a flipped classroom dental anatomy course. Eur J Dent Educ 2018 Aug;22(3):e343-e349. [doi: 10.1111/eje.12300] [Medline: 29120528]
4. Li S, Liao X, Burdick W, Tong K. The Effectiveness of Flipped Classroom in Health Professions Education in China: A Systematic Review. J Med Educ Curric Dev 2020;7:2382120520962838 [FREE Full text] [doi: 10.1177/2382120520962838] [Medline: 33110941]
5. Li B, Cao N, Ren C, Chu X, Zhou H, Guo B. Flipped classroom improves nursing students' theoretical learning in China: A meta-analysis. PLoS One 2020;15(8):e0237926 [FREE Full text] [doi: 10.1371/journal.pone.0237926] [Medline: 32853214]
6. Boruff R. Nursing Students Choose Their Own Role in a Flipped Classroom Approach. J Nurs Educ 2018 Jul 01;57(7):450. [doi: 10.3928/01484834-20180618-13] [Medline: 29958318]
7. Quoß M, Rüttermann S, Gerhardt-Szep S. Cross-year peer-assisted learning using the inverted ("flipped") classroom design: A pilot study in dentistry. Z Evid Fortbild Qual Gesundhwes 2017 Oct;126:84-93. [doi: 10.1016/j.zefq.2017.07.007] [Medline: 29029969]
8. Wu J, Chi S, Wu C, Kang Y. Helps from flipped classroom in learning suturing skill: The medical students' perspective. PLoS One 2018;13(10):e0204698 [FREE Full text] [doi: 10.1371/journal.pone.0204698] [Medline: 30278060]
9. Rotellar C, Cain J. Research, Perspectives, and Recommendations on Implementing the Flipped Classroom. Am J Pharm Educ 2016 Mar 25;80(2):34 [FREE Full text] [doi: 10.5688/ajpe80234] [Medline: 27073287]
10. Pickering JD, Roberts DJH. Flipped classroom or an active lecture? Clin Anat 2018 Jan;31(1):118-121. [doi: 10.1002/ca.22983] [Medline: 28857269]
11. Ramnanan CJ, Pound LD. Advances in medical education and practice: student perceptions of the flipped classroom. Adv Med Educ Pract 2017;8:63-73 [FREE Full text] [doi: 10.2147/AMEP.S109037] [Medline: 28144171]
12. Tolks D, Schäfer C, Raupach T, Kruse L, Sarikas A, Gerhardt-Szép S, et al. An Introduction to the Inverted/Flipped Classroom Model in Education and Advanced Training in Medicine and in the Healthcare Professions. GMS J Med Educ 2016;33(3):Doc46 [FREE Full text] [doi: 10.3205/zma001045] [Medline: 27275511]
13. Yousaf A, Li A. Utilizing research findings in medical education: The testing effect within an flipped/inverted biochemistry classroom. Med Teach 2020 Jun;42(6):716. [doi: 10.1080/0142159X.2019.1669780] [Medline: 31580729]
14. McLaughlin JE, Roth MT, Glatt DM, Gharkholonarehe N, Davidson CA, Griffin LM, et al. The flipped classroom: a course redesign to foster learning and engagement in a health professions school. Acad Med 2014 Feb;89(2):236-243 [FREE Full text] [doi: 10.1097/ACM.0000000000000086] [Medline: 24270916]
15. Tan N, Bavadian N, Lyons P, Lochhead J, Alexander A. Flipped Classroom Approach to Teaching a Radiology Medical Student Clerkship. J Am Coll Radiol 2018 Dec;15(12):1768-1770. [doi: 10.1016/j.jacr.2018.07.017] [Medline: 30340999]
16. Telford M, Senior E. Healthcare students' experiences when integrating e-learning and flipped classroom instructional approaches. Br J Nurs 2017 Jun 08;26(11):617-622. [doi: 10.12968/bjon.2017.26.11.617] [Medline: 28594611]
17. Islam MA, Sabnis G, Farris F. The trilayer approach of teaching physiology, pathophysiology, and pharmacology concepts in a first-year pharmacy course: the TLAT model. Adv Physiol Educ 2017 Sep 01;41(3):395-404 [FREE Full text] [doi: 10.1152/advan.00047.2017] [Medline: 28679578]
18. Li Y, Li K, Yao H, Xu X, Cai Q. Reform in teaching preclinical pathophysiology. Adv Physiol Educ 2015 Dec;39(4):254-258 [FREE Full text] [doi: 10.1152/advan.00165.2014] [Medline: 26628645]
19. Kovac Z. Beijing declaration on medical pathophysiology education. Adv Physiol Educ 2007 Dec;31(4):387-388 [FREE Full text] [doi: 10.1152/advan.00062.2007] [Medline: 18057419]
20. Chen B, Fan Y, Zhang G, Liu M, Wang Q. Teachers' networked professional learning with MOOCs. PLoS One 2020;15(7):e0235170 [FREE Full text] [doi: 10.1371/journal.pone.0235170] [Medline: 32614843]
21. Wang JR. Pathophysiology (8th edition). Beijing, China: People's Medical Publishing House; 2013.
22. Han E, Klein KC. Pre-Class Learning Methods for Flipped Classrooms. Am J Pharm Educ 2019 Feb;83(1):6922 [FREE Full text] [doi: 10.5688/ajpe6922] [Medline: 30894772]

23. Schneider A, Kühl M, Kühl SJ. Utilizing research findings in medical education: The testing effect within a flipped/inverted biochemistry classroom. Med Teach 2019 Nov;41(11):1245-1251. [doi: 10.1080/0142159X.2019.1628195] [Medline: 31282246]
24. Rehman R, Hashmi S, Akbar R, Fatima SS. Teaching "Shock Pathophysiology" by Flipped Classroom: Views and Perspectives. J Med Educ Curric Dev 2020;7:2382120520910853 [FREE Full text] [doi: 10.1177/2382120520910853] [Medline: 32166116]
25. Hew KF, Lo CK. Flipped classroom improves student learning in health professions education: a meta-analysis. BMC Med Educ 2018 Mar 15;18(1):38 [FREE Full text] [doi: 10.1186/s12909-018-1144-z] [Medline: 29544495]
26. Potaliya P, Ghatak S. Enhancing Student Centered Active-Learning by "Flipped Classrooms" In a Histology Module. Mymensingh Med J 2020 Jul;29(3):684-690. [Medline: 32844812]
27. McLean S, Attardi SM, Faden L, Goldszmidt M. Flipped classrooms and student learning: not just surface gains. Adv Physiol Educ 2016 Mar;40(1):47-55 [FREE Full text] [doi: 10.1152/advan.00098.2015] [Medline: 26847257]

Edited by G Eysenbach; submitted 15.09.20; peer-reviewed by P Kanzow, M Rosly, C Mace; comments to author 03.12.20; revised version received 23.01.21; accepted 17.04.21; published 18.06.21.

Please cite as:
Lin H, Zeng X, Zhu J, Hu Z, Ying Y, Huang Y, Wang H
Application of the Inverted Classroom Model for Teaching Pathophysiology to Chinese Undergraduate Medical Students: Usability Study
JMIR Med Educ 2021;7(2):e24358
URL: https://mededu.jmir.org/2021/2/e24358
doi:10.2196/24358
PMID:34142976

Original Paper

Using a Scenario-Based Approach to Teaching Professionalism to Medical Students: Course Description and Evaluation

James Ashcroft[1], MSc, MRes, MBChB, MRCS; Patrick Warren[1], BA; Thomas Weatherby[1], BA, MB BChir; Stephen Barclay[1], MA, MSc, BM BCh, MD, FRCGP; Laurence Kemp[1], MA, MSc, MB BChir, MRCGP, FRACGP, DRCOG, PGCertMedEd; Richard Justin Davies[1], MA, MB MChir, FRCS, LRCP, FEBS(Coloproctology); Catherine Elizabeth Hook[1], MA, MSc, MB BChir, FRCPath, PhD; Elizabeth Fistein[1], BSc, MA, MBBS, FRCPsych, PhD, PGDipLaw; Elizabeth Soilleux[1], MA, MB BChir, FRCPath, PhD, PGDipMedEd

University of Cambridge, Cambridge, United Kingdom

Corresponding Author:
Elizabeth Soilleux, MA, MB BChir, FRCPath, PhD, PGDipMedEd
University of Cambridge
Department of Pathology
Tennis Court Road
Cambridge, CB2 1QP
United Kingdom
Phone: 44 1223 336916
Fax: 44 1223 333346
Email: ejs17@cam.ac.uk

Abstract

Background: Doctors play a key role in individuals' lives undergoing a holistic integration into local communities. To maintain public trust, it is essential that professional values are upheld by both doctors and medical students. We aimed to ensure that students appreciated these professional obligations during the 3-year science-based, preclinical course with limited patient contact.

Objective: We developed a short scenario-based approach to teaching professionalism to first-year students undertaking a medical course with a 3-year science-based, preclinical component. We aimed to evaluate, both quantitatively and qualitatively, student perceptions of the experience and impact of the course.

Methods: An interactive professionalism course entitled Entry to the Profession was designed for preclinical first-year medical students. Two scenario-based sessions were created and evaluated using established professionalism guidance and expert consensus. Quantitative and qualitative feedback on course implementation and development of professionalism were gathered using Likert-type 5-point scales and debrief following course completion.

Results: A total of 70 students completed the Entry to the Profession course over a 2-year period. Feedback regarding session materials and logistics ranged from 4.16 (SD 0.93; appropriateness of scenarios) to 4.66 (SD 0.61; environment of sessions). Feedback pertaining to professionalism knowledge and behaviors ranged from 3.11 (SD 0.99; need for professionalism) to 4.78 (SD 0.42; relevance of professionalism). Qualitative feedback revealed that a small group format in a relaxed, open environment facilitated discussion of the major concepts of professionalism.

Conclusions: Entry to the Profession employed an innovative approach to introducing first-year medical students to complex professionalism concepts. Future longitudinal investigations should aim to explore its impact at various stages of preclinical, clinical, and postgraduate training.

(JMIR Med Educ 2021;7(2):e26667) doi:10.2196/26667

KEYWORDS

medical education; curriculum; training; professionalism

Introduction

The medical profession is an ancient profession, whose members are regarded as important and respected members of society. Doctors play a key role in many aspects of individuals' lives, with a more holistic integration into society than simply as those who can diagnose and treat disease. Individuals entrust doctors with information that they might tell no one else and are prepared, as relevant, to be subjected to intimate examinations by them. It follows that the doctor must show exemplary conduct to justify this level of trust and respect. Because public trust in doctors and the regulation and accountability of the profession is vital for the effective practice of medicine, core professional values must be upheld, not only by those who are qualified, but also by medical students. Unprofessional behavior at medical school is associated with early academic difficulties [1], unsatisfactory progress [2], and poor clinical performance [3] and predicts subsequent serious misconduct among practitioners [4].

The UK General Medical Council, Medical Schools Council, and British Medical Association have provided relatively extensive guidance about the responsibilities of medical students with respect to professional behavior [5]. Much of what is formally taught in medicine is about the knowledge, skills, and behaviors required of a physician, including how to express compassion and respect for patients at the bedside [6]. Every year, concern is raised about the conduct of medical students, with a small number refused provisional registration to practice [7]. In 2016, 13% of applications for provisional registration with the General Medical Council from final year medical students included declarations about fitness to practice issues, although the majority of applications were ultimately successful [8].

Given the potentially profound implications of professional misconduct, a proactive approach from the beginning of the medical course might be preferable over waiting to redress problems that have already occurred. Formal methods have previously been considered for the delivery of the professionalism curriculum. In the traditional view of medicine, there is a dominant testing culture heavily influenced by behaviorist learning theory, belief in objective and standardized testing, and separation of testing from instruction [9,10]. This perspective has allowed conceptualization of professionalism as correct or desirable character traits or behaviors and has been useful in developing summative tools for assessment of progression. A recent shift toward a constructivist learning paradigm based on intersubjectivity instead of classical objectivity accepts that professionalism is not a stable construct that can be isolated, taught, and assessed but a set of sophisticated and socially constructed competencies that can be taught and refined over a lifetime [11,12]. An extension of this concept is the development of vignettes or scenarios to enable reflection on realities of professionalism as enacted in practice. Several studies have successfully used standardized professional dilemmas to explore how students conceptualize appropriate or inappropriate behavior and how they come to decisions about how they might act [13-17]. Vignettes or scenarios relating to professionalism have also been used very successfully for postgraduate clinical trainees in ophthalmology [18] and pathology [19]. However, no previous studies have undertaken early professionalism in undergraduate medical students prior to clinical experience, which is the case for a traditional preclinical medical school curriculum in the United Kingdom. Traditional preclinical medical students here undertake a scientific preclinical course of study involving minimal patient contact or clinical experience, and they are surrounded by students studying a wide range of other subjects. In many ways, this is a positive aspect of their student experience, but there is a risk that students do not identify as future medical professionals and so become involved in behaviors at odds with their fitness to practice obligations.

Applying the aforementioned principles has allowed for the development of a short course described in this report with the aim of ensuring that all first-year preclinical medical students understand their obligations with respect to professional conduct. This is the first report of professionalism training in this unique cohort preceding all clinical patient interaction.

Methods

Design and Setting

A session-based short course was developed and incorporated into the first year of undergraduate medical training at the School of Clinical Medicine, University of Cambridge, United Kingdom. Key areas of concern for student fitness to practice were identified through adaptation of previously published professional competences defined in medical practice [20,21], guidance from the General Medical Council on professional behavior and fitness to practice [5], and expert opinion from clinical educators and mentors.

Two 90-minute sessions each dealing with 3 areas of concern were designed by experienced clinical educators working with senior medical students with experience in a range of clinical environments to increase both authenticity and peer impact (Textbox 1).

Textbox 1. Entry to the profession: facilitator's guide.

Learning objectives

- By the end of this activity, learners will be able to perform the following:
  - Describe fundamental principles of medical professionalism
  - Apply standards of professionalism to their day-to-day lives as undergraduate medical students
  - Begin to recognize professionalism problems that could arise in a medical setting

Introduction

- Learners are informed about the professionalism training and give informed consent to participate

Initial meeting

- Course structure is explained, and participants are introduced to facilitators and individual groups

Room plan

- Each session takes place in an open university room allowing for engagement within a circle seating arrangement

Session 1 topics

- Interacting with professional colleagues (issues: academic bullying, confidentiality, whistle blowing, public confidence in the profession)
- Respecting colleagues (issues: lying, respect for colleagues, racism, sexism, competence/patient safety, team working)
- Maintaining professional behavior in all aspects of life (issues: alcohol, lying, respect for colleagues, racism, competence/patient safety, sexual consent)

Session 2 topics

- Health and probity (issues: alcohol/addiction, lying, mental health)
- Photos and communication (issues: confidentiality and probity, respect for colleagues and patients, consent for use of publication of photographic material)
- Presentation and conduct (issues: appearance, sphere of competence, data protection)

Debrief

- Participants undertake debrief conducted by facilitators of varying experiences that encourages reflection on the conversation topics

Participant evaluation

- Postsimulation questionnaire and open-ended interview explore participant experiences

Each area of concern was introduced with a hard-hitting scenario involving a qualified doctor doing something that is obviously wrong. Following this introductory scenario, 3 more nuanced scenarios were presented probing related topics. These additional scenarios were more pertinent to medical students and facilitated more thoughtful discussion than a simple comment that what was occurring was clearly inappropriate. In total, each session comprised 12 scenarios divided into 4 groups, each thematically associated with one of the introductory scenarios relating to qualified doctors. To ensure active or experiential learning, students were provided with scenarios/vignettes to read prior to each session (Multimedia Appendix 1). Discussions were centered on judgments about whether conduct was appropriate or inappropriate and how the individuals depicted in the scenarios might have behaved more professionally.

Participants

A total of 70 first-year medical students attended the short course as a mandatory component of their undergraduate course. In order to maximize participation within groups, students were divided into groups of 3 to 4 with each group being guided by a facilitator. Clinical facilitators from medical, surgical, clinical laboratory, and primary care specialties with varying backgrounds and senior clinical medical students were recruited and trained in facilitating the course and debriefing. We sought to maximize student perceptions of the applicability of professionalism to all aspects of their lives and not just those associated with lectures, practical classes, small group teaching sessions, and other aspects of academic learning. Accordingly, the sessions were contextualized by running them in an informal and nonthreatening evening setting with refreshments being included (Multimedia Appendix 2). Facilitators could read the scenarios in advance and discuss them with the course lead, who could direct them to relevant documents, particularly the General Medical Council, British Medical Association, and Medical Defense Union publications referred to in this article [5,7,22]. Facilitators were debriefed at the end of the session and could make suggestions for improving the material and raise any concerns about the course material or the attitude of any particular student.

Data Collection

Small focus groups have been demonstrated to stimulate debate and insightful thoughts and encourage interactions key for data collection [23]. Anonymous feedback was collected from students in a quantitative and qualitative approach to gain insights into the course implementation and development of professionalism rather than assessing knowledge and/or understanding of issues related to professionalism. Quantitative data were gathered from students using a Likert-type 5-point scale (1=strongly disagree, 2=agree, 3=neutral, 4=agree, 5=strongly agree) on (1) acceptability of the format and subject matter of the course, (2) attitude toward professionalism before and after the course, (3) course delivery and perception of the course's effect on their attitudes, (4) extent to which they believe issues of professionalism apply to them as students, and (5) perception of their own level of understanding of professionalism. Qualitative data was gathered through debrief feedback and white space questions following course completion. Data were captured on a secure web-based Google form accessible only to the program directors. No identifiable or personal health information was collected, and the course was not an educational experiment upon the students, so no ethical review was required.

Data Analysis

Survey data analyses were undertaken for curriculum implementation and development of professionalism. Quantitative analysis of ordinal 5-point Likert-type responses was undertaken using SPSS (version 23.0, IBM Corp). Qualitative thematic analysis was undertaken using a 6-phase approach of familiarization including numbering of student responses, generating codes, searching for themes, reviewing themes, defining themes, and producing a report [24]. The coding scheme for qualitative analysis is demonstrated in Table 1. Student statements were categorized and rated independently by 2 authors (PW and JA) in terms of how positive or negative the statement was perceived on a scale of –2 to +2, allowing a mean score per category to be generated. The mean rating calculated for each category was multiplied by the total number of students who commented on the subcategory to provide semiquantitative analysis of total effect.

Table 1. Coding scheme for qualitative analysis of curriculum implementation and development of professionalism [24].

Category label	Criteria
Curriculum implementation	
Course facilitators	Student refers to facilitators delivering course.
Environment	Student refers to atmosphere/environment of course.
Timing	Student refers to timing of course.
Quantity	Student refers to quantity of content used in course.
Quality of content	Student refers to content used in course.
Development of professionalism	
Challenge	Student refers to ease or difficulty of professionalism concepts covered in course.
Learning	Student refers to learning about professionalism concepts covered in course.
Revision	Student refers to revision of professionalism concepts covered in course.
Enjoyable	Student refers to enjoyment of course.
Engagement	Student refers to engagement in course.

Results

In the first year (2017-2018), 50 students participated in the session, and feedback and debriefs regarding course implementation were collected. Specific suggestions from student and facilitator feedback were considered and implemented as necessary. In the second year (2018-2019), 100 students participated in the course and were assessed in their development of professionalism. Within the 2 cohorts, 15 pilot participants and 55 subsequent participants who undertook 2 professionalism sessions volunteered quantitative feedback on the course. Following the second year of course implementation, 18 students volunteered to provide qualitative feedback regarding curriculum implementation and development of professionalism at the end of the course. The session leads collected feedback from students, took debriefs from facilitators, and wrote a brief contemporaneous record of all feedback to aid in implementing suggested changes in the next iteration. All 70 of the participants who gave feedback answered questions about their views on the practicalities and implementation of this professionalism curriculum by answering a quantitative postcourse survey (Table 2).

Table 2. Quantitative curriculum implementation feedback scores (n=70).

Curriculum implementation feedback	Value, mean (SD)
Environment in which the sessions were delivered allowed me to feel comfortable in sharing my honest opinions and asking questions.	4.66 (0.61)
Structure of the discussion was well designed and effective for achieving the aims of the session.	4.43 (0.69)
I now have a better understanding of what may be considered unprofessional behavior.	4.39 (0.79)
These sessions have improved my understanding and awareness of how issues surrounding professionalism affect me as a medical student.	4.37 (0.76)
I now feel more able to act appropriately if an event occurs that could potentially bring my or a friend or colleague's professionalism into question.	4.29 (0.84)
Content of the scenarios and discussions was effective and covered most areas of professionalism that could affect me as a preclinical student.	4.23 (0.78)
I found these sessions useful and worthwhile to me as a medical student.	4.19 (0.95)
Scenarios and discussions were appropriate to me as a first-year medical student.	4.16 (0.93)

Mean scores on a Likert-type 5-point scale ranged from 4.16 (SD 0.93; appropriateness of scenarios) to 4.66 (SD 0.61; environment of sessions), indicating positive postcourse feedback. Semiquantitative participant feedback was gathered using a quantitative postcourse survey (Table 3).

Table 3. Quantitative development of professionalism feedback scores (n=70).

Development of professionalism feedback	Value, mean (SD)
Medical students should be expected to behave professionally.	4.78 (0.42)
I understand what is meant by professionalism.	4.71 (0.46)
Professionalism is a relevant topic for medical students in preclinical years.	4.62 (0.59)
I feel I can recognize professional and unprofessional behavior in my teachers.	4.04 (0.74)
My behavior in my preclinical medical studies is social and shouldn't be evaluated.	3.87 (0.79)
Higher standards of professionalism are needed in preclinical medical education.	3.11 (0.99)

Mean scores on a Likert-type 5-point scale ranged from 3.11 (SD 0.99; need for professionalism) to 4.78 (SD 0.42; relevance of professionalism), indicating positive postcourse professionalism development. A total of 18 students engaged in qualitative feedback in curriculum implementation and development of professionalism as displayed in Table 4. The most frequent qualitative theme addressed was the quality of the sessions, with a strongly positive effect indicating that the sessions were well received by the students. Students were less likely to comment on the impact of the professionalism course on their learning or revision. Overall, feedback across all aspects of the sessions was positive with no significant concerns regarding course content or execution.

Table 4. Qualitative curriculum implementation and development of professionalism feedback.

Category	Value, mean (SD)	Number of contents	Total effect (mean × n)	Sample paraphrased comments from students (assigned comment number)
Curriculum implementation				
Timing	–0.17 (0.41)	6.00	–1.00	There could be greater flexibility in the timing of the course (1, 6, 7, 9, 14, 18).
Quality of content	1.22 (0.97)	9.00	11.00	I thought the scenarios discussed were very useful and definitely helped put ideas that we may have already been aware of into practice (1, 2, 4, 6, 8, 10, 15, 14, 18).
Environment	2.00 (0)	5.00	10.00	The setting for the seminars (relaxed, with drinks and snacks, etc) created a friendly engaging atmosphere (3, 9, 12, 16, 18).
Course facilitators	1.60 (0.89)	5.00	8.00	Really valuable to have a current clinical student present (5, 7, 8, 9, 17).
Quantity	0.33 (0.58)	3.00	1.00	Maybe slightly reduce the number of cases presented (11, 14, 18).
Development of professionalism				
Challenge	0.33 (0.58)	3.00	1.00	The scenarios were sometimes quite obvious (1, 2, 6).
Revision	2 (0)	2.00	4.00	Definitely helped put ideas that we may have already been aware of into practice (10, 11).
Enjoyment	2 (0)	2.00	4.00	Loved the sessions (12, 16).
Learning	2.25 (0.50)	2.00	4.50	I now feel I have a much broader understanding of the levels of professionalism required as both a medical student and a doctor (17, 18).
Engagement	1.00 (0.89)	3.00	3.00	I felt that the open table group discussion was a bit intimidating simply because I am quieter than a lot of my peers (5, 10, 14).

Discussion

Principal Findings

This approach to teaching professionalism was designed to introduce first-year preclinical medical students, undertaking a course with very limited patient contact in the first 3 years, to complex concepts relevant to medical students and qualified doctors in two 90-minute sessions. Both quantitative and qualitative feedback indicate that the sessions were very well received by students. Although still strongly positive, the least well-received themes revolved around the usefulness and appropriateness of the course content, with qualitative feedback revealing that this may be due to the challenge of the scenarios being too easy. Interestingly, the response to the question of whether higher standards of professionalism are required in the medical field was neutral. One reason may be that the very strong focus on preclinical science in the undergraduate UK medical course means that students have, at that stage, devoted little time to consideration of the meaning of professional conduct as applied to interactions with patients and colleagues. It is also difficult to judge how complex professionalism scenarios for first-year medical students should be, as there may be very significant variation in students' prior experience in relevant professional situations. However, it is clear that professionalism is required for all practicing clinicians, and longitudinal studies of professionalism in medical students may give more insights into appropriate professionalism scenario complexity at this stage of training.

Quantitative and qualitative course feedback revealed that quality of content, environment, and course facilitators were the most positive factors overall. In this case, professionalism training was applied within the student collegiate system, where the majority of pastoral and small group teaching components of the medical course are delivered, thereby enhancing the familiarity of the group session. Using small group discussions with familiar college mentors and senior students as facilitators encouraged active engagement of students with the scenarios, which maximized their understanding and retention of the material. Feedback provided insights into less positively received timing and quantity aspects of the course, with students feeling the course at times tried to cover complex scenarios over short durations. Educational programs in an ideal world should be flexible, with differences between individual learners being identified and suitable learning tasks selected, therefore allowing all abilities of student to comfortably advance through course content [25]. To further improve this program, a greater emphasis could be placed on instructional design and stimulating the recall of prerequisite knowledge to allow a more seamless progression through scenarios [25,26]. Students felt that the course should restrict itself to covering fewer scenarios in order to fully explore professionalism dilemmas. This is understandable, as professional practice involves practitioners finding not so much the right answer (which may not always exist in any absolute sense) but rather in deciding what is best in the situation in which they find themselves [27]. The demanding medical curriculum, unfortunately, did not allow extension of the length of this professionalism course. Due to the complexity of professionalism, future iterations of the course will aim to provide more time for each scenario discussion to improve both engagement and learning.

Limitations

Although this study collected a range of constructive feedback to enhance the provision and content of the course, students gave this feedback on a voluntary basis, and only 30% of the 2017-2018 cohort and 55% of the 2018-2019 cohort provided feedback. There is a risk that this induced selection bias, with students with either more positive or more extreme opinions preferentially providing feedback. All feedback was anonymized in order to minimize any perceived pressure to provide positive feedback. A further limitation of this study is its inability to precisely determine the effects of our professionalism intervention on the students' subsequent clinical practice. The benefits of professionalism training might not be felt until after qualification as a doctor, which would need both detailed ethical approval and extensive follow-up in order to produce meaningful results. Unfortunately, long-term follow-up is difficult in medical students and medical doctors, as they frequently move between jobs due to the nature of training rotations and sometimes move in and out of research and/or other career breaks from medicine, with some leaving the country either temporarily or permanently.

Conclusion

This approach to teaching professionalism is both interactive and experiential in nature and aimed at medical students in the first year of a traditional medical course. In particular, Entry to the Profession benefitted from a small group format in a relaxed and open environment with welcoming facilitators to successfully teach the major concepts of professionalism. Our study would benefit from a future longitudinal complementary investigation to explore the impact of medical student professionalism education at various stages of preclinical, clinical, and postgraduate training.

Conflicts of Interest

None declared.

Multimedia Appendix 1

A scenario-based approach to teaching professionalism to medical students: case vignettes.

[DOCX File , 36 KB - mededu_v7i2e26667_app1.docx]

Multimedia Appendix 2

A scenario-based approach to teaching professionalism to medical students: session setup.

[DOCX File , 27 KB - mededu_v7i2e26667_app2.docx]

References

1. Yates J, James D. Risk factors at medical school for subsequent professional misconduct: multicentre retrospective case-control study. BMJ 2010 Apr 27;340:c2040 [FREE Full text] [doi: 10.1136/bmj.c2040] [Medline: 20423965]
2. Bennett AJ, Roman B, Arnold L. Models of identification and intervention. Acad Psychiatry 2012:426-432.
3. Arnold L. Assessing professional behavior: yesterday, today, and tomorrow. Acad Med 2002 Jun;77(6):502-515. [doi: 10.1097/00001888-200206000-00006] [Medline: 12063194]
4. Papadakis MA, Hodgson CS, Teherani A, Kohatsu ND. Unprofessional behavior in medical school is associated with subsequent disciplinary action by a state medical board. Acad Med 2004 Mar;79(3):244-249. [doi: 10.1097/00001888-200403000-00011] [Medline: 14985199]
5. Professional behaviour and fitness to practise. UK General Medical Council. 2016. URL: https://www.gmc-uk.org/-/media/documents/professional-behaviour-and-fitness-to-practise-20200730_pdf-66085925.pdf [accessed 2021-05-14]
6. Lehmann LS, Sulmasy LS, Desai S, ACP Ethics, Professionalism and Human Rights Committee. Hidden curricula, ethics, and professionalism: optimizing clinical learning environments in becoming and being a physician: a position paper of the American College of Physicians. Ann Intern Med 2018 Apr 03;168(7):506-508. [doi: 10.7326/M17-2058] [Medline: 29482210]
7. Fitness to practice (FTP) procedures. Medical Defence Union. 2021 Feb 23. URL: https://www.themdu.com/guidance-and-advice/guides/fitness-to-practise-procedures [accessed 2021-05-23]
8. Outcomes for graduates. UK General Medical Council. 2018. URL: https://www.gmc-uk.org/-/media/documents/outcomes-for-graduates-2020_pdf-84622587.pdf?la=en&hash=35E569DEB208E71D666BA91CE58E5337CD569945 [accessed 2021-05-14]
9. Birenbaum M. Assessment preferences and their relationship to learning strategies and orientations. High Educ 1997;33:71-84. [doi: 10.1023/A:1002985613176]
10. Shepard LA. The role of assessment in a learning culture. Educ Researcher 2016 Jul 01;29(7):4-14. [doi: 10.3102/0013189x029007004]
11. Lesser CS, Lucey C, Egener B, Braddock C, Linas S, Levinson W. A behavioral and systems view of professionalism. JAMA 2010 Dec 22;304(24):2732-2737. [doi: 10.1001/jama.2010.1864] [Medline: 21177508]
12. Martimianakis M, Maniate J, Hodges B. Sociological interpretations of professionalism. Med Educ 2009 Sep;43(9):829-837. [doi: 10.1111/j.1365-2923.2009.03408.x] [Medline: 19674298]

13. Bernabeo EC, Holmboe ES, Ross K, Chesluk B, Ginsburg S. The utility of vignettes to stimulate reflection on professionalism: theory and practice. Adv Health Sci Educ Theory Pract 2013 Aug 21;18(3):463-484. [doi: 10.1007/s10459-012-9384-x] [Medline: 22717991]
14. Ginsburg S, Lingard L. Using reflection and rhetoric to understand professional behaviors. Meas Med Prof 2006:195-212.
15. Ginsburg S, Lingard L, Regehr G, Underwood K. Know when to rock the boat: how faculty rationalize students' behaviors. J Gen Intern Med 2008 Jul 10;23(7):942-947 [FREE Full text] [doi: 10.1007/s11606-007-0401-3] [Medline: 18612721]
16. Ginsburg S, Regehr G, Lingard L. The disavowed curriculum: understanding student's reasoning in professionally challenging situations. J Gen Intern Med 2003 Dec;18(12):1015-1022 [FREE Full text] [doi: 10.1111/j.1525-1497.2003.21247.x] [Medline: 14687260]
17. Ginsburg S, Regehr G, Mylopoulos M. Reasoning when it counts: students' rationales for action on a professionalism exam. Acad Med 2007 Oct;82(10 Suppl):S40-S43. [doi: 10.1097/ACM.0b013e31813ffda4] [Medline: 17895688]
18. Khan R, Lee AG, Golnik KC, Paranilam J. Residency education professionalism vignettes. Ophthalmology 2013 Apr;120(4):874. [doi: 10.1016/j.ophtha.2012.10.035] [Medline: 23552086]
19. Domen R, Johnson K, Conran R, Hoffman R, Post M, Steinberg J, et al. Professionalism in pathology: a case-based approach as a potential educational tool. Arch Pathol Lab Med 2017 Feb;141(2):215-219 [FREE Full text] [doi: 10.5858/arpa.2016-0217-CP] [Medline: 27763788]
20. Gronowski AM, McGill MR, Domen RE. Professionalism in residency training: a compilation of desirable behaviors and a case-based comparison between pathologists in training and practice. Acad Pathol 2016 Sep 16;3:2374289516667509 [FREE Full text] [doi: 10.1177/2374289516667509] [Medline: 28725778]
21. Blackall GF, Melnick SA, Shoop GH, George J, Lerner SM, Wilson PK, et al. Professionalism in medical education: the development and validation of a survey instrument to assess attitudes toward professionalism. Med Teach 2007 Mar 03;29(2-3):e58-e62. [doi: 10.1080/01421590601044984] [Medline: 17701611]
22. Ethics toolkit for medical students: medical students and the GMC. British Medical Association. 2020 May 01. URL: https://www.bma.org.uk/advice-and-support/ethics/medical-students/ethics-toolkit-for-medical-students/medical-students-and-the-gmc [accessed 2021-05-14]
23. Stalmeijer R, Mcnaughton N, Van Mook W. Using focus groups in medical education research: AMEE Guide No. 91. Med Teach 2014 Nov;36(11):923-939. [doi: 10.3109/0142159X.2014.917165] [Medline: 25072306]
24. Braun V, Clarke V. Thematic analysis. In: Cooper H, Camic P, editors. APA Handbook of Research Methods in Psychology, Vol. 2: Research Designs: Quantitative, Qualitative, Neuropsychological, and Biological. Washington: American Psychological Association; 2012:57-71.
25. van Merriënboer JJG, Kester L, Paas F. Teaching complex rather than simple tasks: balancing intrinsic and germane load to enhance transfer of learning. Appl Cognit Psychol 2006 Apr;20(3):343-352. [doi: 10.1002/acp.1250]
26. Kirschner P, Van Merriënboer J. Ten steps to complex learning: a new approach to instruction and instructional design. In: Good T, editor. 21st Century Education: A Reference Handbook. Thousand Oaks: Sage Publishers; 2012:244-253.
27. Coles C. Developing professional judgment. J Contin Educ Health Prof 2002;22(1):3-10. [doi: 10.1002/chp.1340220102] [Medline: 12004638]

Edited by G Eysenbach; submitted 20.12.20; peer-reviewed by MA Hasdianda, P Dattathreya, R Subramaniyam; comments to author 04.03.21; revised version received 22.03.21; accepted 15.04.21; published 24.06.21.

Please cite as:
Ashcroft J, Warren P, Weatherby T, Barclay S, Kemp L, Davies RJ, Hook CE, Fistein E, Soilleux E
Using a Scenario-Based Approach to Teaching Professionalism to Medical Students: Course Description and Evaluation
JMIR Med Educ 2021;7(2):e26667
URL: https://mededu.jmir.org/2021/2/e26667/
doi:10.2196/26667
PMID:34185007

Original Paper

Nursing Students' Perceptions about Effective Pedagogy: Netnographic Analysis

Jennie C De Gagne[1*], PhD, DNP, FAAN; Paula D Koppel[1*], MS; Hyeyoung K Park[2*], PhD; Allen Cadavero[1*], PhD; Eunji Cho[3*], PhD; Sharron Rushton[1*], MS, DNP; Sandra S Yamane[4*], MSN, DNP; Kim Manturuk[5*], PhD; Dukyoo Jung[6*], PhD

[1]School of Nursing, Duke University, Durham, NC, United States
[2]College of Nursing, University of Massachusetts Amherst, Amherst, MA, United States
[3]School of Nursing, Vanderbilt University, Nashville, TN, United States
[4]Department of Nursing, Catawba College, Salisbury, NC, United States
[5]Duke Learning Innovation, Duke University, Durham, NC, United States
[6]College of Nursing, Ewha Womans University of Korea, Seoul, Republic of Korea
[*]all authors contributed equally

Corresponding Author:
Dukyoo Jung, PhD
College of Nursing
Ewha Womans University of Korea
52 Ewhayeodae-gil
Seodaemun-gu
Seoul, 03760
Republic of Korea
Phone: 82 10 4310 4522
Fax: 82 2 3277 2875
Email: dyjung@ewha.ac.kr

Abstract

Background: Effective pedagogy that encourages high standards of excellence and commitment to lifelong learning is essential in health professions education to prepare students for real-life challenges such as health disparities and global health issues. Creative learning and innovative teaching strategies empower students with high-quality, practical, real-world knowledge and meaningful skills to reach their potential as future health care providers.

Objective: The aim of this study was to explore health profession students' perceptions of whether their learning experiences were associated with good or bad pedagogy during asynchronous discussion forums. The further objective of the study was to identify how perceptions of the best and worst pedagogical practices reflected the students' values, beliefs, and understanding about factors that made a pedagogy good during their learning history.

Methods: A netnographic qualitative design was employed in this study. The data were collected on February 3, 2020 by exporting archived data from multiple sessions of a graduate-level nursing course offered between the fall 2016 and spring 2020 semesters at a large private university in the southeast region of the United States. Each student was a data unit. As an immersive data operation, field notes were taken by all research members. Data management and analysis were performed with NVivo 12.

Results: A total of 634 posts were generated by 153 students identified in the dataset. Most of these students were female (88.9%). From the 97 categories identified, four themes emerged: (T) teacher presence built through relationship and communication, (E) environment conducive to affective and cognitive learning, (A) assessment and feedback processes that yield a growth mindset, and (M) mobilization of pedagogy through learner- and community-centeredness.

Conclusions: The themes that emerged from our analysis confirm findings from previous studies and provide new insights. Our study highlights the value of technology as a tool for effective pedagogy. A resourceful teacher can use various communication techniques to develop meaningful connections between the learner and teacher. Styles of communication will vary according to the unique expectations and needs of learners with different learning preferences; however, the aim is to fully engage each learner, establish a rapport between and among students, and nurture an environment characterized by freedom of expression in which

ideas flow freely. We suggest that future research continue to explore the influence of differing course formats and pedagogical modalities on student learning experiences.

(JMIR Med Educ 2021;7(2):e27736) doi:10.2196/27736

KEYWORDS

discussion forums; faculty behaviors; health professions students; learning environment; learning experience; netnography; pedagogy

Introduction

Background

Pedagogy is defined as the science and art of teaching practice, and is informed by complex learning theories and principles [1]. Effective pedagogy that nurtures high standards of excellence and commitment to lifelong learning is particularly meaningful for health professions education (HPE) to prepare students for real-life challenges such as health disparities and global health issues. Recognizing that their preparation as health care providers often places students in unfamiliar settings, HPE scholars [2,3] contend that it is important to leverage such sites to facilitate transformative learning and the motivation to grow. Accordingly, transformative learning theory has a broad application within HPE, and feminist pedagogy is similarly applicable given the rise of more inclusive and transformative learning environments to generate humanizing experiences for students [4].

Transformative and Feminist Pedagogy

Transformative learning theory is grounded in Mezirow's [5] belief that the value of educational programs relies on the perspectives of individuals, groups, and stakeholders in the evaluation process. The STAR (Sensitivity, Taking Action, and Reflection) framework synthesizes doctrines from transformative learning to support the changes in teaching strategies and curriculum in nursing education that are needed for the 21st century [2]. The STAR framework leverages the synergy between transformative learning and nursing education, highlighting a humanistic focus and holistic teaching strategies to cultivate empathy and compassion [2]. Feminist pedagogy similarly rejects the traditional teacher-student hierarchy, while encouraging students and teachers to use personal experiences as essential resources to evaluate perspectives critically and contemplate shifts in beliefs [6].

Feminist pedagogy is defined as "a theory about the teaching/learning process that guides our choice of classroom practices by providing criteria to evaluate specific educational strategies and techniques in terms of the desired course goals or outcomes" [7] (page 8). Feminist theorists suggest that teachers provide activities that develop critical thinking by tapping into the "disequilibrium" created by using a feminist teaching approach [8]. This process involves choosing content and assignments that allow students to examine, question, and create new knowledge, as well as encouraging them to write to learn rather than to demonstrate acquisition of knowledge. Teacher role modeling plays an important role in feminist pedagogy, allowing students to provide significant input into course development and ensuring that all students' voices are heard in class discussions [8]. The teacher supports trust and sharing by creating a safe environment, and remains receptive to changing class activities or content to promote enhanced student perspective and reflective dialogue [9].

Experience, reflection, and change are at the heart of transformative and feminist pedagogies: both encourage students to process information acquired through personal experiences, values, feelings, and conditioned responses, and both emphasize a learning process guided by discourse, dialogue, and reflection [10,11]. Rooted in the social change movements of the late 1960s and early 1970s, feminist pedagogy focuses on raising consciousness and empowering vulnerable and oppressed groups [11,12]; thus, both the STAR framework and feminist teaching approaches aim to familiarize and engage nursing students with social justice issues [2].

Although many primary tenets of feminist pedagogy are already reflected in teaching practice [4], online learning formats pose challenges to several fundamental characteristics of the theory, such as the ability of teachers and students to cocreate the classroom experience when learning modules are prepared by the teacher in advance [6]. The theory of community inquiry [13] can contribute solutions for some of these challenges in online pedagogy and research.

Community of Inquiry Framework

The community of inquiry (COI) framework emerged within a study as researchers sought ways to code and analyze computer-mediated communication such as asynchronous online discussion forums; however, this framework has also been used to support online pedagogy as the basis of cognitive, social, and teaching presence [13]. One of the most important components of online pedagogy is active engagement, and discussion forums are effective instructional strategies for fostering collaborative learning in varied domains [14]. Categories and indicators for each of the three elements of presence are sufficiently broad to be useful in analysis of transcripts but specific enough to be meaningful [13]. Because the evolution of this framework is in line with our project's scope, we considered that it may provide a useful guide for exploring our text-based discussion forum data. Interestingly, the work of Garrison and colleagues [13] provides some of the first empirical evidence that written or text-based communication is generally better at producing high-order critical thinking, and that community and social context are important to achieve this more advanced level.

As suggested by transformative and feminist pedagogies and the COI framework, the role of the educator (whether in person or at a distance) is that of a colearner as well as a facilitator who recognizes learners' objectives and goals, and creates a safe forum for discussion and reflection. The educator maintains control of the learning setting but is not controlling of the learning process. Classroom strategies focus on empowerment by providing class members with opportunities to develop goals and objectives, develop autonomy, enhance decision-making, and boost/reinforce their self-esteem [12]. By reimagining the classroom as a shared learning community [12], educators facilitate the achievement of students' goals, propel them toward autonomy [10], and empower them to create and advocate for positive change as they assume their professional roles [2].

Research Aim

The aim of this study was to explore health profession students' perceptions of whether their learning experiences were associated with good or bad pedagogy during asynchronous discussion forums. A further objective of the study was to identify how perceptions of the best and worst pedagogical practices reflect the students' values, beliefs, and understanding about factors that made a pedagogy good during their learning history.

Methods

Netnography

As the context of the data collected for this study was an online learning course, netnography was an ideal methodology. Netnography developed as a subgroup of the ethnographic research tradition and is specifically designed to examine the practice of distinct social interactions [15]. Described by Kozinets, its creator, as a way to analyze "technocultural contexts" where culture and technology utilization meet [16], netnography always focuses on social media and technoculture; includes the immersion of the researcher; and uses impressions to inform cultural understanding of the nexus where culture, technology, and society intersect [15,16]. Netnography examines any phenomenon within this domain that has become a key component of our collective experience as humans; it distinguishes itself as a method designed to illuminate the emotional story and meaning of online life [16]. Netnography uses the following steps: (1) planning and including a cultural entrée, (2) collecting data, (3) performing ethically based research, (4) interpreting data, and (5) determining a data presentation plan [17]. This methodology requires that the investigators be fully immersed in the online community to gather data through participant observation [18]. Investigators may also conduct interviews and gather archival data, field notes, and other forms of data [17]. Additionally, investigators use reflection to better understand the community [18].

Study Design, Participants, and Setting

A netnographic qualitative design was used to explore the views and experiences of students who participated in online forums in a graduate-level nursing course that teaches themes of adult learning, learning styles, student engagement, domains of learning, teaching strategies, and/or methods of integrating technology into nursing education. Enrollment size ranges from 10 to 35 students; however, group dynamics and interactions among members are unlikely to be affected by differences in enrollment because students work in small groups of 4 to 5 in a discussion forum. The forum presents an opportunity for students to share their ideas and personal perspectives on each week's course topics thoughtfully. During the course, students are expected to write an initial post in response to a question posted for the week and to respond to posts from at least two peers. The data for this study included the initial discussion forum posts and peer-response posts during the first or second week of the course. This project was reviewed and declared exempt by the Duke University Institution Review Board (Pro00104522).

Data Collection Procedures

The data for this study were collected on February 3, 2020 by exporting archived data from sessions of the nursing course run between the fall 2016 and spring 2020 semesters. In each session, students were given the discussion forum prompt shown in Textbox 1. This prompt asked them to describe their best and worst learning experiences and to reflect on how these experiences were related to what they were learning in the course.

The analysis file used in this study included the original forum prompt and all of the nested replies to that prompt. The study data were deidentified, cleaned, and placed into Microsoft Excel 365 software and exported to NVivo qualitative data analysis software (QSR International Pty Ltd) prior to analysis.

Although netnography typically requires researchers to immerse themselves in the online community during data collection, our study collected investigative data from the course discussion forum retrospectively; thus, field notes were taken by all research members as an immersive data operation. Among the nine researchers of this study, six are nurse educators. In addition, our research team included the professor, teaching assistants (TAs), and previous students of the course. This immersive data operation was deliberatively performed to serve as a "reflective, catalytic, and analytic guide" [19] for the data analysis by teachers and observers of the students' online discussion forum.

Textbox 1. Discussion forum prompt.

Think about the best learning experience you've had. It can be any kind of course and taken at any time in your learning history. Now ask yourself WHY this was such a good learning experience. What was it about the focus of the course, what the teacher did, what you were expected to do, the course assignments, and so on that made this such a positive experience? Reflect on what you've heard and read about principles and theories of learning and discuss how your very positive experience does or does not confirm what the theorists say about how people learn, good principles of education, the factors that influence learning, etc.

Now think about the worst learning experience you've had. Think about what made it so bad, which principles of learning were "violated," and what could have made the learning experience better for you.

In both cases, you should feel free to describe the course (eg, the leadership course in my undergraduate nursing program), when you took it (eg, this was the last semester before we were to graduate), and anything else that may help the rest of us understand the context (eg, there were 60 students in this course, and we had been together in many courses before taking this one; the teacher was new to the school but not new to teaching). Connect your thinking and experience with what you've read and consider whether your experiences were unique or whether they were similar to those of other students enrolled in that same course. In all discussions, please do not mention names of professors or schools.

Data Analysis

Data management and analysis were performed with NVivo 12. Each student is a data unit. Our analysis primarily focused on the initial post by each student, although follow-up posts in response to other students were also included in the analysis as they reflected students' learning experiences. An inductive approach was used to code the data. The data units were divided among the team members and in vivo coding was generated to ensure that the first-level coding was grounded in the participants' experience [20]. Field notes in the form of reflections/memos were also created iteratively as authors read and coded the data, and were included as part of the analysis. Each member read the discussion thread several times to get a sense of the whole and generated field notes as a format of free writing. This included reflective memos to capture both insights and bracket personal perceptions that might have influenced the analysis, making the team members' personal beliefs and experiences transparent [20].

During the coding process, first-level coders (AC, EC, SY, SR, and DJ) generated a total of 1019 in vivo codes. Three team members (JD, PK, and HP) completed second-level coding by exploring patterns and relationships among the in vivo codes. Codes and categories generated by coders were reviewed by two research members (PK, HP), and each step of data analysis was discussed during the regular research team meetings. This resulted in the development of 97 categories (50 positive aspects, 33 negative aspects, 14 neutral aspects). The categories were reviewed and discussed during team meetings for consensus on themes. The categorization and theme generation required an iterative process to ensure the incorporation of as many of the participants' experiences as possible into the final themes.

Rigor/Trustworthiness

The research team members met regularly to discuss and refine all levels of the data analysis process. The data analysis process and personal impressions of the data were carefully and consistently recorded in analytical memos [20], which included all major analytical decisions (ie, code revisions, recoded data, data organization, and labeling processes) as well as insights and relationships observed. This process resulted in a detailed audit trail to help promote transparency [21]. Finally, the research team selected categories that represented a wide range of ideas and topics present in the data. Exemplar quotes were selected for each major theme and subthemes to document evidence thoroughly for the study's findings [22]. These processes allow readers to determine the application of our results to their own contexts and more easily reproduce the study [23].

Results

Sample Characteristics

The total number of posts was 634, generated by 153 students identified in the dataset. Most of these students were female. Many of the students were enrolled in the Doctor of Nursing Practice and Master of Science in Nursing degree programs. Others were students from outside the nursing discipline. Details of the sample can be found in Table 1.

Table 1. Descriptions of study participants (N=153).

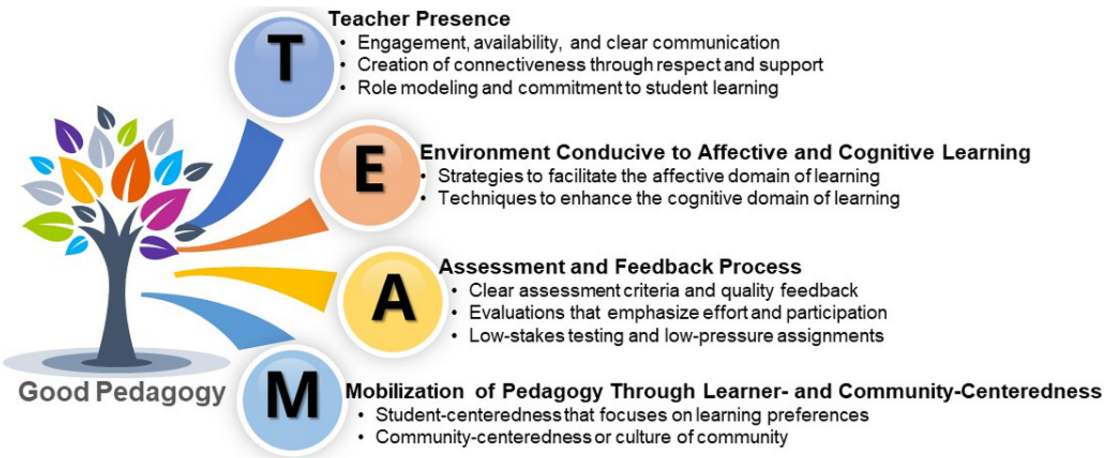
Characteristic	Participants, n (%)
Gender	
Female	136 (88.9)
Male	17 (11.1)
Participation per semester	
Fall 2016	36 (23.5)
Spring 2017	11 (7.2)
Fall 2017	9 (5.9)
Spring 2018	16 (10.5)
Spring 2019	33 (21.6)
Summer 2019	13 (8.5)
Fall 2019	22 (14.4)
Spring 2020[a]	13 (8.5)
Degree	
ABSN[b]	4 (2.6)
BSN[c] to DNP[d]	11 (7.2)
DNP	63 (41.2)
MSN[e]	61 (39.9)
PhD[f]	6 (3.9)
Other	8 (5.2)

[a]Data were collected prior to the COVID-19 pandemic in the United States.
[b]ABSN: Accelerated Bachelor of Science in Nursing.
[c]BSN: Bachelor of Science in Nursing.
[d]DNP: Doctor of Nursing Practice.
[e]MSN: Master of Science in Nursing.
[f]PhD: Doctor of Philosophy in Nursing.

Overview of Themes

From the 97 categories identified, four themes emerged: (1) teacher presence built through relationship and communication, (2) environment conducive to affective and cognitive learning, (3) assessment and feedback processes that yield a growth mindset, and (4) mobilization of pedagogy through learner- and community-centeredness. We created an acronym (ie, T.E.A.M.) to help us remember these themes, depicted in Figure 1 as the principal findings of this study.

Figure 1. Overview of the key themes and their subthemes.



T: Teacher Presence

Description of Main Theme

Students described their learning experiences as positive when the teacher was connected and actively involved in the learning environment. By contrast, negative learning experiences were associated with disengagement between teachers and students as well as with lack of teacher passion or empathy. When their teachers were perceived to be apathetic, defensive, indifferent, insecure, and difficult to access, students negatively evaluated their learning experiences. Students' perceptions that they were not receiving needed support or respect from teachers interfered with their learning efficiency.

Engagement, Availability, and Clear Communication

Teachers were described positively when they were perceived as being eager to communicate and cocreate an active learning environment with students, or as truly caring about students and their learning. Vigorous and receptive teachers were considered approachable, open to communication with students, and able to deliver clear instructions and guidelines. One student explained, "[my teacher] made it clear at the beginning of the class what was expected from the class and how she was going to assist the class to navigate the course." On the other side, lack of clarity was a source of frustration for the students. For example, one student said, "The teacher was so awful at explaining things that I walked out of that first lecture feeling more confused about things I had previously understood."

Creation of Connectiveness Through Respect and Support

Teachers were identified as having provided positive learning experiences if they had created close and strong connections with students, often from the start of the semester: "I find that when professors introduce themselves and students do, that I connect more. It begins a relationship that can make learning more interactive." Students who perceived that their teachers were willing to care and connect with them expressed that they felt supported and respected as members of the class and as human beings. A sense of participating in a humanistic teacher-student relationship stimulated motivation to learn and engage in the classroom. As one student noted, "The contact between the professor and the students was not only motivating, but truly enhanced the learning experience." Students perceived teachers' prompt responses, constructive criticism, and enthusiastic support as indications of a full effort to guide them to their highest potential. One student described their teacher as "a coach, counselor, cheerleader, and mentor," expressing their perception that the teacher not only conveyed knowledge to students but also treated them as autonomous agents, guiding them with affection.

Role Modeling and Commitment to Student Learning

Students highly valued teachers' devotion, time, effort, and professional expertise. Teachers with excellent expertise and profound knowledge in their fields were perceived as positive role models who were well-prepared and trustworthy. According to one student:

> *Teacher factors that impacted the learning experience included her high level of competence within nursing, her many shared experiences which were relevant to course material, very high level of motivation, and a positive personality that she brought to class.*

E: Environment Conducive to Affective and Cognitive Learning

Description of Main Theme

Students' posts described qualities of the learning environment that supported or inhibited their learning. Students discussed cognitive learning, especially in relation to supportive teaching strategies, and frequently described experiences and characteristics of educators that promoted aspects of affective learning such as self-awareness, self-confidence, and values consistent with nursing behavior.

Strategies to Facilitate the Affective Domain of Learning

Students described a variety of strategies that instructors used to develop and foster confidence, motivation, and professional growth, thereby creating an environment that facilitated learning in the affective domain. Motivating students was identified as an important goal, but creating motivation appeared to require a holistic approach to pedagogy. For example, students expressed that high expectations from the teacher, when combined with professionalism and respect for students, created an atmosphere that ignited constant learning. As one student stated, the teacher taught the students "as adult learners, and it was incredibly refreshing. She respected us, set high expectations, maintained professionalism, and was a skilled leader." Challenge combined with positive reinforcement was especially appreciated by a student who stated, "I need validation from professors. I need to know I am going in the right direction."

Students not only expressed that their best experiences involved courses with high expectations but also described easy classes as their worst experiences. For example, one student noted that "even though most of the students in her class obtained good grades, it did not feel like we earned them because she did not challenge her students and spoon-fed us the answers." Self-awareness or self-reflection was noted as a strategy that also facilitated learning in the affective domain. As one student noted, "[The teacher] helped the nursing students explore their possibility and build their beliefs of being nurses."

Techniques to Enhance the Cognitive Domain of Learning

Positive techniques perceived as facilitating learning in the cognitive domain included promoting a spirit of inquiry through questioning and goal-setting. Creative activities were also appreciated, as one student explained: "[The teacher] kept learning interesting by introducing new opportunities to meet objectives in unconventional ways." On the other side, students did not perceive all strategies as contributing to positive learning experiences. For example, rote memorization by faculty was often described as unhelpful. One student emphasized the importance of making connections beyond memorization of the material, stating that "memorization can be a great way to efficiently get a good grade on a test, but much of it is eventually lost since it is often without meaning."

A: Assessment and Feedback Process

Description of Main Theme

Assessment and feedback were frequently described in the posts along with comments on characteristics that enhanced and inhibited students' learning experience. This included the type, frequency, and focus of evaluations as well as the manner in which feedback was delivered.

Clear Assessment Criteria and Quality Feedback

Students reported that a higher level of learning was achieved when they were provided with clear instructions and expectations for assignments and deadlines. Lack of organization and structure as well as grading and assessments that did not contain material covered in class or other resources were identified as contributing to negative experiences, as illustrated in one student's reflection:

> *The professor would jump from topic to topic, would skip key concepts, and was not very organized. The tests often contained material that was not covered in class or within the assigned readings, and she often misplaced our assignments.*

Other negative experiences were associated with tests that did not assess a real understanding of concepts from the material. Providing meaningful feedback on tests and papers, both negative and positive, was identified as an important way to improve student performance. As one student stated, "I learn and grow best with a healthy amount of constructive criticism." The use of verbal feedback created a lasting impression and invoked a sense of pride in students. As one student expressed:

> *The input was not only in the form of a grade but also verbal. I may not remember the words said but can remember the sense of pride I felt and the body language of the teacher communicating my success.*

Evaluations That Emphasize Effort and Participation

A strong desire was expressed for a shift to assessments and grading focused on learning in lieu of letter grades. Students reported that a focus on learning made them feel more invested in learning and enhanced their ability to gain knowledge. One student shared that "when I'm not focused on the letter grade, I find myself more invested in the learning experience as a whole and leave with a whole new set of knowledge." Examples provided included an emphasis on assessment of participation, and evaluations that described how students exhibited a desire to learn. Another student noted that tracking participation in class increased engagement and eventually led to a better learning experience.

Low-Stakes Testing and Low-Pressure Assignments

Several comments illustrated that low-stakes testing was a valuable tool for learning. For example, they expressed that noncumulative exams and incremental assignments relieved pressure compared to higher-stakes testing and evaluation. One student explained, "There are three exams. And it is not cumulative, which means a lot of relief at the end of the semester." Another preferred approach was the use of short-answer responses on quizzes about the application of concepts learned in class. Homework assignments that encouraged students to examine the material presented in lectures in greater depth were described as facilitating understanding.

M: Mobilization of Pedagogy Through Learner- and Community-Centeredness

Description of Main Theme

The fourth element of good pedagogy was learner and community centeredness. One student described such an approach as evidenced by "an excellent teacher who is warm and accessible, respects our options and ideas, creates a sense of community and belonging." Students emphasized the importance of creating a safe and nurturing learning environment.

Student-Centeredness That Focuses on Learning Preferences

Students made personal connections with course content that teachers illuminated with their past experiences and existing knowledge. Unfortunately, not all student experiences were positive. Teachers who were perceived as having ignored individual learning styles or overemphasized one teaching strategy were described as having disenfranchised the adult learner. One student reported, "Different styles of learning were not taken into account, and the large, bleak classroom and chalkboards were unstimulating." Interestingly, students often reframed such negative experiences as ways of reassessing their learning needs or as teaching moments. For example, one student posted that "the bad experience certainly showed me what not to do, how not to behave, and what my future students will not want me to do."

Community-Centeredness or Culture of Community

Teachers were highly esteemed by students when they actively engaged the learner through dynamic discussions, and valued group members' ideas and opinions. Students expressed that they felt safe when encouraged "to express their feelings and learn to respect and listen to others." When teachers fostered this type of open collaboration, students felt that a community of practice developed between the learner and teacher, promoting a culture of inquiry. On the other side, students expressed that teachers who used confrontational tactics, including public correction and shaming, disengaged the learner and broke the bond of trust and community. One student lamented, "I remember nothing from his class except my feeling of fear and sadness for my friends that were humiliated by this teacher."

Discussion

Reflections From the Research Team

Using the netnographic approach, this study analyzed asynchronous discussion forum posts by health profession students describing their best and worst learning experiences in an effort to understand their perceptions of what constituted or contributed to good pedagogy. Before addressing this specific aim, the reader is referred to Multimedia Appendix 1, in which each author has provided a brief reflection to describe their social identity and relevant experiences related to the study findings.

As is true of any qualitative study, our research process was undoubtedly influenced by the beliefs, values, experiences, and perspectives of the members of our research team, starting with the questions we selected to investigate. Although we analyzed data retrospectively, many of us had roles in the course where data were collected. Our research team was made up of an eclectic group of teachers, former students from the course, and researchers with various titles and roles within the academic profession. Reflective memos were used to identify our prior beliefs and values, and this exercise provided opportunities for bracketing the influences of our perspectives and made them transparent [21]. To strengthen our collective analysis of the data, we had multiple research team meetings in which we shared our personal worldviews and perspectives on good pedagogy as related to the data overall. This process is essential in netnography, a methodology that encourages participant observation with investigators immersed in an online community [18]; it helped us to explore our individual perspectives and consider the meaning of our experiences from multiple viewpoints. For example, one team member described their experience of reading student writing from two perspectives: first as a student in the course and then as an educator (a TA) in the course the following semester. This sharing of experiences during team meetings nourished team members' reflections and increased the richness of our perspectives as researchers.

All of the researchers involved in this study have been students (most are either current students or have recently graduated), and all have been teachers or TAs. These experiences influenced our reading of the data in that we recognized the challenges involved in meeting individualized and diverse student needs within the constraints of our teaching environments. Acknowledging our prior experiences at the onset of the project was both a strength and a limitation; we purposely chose to start the analysis using in vivo codes to have the best chance of keeping the data grounded in the participants' experiences.

Student Perceptions of Good Pedagogy

Our findings confirm that nursing students consider a positive teacher presence and a strong teacher-student connection to be key elements of good pedagogy. Students' descriptions showed that they perceived a transfer of knowledge alone to be insufficient for effective learning as they needed to feel motivated, inspired, and respected as human beings by the teacher's presence. Our findings support several studies that have reported that humanistic connections and relationships with teachers can lead students to achieve positive learning outcomes and professional socialization [24-26]. Bergum [24] used the term "relational pedagogy" to highlight the importance of a teacher listening to students' thoughts and responses, creating connections with students and the world, and inspiring students while being inspired by students. Furthermore, the inherent values of the teacher-student connection (eg, trust, respect, reciprocity, and recognition) can transform students' perceptions and perspectives, creating a "place of possibility" that allows students to discover their personal and professional potential, and to achieve self-transcendence [26]. In a study of preservice teachers' experience of learning a humanizing pedagogy, emotional bonding and positive relationships with students were reported as catalysts to address educational issues with care, trust, and respect [27]. These findings suggest that human relationships, connections, and respect between teachers and students are not optional but indispensable for a thriving learning environment.

By contrast, there have been discussions about maintaining a proper distance between teachers and students. Chory and Offstein [28] questioned the extent to which the personal, emotional, and professional nature of human interaction should be attempted in learning domains, where a caring relationship between the faculty and students is essential. Molloy and Bearman [29] discussed "intellectual candor" in HPE and questioned the extent to which teachers can openly show vulnerability while remaining credible. Admittedly, criteria for meaningful connections between faculty and students are ambiguous and complex, and faculty-student relationships can become overly intimate and personal unintentionally [28]. To protect faculty, educational institutions, and students in particular, teachers should establish mutually desirable and healthy relationships with students through constant self-reflection and close discussion with colleagues, mentors, and administrators [28]. Further research of teacher and student perspectives is required to establish concrete guidelines for professional teacher-student relationships.

Our study supports the notion that teachers need to consider how to create a supportive learning environment given its impact on learning outcomes [30]. The creation of a learning environment that supports affective learning was highlighted as an important pedagogical strategy for the students. To deliver high-quality patient care, health profession students must learn to apply affective domain skills such as ethics, critical thinking, and judgment to clinical situations [31]. The literature identifies that reflection is an important strategy for affective learning, which is consistent with our findings [32,33], and is also a tool to facilitate active learning [32]. In addition to self-reflection, educators should consider incorporating strategies such as think-pair-share, role playing, and simulation to strengthen the affective learning domain [30], as well as activities such as portfolios, volunteering, and learning contracts [31].

The findings of our study expand on previous literature suggesting that the learning environment, and specifically the educator, can have an impact on student motivation [34]. Kember et al's [34] motivational teaching and learning environment framework describes findings similar to all four themes outlined in this paper. Although all eight elements of Kember's model were evident in our data, those that align most closely with our themes include close teacher-student relationships, teaching for understanding, assessment of learning activities, and sense of belonging between classmates [34]. Similar to the findings of Kember and colleagues, some students in our dataset identified student-teacher rapport, a sense of community, teaching strategies that facilitated cognitive and affective learning, and the importance of feedback as elements that fostered their motivation.

Our findings also suggest that students value being adequately challenged by coursework, which is consistent with recommendations for medical educators based on a social cognitive model [35] and self-determination theory [36]. These recommendations suggest that motivation to learn is an interaction of internal and external factors, and exploring ways of stimulating internal motivation [35,36]. In addition to using activities that provide challenge, other recommendations that were supported by our findings include promoting student-centered learning, effective feedback, and a sense of connectedness with the teacher and community.

An important form of interaction between students and instructors is assessment and feedback. Assessment and evaluation in nursing education are essential to the learning process [37]. Assessment is the process of gathering information about students, courses, educational programs, and policies. Assessment provides educators with information to make decisions about student performance, proficiency, and learning. It also produces feedback for students to develop their knowledge and skills, and to evaluate whether they have reached learning goals and outcomes [37]. In our study, students reported a higher level of learning when the instructor/facilitator provided clear instructions and expectations regarding assignments and deadlines, and feedback that improved student performance and instilled a sense of pride. Our findings support that assessment and its communication are key elements in successful pedagogy and best practices for implementation.

The students in our study described having good pedagogical experiences when learner and community building was mobilized. Humans are social creatures and need interaction to create a learning environment that actively involves students in the learning process [38]. Online education is becoming standard in higher education. As of the fall of 2018, over 35% of undergraduate students and 40% of graduate students were enrolled in at least one online course [39]. Student perspectives on the COI model in our study are consistent with assertions that active engagement and effective communication are essential in online learning communities [14] and provide an opportunity to socialize and feel more connected [38,40]. The COVID-19 pandemic has stressed the importance of being able to reach students remotely, and has confirmed both the benefits and the challenges of online education. The discussion board has emerged as a crucial methodology for instructors to provide interactive, active, and collaborative learning [14,38,40]. Some even argue that the best teaching occurs in asynchronous online discussion forums [38]. Modeling good online practice, summarizing posts, and responding to student posts consistently and often have been shown to encourage critical thinking [41] and higher-level learning [40]. As in transformative learning and feminist pedagogy, an interactive discourse is essential to mobilizing critical thinking and cocreating new knowledge in the COI framework. The students in our study described their learning experiences as positive when their teachers fostered a sense of community and meaningful collaboration while accommodating individual learning styles and preferences.

We also discovered that individual students responded to or perceived specific teaching strategies and teacher characteristics differently. Interestingly, some students perceived high expectations as indicative of being respected as learners, whereas others wrote that their worst experience was related to high expectations. High expectations combined with respect or rapport, or with a supportive human relationship were more often viewed as components of good pedagogy. Despite some conflicting views, clear and strong themes emerged from the data demonstrating the importance of professionalism, caring, respectful student-teacher engagement, clear communication, and timely and thoughtful feedback for creating an effective learning community characterized by good pedagogy.

Limitations

This study has several limitations. First, the data analysis and its interpretation depend on the researchers' skills, assumptions, and experience; therefore, we took great care to maintain rigor during all levels of the coding, and we reflected on and shared our personal worldviews at the onset. Additionally, we involved a large team of researchers with diverse cultural backgrounds and different levels of teaching experience in the analysis and interpretation to ensure a multiplicity of perspectives. Second, our analysis depends solely on archived data, and we were unable to carry out member-checking of the data. We cannot know whether our interpretations of the sentiments expressed by the students in their writing accurately represent what they were experiencing or feeling at the time of posting. The nature of textual data in a netnographic study [17] also limits the ability to detect participants' emotions or states of mind in the asynchronous online forum. Finally, the students in this study came solely from a private university in the southeastern United States. There were differences in age, nationality, race/ethnicity, and level of education among the students who participated in this study; however, there was homogeneity in that some study participants were enrolled in the same educational institution. Although this homogeneity may hinder generalization of the results to populations in other countries or areas, we did not ask students to limit their reflections only to educational experiences at their current university; therefore, it is likely that the range of experiences we coded, both positive and negative, represent experiences from many different learning environments.

Future Studies

Although this analysis identifies several key aspects of high-quality education experiences, there remain some unanswered questions that can be addressed in future research. First, we note the tension that can exist between student wants and the pragmatic realities of teaching. For example, our analysis found that students want to receive frequent and detailed feedback on their work throughout a learning experience; however, instructors will find this difficult to accomplish when teaching large classes. Such tensions resonated with the research team, many of whom had recent related experiences as both instructors and students. Future research should examine different models for integrating or balancing the needs of students and instructors in larger classes.

Second, we note the importance of finding the right balance between the amount of work assigned and its level of difficulty. Students' descriptions of poor learning experiences included those in which the work was too easy as well as too difficult. The same pattern emerged regarding the amount of work assigned. Good pedagogies provide a challenging yet manageable amount of work. Future research is needed to identify strategies that instructors can use to establish the right balance in a course. We hypothesize that this balance will vary based on course type, level, student population, and teacher characteristics, as well as pedagogical strategies and philosophies of education.

Third, future research should further elaborate the relationships between critical components of good pedagogy. For example, the role of student motivation in mediating learning experiences could be explored. Our data showed that teacher professionalism, adequate design of the learning environment, supportive challenges, and sense of connection with the teacher inspired and motivated students to embrace learning for personal and professional enrichment rather than as a means of obtaining a high grade. Although our study cannot verify a causal relationship, Keller [42] highlighted the critical role of motivation in learning and proposed the ARCS-V (attention, relevance, confidence, satisfaction, and volition) model, which can provide practical strategies to build and sustain student motivation. Future research can be performed to develop a conceptual framework of good pedagogy and explore the specific role of each component identified in this study, including motivation.

Finally, we did not ask the students to identify whether the positive and negative learning experiences they described occurred online, in person, or in hybrid courses. It is probable that different course formats and modalities should emphasize different elements of good pedagogy. For example, community building may be more critical in online classes in which students have no extracurricular engagements, whereas in campus-based courses that make greater demands on students' time, managing the workload may be more critical. Interestingly, a recent study by Jezuit et al [43] surveyed nursing students in an online graduate program about faculty caring in their online program. Their results appear strikingly similar to ours. They identified four themes: (1) demonstrates engagement (ie, responsive, available, accessible); (2) facilitates learning (ie, timely, personalized feedback), which is similar to our assessment theme; (3) challenges students (ie, shares expertise, poses critical intellectual questions), which is similar to our environment for affective and cognitive learning theme; and (4) encourages students (ie, expresses empathy and compassion, provides praise, reaches out), which is similar to our teacher presence and mobilizing learner- and community-centered approach. We suggest that future research continue to explore how differences in course formats and modalities influence good pedagogy.

Conclusions

We explored perceptions of good pedagogy by analyzing students' descriptions of their best and worst learning experiences. The themes that emerged from our analysis confirm findings from previous studies and provide new insights. The essence of pedagogy must be high-quality, practical, real-world knowledge and skills that empower students to reach their potential. Good pedagogy is more than an instructional platform; students can have good and bad learning experiences on any platform. Instructional platforms are tools that an effective teacher uses skillfully to encourage maximum achievement. When utilized by the unskilled or inattentive teacher, however, the same tools can yield disappointingly different results. Virtual platforms pose unique challenges to observing the theoretical tenets of transformational learning and feminist pedagogy. Our analysis highlights the critical need to view technology as a tool in the service of pedagogy. Technology can facilitate the implementation of student-centered teaching approaches but cannot create them. Indeed, the COI framework embraces the feminist pedagogy by breaking down barriers between the teacher and learner, and creating the community necessary for higher-level learning. A resourceful teacher will embrace various communication techniques to develop meaningful teacher-learner connections. Styles of communication will vary as each unique group of learners presents different expectations and learning preferences. The aim of all should be to engage each learner fully by establishing a rapport and environment that allows the free flow of ideas and expression.

Acknowledgments

The authors would like to thank the Duke University Compact for Open Access Publishing Equity program for its support of the open access publication of this manuscript. This research was funded by a 2019-2020 Duke Learning Innovation's Educational Research Grant awarded to JD. The authors thank Donnalee Frega, PhD for editorial assistance.

Authors' Contributions

JD and KM designed the study, and JD drafted the introduction. KM (Associate Director of Research, Evaluation, and Development of Duke Learning Innovation) cleaned and migrated a large dataset from the online discussion forum, and drafted the context of the study and data collection. JD, PK, HP, AC, EC, SR, SY, and DJ comprised the coding team that developed in vivo codes and analyzed the data iteratively. Data analysis and the results were drafted by all authors, who interpreted the results and wrote the discussion and conclusion collaboratively. All authors have read and approved the final manuscript.

Conflicts of Interest

None declared.

Multimedia Appendix 1

Reflective notes from each author.
[PDF File (Adobe PDF File), 93 KB - mededu_v7i2e27736_app1.pdf]

References

1. Bhowmik M, Banerjee B, Banerjee J. Role of pedagogy in effective teaching. Basic Res J Educ Res Rev 2013;2(1):1-5.
2. McAllister M. STAR: a transformative learning framework for nurse educators. J Transform Educ 2012 Jan 05;9(1):42-58. [doi: 10.1177/1541344611426010]
3. Van Schalkwyk SC, Hafler J, Brewer TF, Maley MA, Margolis C, McNamee L, Bellagio Global Health Education Initiative. Transformative learning as pedagogy for the health professions: a scoping review. Med Educ 2019 Jun;53(6):547-558. [doi: 10.1111/medu.13804] [Medline: 30761602]
4. Onufer L, Munoz Rojas L. Teaching at Pitt: Introduction to feminist pedagogy. University of Pittsburg University Times. 2019. URL: https://www.utimes.pitt.edu/news/teaching-pitt-8 [accessed 2021-01-10]
5. Mezirow J. Learning as transformation: Critical perspectives on a theory in progress. 1st ed. San Francisco, CA: Jossey-Bass; 2000.
6. Henderson EF. Feminist pedagogy. Gender and Education Association. URL: http://www.genderandeducation.com/issues/feminist-pedagogy [accessed 2020-10-12]
7. Shrewsbury CM. What is feminist pedagogy? Women's Stud Q 1993;21(3-4):8-16 [FREE Full text]
8. Rich JD. Feminist pedagogy in the classroom. Psychology Today. URL: https://www.psychologytoday.com/us/blog/psyched/201502/feminist-pedagogy-in-the-classroom [accessed 2021-01-22]
9. Yates HT, Rai A. A scoping review of feminism in U.S. social work education: strategies and implications for the contemporary classroom. J Evid Based Soc Work 2018 Dec 10;16(2):1-13. [doi: 10.1080/23761407.2018.1555070] [Medline: 30526446]
10. Mezirow J. Transformative learning: theory to practice. New Dir Adult Cont Educ 2002 Dec 10;1997(74):5-12. [doi: 10.1002/ace.7401]
11. Weiler K. Freire and a feminist pedagogy of difference. Harv Educ Rev 1991;61(4):449-474. [doi: 10.17763/haer.61.4.a102265jl68rju84]
12. Shrewsbury CM. What is feminist pedagogy? Women's Stud Q 1987;15(4):6-14.
13. Garrison DR, Anderson T, Archer W. Critical inquiry in a text-based environment: computer conferencing in higher education. Internet High Educ 1999 Mar;2(2-3):87-105. [doi: 10.1016/s1096-7516(00)00016-6]
14. Covelli BJ. Online discussion boards: the practice of building community for adult learners. J Contin High Educ 2017 Jun 28;65(2):139-145. [doi: 10.1080/07377363.2017.1274616]
15. Morais GM, Santos VF, Gonçalves CA. Netnography: origins, foundations, evolution and axiological and methodological developments and trends. Qual Rep 2020 Feb 18;25(2):441-455 [FREE Full text] [doi: 10.46743/2160-3715/2020.4227]
16. Kozinets RV, Gambetti R. Netnography unlimited understanding technoculture using qualitative social media research. London: Routledge; 2021.
17. Kozinets RV, Dolbec P, Earley A. Netnographic Analysis: understanding culture through social media data. In: Flick U, editor. The SAGE Handbook of Qualitative Data Analysis. 1st ed. Thousand Oaks, CA: SAGE Publications; 2013:262-276.
18. Kulavuz-Onal D. Using netnography to explore the culture of online language teaching communities. Calico J 2015 May 26;32(3):426-448. [doi: 10.1558/cj.v32i3.26636]
19. Kozinets RV. Netnography: The essential guide to qualitative social media research. 3rd ed. Thousand Oaks, CA: SAGE Publications; 2020.
20. Miles MB, Huberman AM, Saldaña J. Qualitative data analysis: a methods sourcebook. 4th ed. Thousand Oaks, CA: SAGE Publications; 2020.
21. Marshall C, Rossman GB. Designing qualitative research. 6th ed. Thousand Oaks, CA: SAGE Publications; 2016.
22. Tracy SJ. Qualitative quality: eight “big-tent” criteria for excellent qualitative research. Qual Inq 2010 Oct 01;16(10):837-851. [doi: 10.1177/1077800410383121]
23. Elo S, Kääriäinen M, Kanste O, Pölkki T, Utriainen K, Kyngäs H. Qualitative content analysis: a focus on trustworthiness. SAGE Open 2014 Feb 11;4(1):1-10. [doi: 10.1177/2158244014522633]
24. Bergum V. Relational pedagogy. Embodiment, improvisation, and interdependence. Nurs Philos 2003 Jul;4(2):121-128. [doi: 10.1046/j.1466-769x.2003.00128.x] [Medline: 14498952]
25. Booker KC, Lim JH. Belongingness and pedagogy. Youth Soc 2016 May 30;50(8):1037-1055. [doi: 10.1177/0044118x16652757]
26. Gillespie M. Student-teacher connection: a place of possibility. J Adv Nurs 2005 Oct;52(2):211-219. [doi: 10.1111/j.1365-2648.2005.03581.x] [Medline: 16164482]
27. Czop Assaf L, O’Donnell Lussier K, Furness S, Hoff M. Exploring how a study abroad and international service-learning project shaped preservice teachers’ understanding of humanizing pedagogy. Teach Educ 2019 May 10;54(2):105-124. [doi: 10.1080/08878730.2018.1520376]
28. Chory RM, Offstein EH. “Your Professor Will Know You as a Person”: evaluating and rethinking the relational boundaries between faculty and students. J Manag Educ 2016 Jul 27;41(1):9-38. [doi: 10.1177/1052562916647986]

29. Molloy E, Bearman M. Embracing the tension between vulnerability and credibility: 'intellectual candour' in health professions education. Med Educ 2019 Jan;53(1):32-41. [doi: 10.1111/medu.13649] [Medline: 30192024]
30. Hagler D, Morris B. Learning environment teaching methods. In: Oermann MH, De Gagne JC, Phillips BC, editors. Teaching in nursing and role of the educator: The complete guide to best practice in teaching, evaluation, and curriculum development. 2nd ed. New York, NY: Springer; 2018:47-74.
31. Van Valkenburg J, Holden LK. Teaching methods in the affective domain. Radiol Technol 2004;75(5):347-354. [Medline: 15202341]
32. Donlan P. Developing affective domain learning in health professions education. J Allied Health 2018;47(4):289-295. [Medline: 30508841]
33. Neumann JA, Forsyth D. Teaching in the affective domain for institutional values. J Contin Educ Nurs 2008 Jun;39(6):248-52; quiz 253. [doi: 10.3928/00220124-20080601-07] [Medline: 18557282]
34. Kember D. Motivating students through teaching and learning. In: Understanding the nature of motivation and motivating students through teaching and learning in higher education. Singapore: Springer; 2016:978-981.
35. Pelaccia T, Viau R. Motivation in medical education. Med Teach 2017 Feb;39(2):136-140. [doi: 10.1080/0142159X.2016.1248924] [Medline: 27866457]
36. Kusurkar RA, Croiset G, Ten Cate TJ. Twelve tips to stimulate intrinsic motivation in students through autonomy-supportive classroom teaching derived from self-determination theory. Med Teach 2011;33(12):978-982. [doi: 10.3109/0142159X.2011.599896] [Medline: 22225435]
37. Oermann M, Gaberson K. Evaluation and testing in nursing education. 5th ed. New York City, NY: Springer; 2016.
38. Darby F. Small teaching online: Applying learning science in online classes. San Francisco, CA: Jossey-Bass; 2019.
39. Fast facts: Distance learning. National Center for Education Statistics. 2020. URL: https://nces.ed.gov/fastfacts/display.asp?id=80 [accessed 2020-11-22]
40. Aloni M, Harrington C. Research based practices for improving the effectiveness of asynchronous online discussion boards. Scholarsh Teach Learn Psychol 2018 Dec;4(4):271-289. [doi: 10.1037/stl0000121]
41. Belcher AR, Hall BM, Kelley K, Pressey KL. An analysis of faculty promotion of critical thinking and peer interaction within threaded discussions. OLJ 2015 May 18;19(4):1-4. [doi: 10.24059/olj.v19i4.544]
42. Keller JM. Motivation, learning, and technology: applying the ARCS-V motivation model. Per 2016 Aug 01;3(2):1-15. [doi: 10.17275/per.16.06.3.2]
43. Jezuit D, Ritt E, Panozzo G, Ridge A. Graduate nursing students' perspectives of faculty caring in online learning: a survey study. Int J Hum Caring 2020;24(4):257-264. [doi: 10.20467/HumanCaring-D-20-00004]

Abbreviations

COI: community of inquiry
HPE: health professions education
STAR: sensitivity, taking action, and reflection
TA: teaching assistant

Edited by G Eysenbach; submitted 05.02.21; peer-reviewed by D McDonnell; comments to author 05.03.21; revised version received 04.04.21; accepted 14.05.21; published 22.06.21.

Please cite as:
De Gagne JC, Koppel PD, Park HK, Cadavero A, Cho E, Rushton S, Yamane SS, Manturuk K, Jung D
Nursing Students' Perceptions about Effective Pedagogy: Netnographic Analysis
JMIR Med Educ 2021;7(2):e27736
URL: https://mededu.jmir.org/2021/2/e27736
doi:10.2196/27736
PMID:34156337

Viewpoint

Survey of Residency Directors' Views on Entrepreneurship

Emily K Tam[1,2*], MD, MPH; Xuezhi Dong[1*], MD, MPH

[1]David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, CA, United States

[2]Boston Medical Center, Boston, MA, United States

[*]all authors contributed equally

Corresponding Author:
Emily K Tam, MD, MPH
David Geffen School of Medicine
University of California, Los Angeles
10833 Le Conte Ave
Los Angeles, CA
United States
Phone: 1 5109071908
Email: emilytam@ucla.edu

Abstract

Medical students enter the medicine field with fresh ideas that may make them great entrepreneurs. However, medical students are uncertain about how the program directors of their desired residency would view them if they pursued business opportunities. We surveyed residency directors to obtain their views on medical students' entrepreneurship experiences. This viewpoint article aims to help American medical students who are interested in health innovations understand how their interests and entrepreneurial experiences may affect how they are viewed by residency program directors. Most program directors had favorable views of medical students with experience in entrepreneurship, and they believed that the innovative traits gained from such experiences would add to the program.

(JMIR Med Educ 2021;7(2):e19079) doi:10.2196/19079

KEYWORDS

medical student education; medical student innovation; health innovation; program director

Introduction

Due to living in an era when innovative companies like Uber and Amazon are radically transforming the way we live our lives (from our transportation methods to our shopping methods), we are constantly exposed to new ideas that make life easier and more efficient. Despite people's excitement for innovation, health care has been lagging in terms of adopting new ways to improve the health of Americans in a cost-effective manner [1]. In 2016, health care expenditures exceeded US $3 trillion in the United States, which is equivalent to US $9500 per person [2]. However, this amount of spending has not resulted in spectacular health outcomes, as the United States continues to have higher chronic disease rates; lower life expectancies; and poorer determinants of health, such as obesity, compared to other high-income nations [3,4]. One group in the medical profession that is beyond capable of being innovators in medicine is medical students.

Medical students enter the clinical medicine field with fresh and inquisitive minds [5]. Without years of experience and preconceptions, medical students can identify inefficiencies and challenges in the medicine field and have a strong desire to do something about them [5]. They often question the status quo of the health care system and ponder how it can be changed for the better. These characteristics have led to examples of successful companies started by medical students, such as Osmosis and SimX [6,7].

Although many medical students may have an interest in innovation and entrepreneurship, not many will actively pursue opportunities in these areas [8,9]. There is tremendous pressure for medical students to stay on the traditional pathway toward residency—obtaining glowing US Medical Licensing Examination scores, stunning clinical rotation evaluations, and prolific research achievements. Although health innovation is essential for improving the health care system, experts are unsure of how it can be integrated into medical training and, more importantly, how it affects students' chances of being matched to their top choice residency programs [8,10]. To uncover how residency program directors perceive medical student entrepreneurship experiences in the application process, we conducted a survey of residency directors from some of the highest-ranked residency programs in the country.

Methods

We sent a web-based survey via email to the directors of residencies across 16 different specialties that were affiliated with 17 top-ranked medical schools (according to the US News and World Report) [11] that represented the major regions of the country. The primary care–related fields that were represented included family medicine, internal medicine, obstetrics and gynecology, pediatrics, emergency medicine, and psychiatry. The nonprimary care–related fields that were represented included anesthesiology, radiology, neurology, general surgery, ophthalmology, orthopedic surgery, and plastic surgery. The initial email was followed by a reminder email that was sent approximately 1-2 weeks later.

The survey included both multiple-choice and open-ended questions. The multiple-choice questions included the following: (1) how many students with start-up experience did you encounter in the last 5 application cycles; (2) how does your program perceive students with start-up experience in the evaluation process; (3) what skills learned from start-ups do you believe can be applicable to a student training as a resident; (4) do you think using this time to work in start-ups or businesses would be beneficial for the student's clinical training; and (5) how would you rate your department/institution in terms of its receptiveness to new ideas? The multiple-choice responses were recorded on Google Forms and response percentages were calculated.

Open-ended questions included the following: (1) what advice do you have for medical students who are interested in entrepreneurship and start-ups; and (2) does your residency program permit students to take time off to pursue their research or academic interests? The responses to these questions were qualitatively analyzed by using a conventional content analysis approach, and notable comments are reported in the *Results* section [12].

Results

We sent 190 survey requests; a total of 28 residency directors responded (response rate=15%). Of the 28 directors, 17 (61%) believed that providing start-up experiences in the residency application was favorable and increased the likelihood of being matched to a residency program. Further, 9 (32%) directors had neutral views on entrepreneurship experience, while 2 (7%) directors viewed the experience as unfavorable. All residency directors reported that they encountered medical students with entrepreneurship experience in the last 5 application cycles, with 10 (36%) reporting that they encountered 1-5 such applicants and 6 (21%) reporting that they encountered more than 15 such applicants.

When asked about what skills students can learn from start-ups that are applicable to residency training, 22 (79%) residency directors believed that students could gain communication skills, leadership skills, and the ability to innovate. Further, 20 (71%) surveyed directors believed that students could gain organizational skills, 18 (64%) believed that students could gain the ability to work in a team, and 16 (57%) said that students could gain better time management skills.

When residency directors were asked to rate their department or institution in terms of its receptiveness to new ideas, 13 (43%) directors reported that their institution was a very innovative place where new ideas were implemented rapidly, and 12 (46%) believed that their institutions were somewhat innovative and that new ideas could take some time to be implemented.

Although 24 (86%) residency directors reported that they permitted residents to take time off to pursue research or academic interests (duration was variable but could range from 6 weeks to 2 years), only 7 (25%) directors thought that taking time off to work in start-ups or businesses would benefit residents' clinical training, 16 (57%) believed that such time off might help students, and 5 (18%) believed that such time off would not help residents.

Perhaps the more interesting insights came from the comments provided by the residency directors. Most comments revolved around the theme that students should focus on becoming great clinicians before pursuing entrepreneurial interests. A Johns Hopkins program director who viewed start-up experiences as favorable made the following comment:

> *Innovation in medicine is of the utmost importance...recently we have all expanded our view on how to fund and support new ideas. Start-ups are an excellent way to support innovation and we are all favorably inclined toward students with experience in this realm. The success or failure of the start-up is immaterial. The process itself is highly educational.*

Another program director said:

> *I would encourage them, but to also reflect on what their ultimate professional goals are with a medical degree. Ideally, their experience would align with these goals. We look for this alignment in the application process.*

A director also cautioned that "[it] is important to be up front with program directors regarding your interests." They also stated:

> *Since you'll be matching into a job (as well as a training program) the program is expecting that your attention will be primarily on the training program so unforeseen changes in staffing can be disruptive. Talking in advance can help keep options open.*

We also learned from directors who negatively viewed entrepreneurship. A director stated:

> *Wait until you are faculty. Our Program and others consider those students interested in entrepreneurship and start-ups to be unfocused, self-absorbed, and potential flight risks. While we interview students with such interests they definitely lose points when it comes time for ranking.*

Another director said:

> *The only residents we've had quit our training program recently have been entrepreneurs. Despite*

the positive qualities inherent in an entrepreneur this has made us hesitant to match any more.

Discussion

Despite our small sample size, our survey roughly gauged the opinions of directors of highly ranked residencies across multiple specialties in the United States. There was a diversity of opinions, but the majority of directors (17/28, 61%) perceived providing start-up experiences in the residency application as positive. Although they encouraged students to pursue entrepreneurial interests, residency directors almost unanimously believed that developing good clinical skills and becoming a good physician were the top priorities. There have been medical students who left their institution for a start-up before returning to school due to their desire to see patients again [13]. Since residency training is very demanding, many highly recommended students pursue other experiences before or after their residency rather than during their residency.

Conclusion

We found that several residency directors were concerned that residents would quit their residency program to pursue other opportunities and therefore had more cautious attitudes. With regard to one's career plans, clear and timely communication with residency program directors during the application cycle is crucial.

Conflicts of Interest

None declared.

References

1. Fleck LM. Controlling healthcare costs: Just cost effectiveness or "just" cost effectiveness? Camb Q Healthc Ethics 2018 Apr;27(2):271-283. [doi: 10.1017/S0963180117000603] [Medline: 29509125]
2. Dieleman JL, Cao J, Chapin A, Chen C, Li Z, Liu A, et al. US health care spending by payer and health condition, 1996-2016. JAMA 2020 Mar 03;323(9):863-884 [FREE Full text] [doi: 10.1001/jama.2020.0734] [Medline: 32125402]
3. Papanicolas I, Woskie LR, Jha AK. Health care spending in the United States and other high-income countries. JAMA 2018 Mar 13;319(10):1024-1039. [doi: 10.1001/jama.2018.1150] [Medline: 29536101]
4. Avendano M, Kawachi I. Why do Americans have shorter life expectancy and worse health than do people in other high-income countries? Annu Rev Public Health 2014;35:307-325 [FREE Full text] [doi: 10.1146/annurev-publhealth-032013-182411] [Medline: 24422560]
5. Murphy B. Effective med student-entrepreneurs have these 5 traits. American Medical Association. 2019 Jul 15. URL: https://www.ama-assn.org/residents-students/medical-school-life/effective-med-student-entrepreneurs-have-these-5-traits [accessed 2020-09-01]
6. Spanu A. Health education startup Osmosis raised $4million in new funding to expand. Healthcare Weekly. 2019 Jun 21. URL: https://healthcareweekly.com/osmosis-funding-round/ [accessed 2020-09-01]
7. Gaglani S. Why medical schools are pumping out entrepreneurs. Entrepreneur. 2013 Oct. URL: https://www.entrepreneur.com/article/229672 [accessed 2020-10-01]
8. Entrepreneurship can start in med school. Here's what to know. American Medical Association. 2019 Feb 11. URL: https://www.ama-assn.org/residents-students/medical-school-life/entrepreneurship-can-start-med-school-here-s-what-know [accessed 2020-04-01]
9. Krieger P, Goodnough A. Medical students, sidelined for now, find new ways to fight coronavirus. The New York Times. 2002 Mar 20. URL: https://www.nytimes.com/2020/03/23/health/medical-students-coronavirus.html [accessed 2020-04-01]
10. Farr C. Siren song of tech lures new doctors away from medicine. NPR. 2015 Jul 19. URL: https://www.npr.org/sections/health-shots/2015/07/19/423882899/siren-song-of-tech-lures-new-doctors-away-from-medicine [accessed 2020-04-01]
11. Best medical schools (research) Ranked in 2022 - US News Rankings. U.S. News & World Report. URL: https://www.usnews.com/best-graduate-schools/top-medical-schools/research-rankings [accessed 2021-04-09]
12. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res 2005 Nov;15(9):1277-1288. [doi: 10.1177/1049732305276687] [Medline: 16204405]
13. Siddiqui G. I left medical school for a startup. Here's why I went back. MedPage Today. 2016 Feb 13. URL: https://www.kevinmd.com/blog/2016/02/left-medical-school-startup-heres-went-back.html [accessed 2020-09-01]

Edited by G Eysenbach; submitted 02.04.20; peer-reviewed by S Chen, S Jung; comments to author 01.06.20; revised version received 07.09.20; accepted 26.03.21; published 14.04.21.

Please cite as:
Tam EK, Dong X
Survey of Residency Directors' Views on Entrepreneurship
JMIR Med Educ 2021;7(2):e19079
URL: https://mededu.jmir.org/2021/2/e19079
doi:10.2196/19079
PMID:33851929

Viewpoint

Teaching Telemedicine: The Next Frontier for Medical Educators

Maria Alcocer Alkureishi[1*], MD; Gena Lenti[2*], BSc; Zi-Yi Choo[2*], BSc; Jason Castaneda[2*], BSc; George Weyer[3], MD; Julie Oyler[3], MD; Wei Wei Lee[3*], MD, MPH

[1]Department of Pediatrics, University of Chicago, Chicago, IL, United States
[2]Pritzker School of Medicine, University of Chicago, Chicago, IL, United States
[3]Department of Medicine, University of Chicago, Chicago, IL, United States
[*]these authors contributed equally

Corresponding Author:
Maria Alcocer Alkureishi, MD
Department of Pediatrics
University of Chicago
5841 S Maryland Avenue
Chicago, IL, 60637
United States
Phone: 1 773 834 8927
Email: malkureishi@peds.bsd.uchicago.edu

Abstract

The COVID-19 pandemic has pushed telemedicine to the forefront of health care delivery, and for many clinicians, virtual visits are the new normal. Although telemedicine has allowed clinicians to safely care for patients from a distance during the current pandemic, its rapid adoption has outpaced clinician training and development of best practices. Additionally, telemedicine has pulled trainees into a new virtual education environment that finds them oftentimes physically separated from their preceptors. Medical educators are challenged with figuring out how to integrate learners into virtual workflows while teaching and providing patient-centered virtual care. In this viewpoint, we review principles of patient-centered care in the in-person setting, explore the concept of patient-centered virtual care, and advocate for the development and implementation of patient-centered telemedicine competencies. We also recommend strategies for teaching patient-centered virtual care, integrating trainees into virtual workflows, and developing telemedicine curricula for graduate medical education trainees by using our TELEMEDS framework as a model.

(JMIR Med Educ 2021;7(2):e29099) doi:10.2196/29099

KEYWORDS

telemedicine; virtual visits; patient-centered care; graduate medical education; medical education; telehealth; virtual health; graduate students; education; COVID-19; pandemic

Introduction

Virtual visits are "clinical interactions in health care that do not involve the patient and provider being in the same room at the same time" [1], such as visits conducted via telephone or videoconferencing [2]. At the start of the COVID-19 pandemic, virtual visits allowed clinicians to provide care to their ambulatory patients in a safe manner; however, for most clinicians, the speed at which they were forced to transition their practices to telemedicine did not allow time for thoughtful planning about the integration of patient-centered care practices and trainee education. Virtual visits continue to constitute a significant portion of outpatient care, and although guidance exists on how to make virtual visits more effective and patient-centered [2-6], we suspect many clinicians across various specialties are finding it difficult to master patient-centered virtual visit practices, all while trying to educate their students, residents, and fellows on the same topic. Furthermore, trainees and faculty may not be in the same physical space for virtual clinic sessions, which creates further challenges for integrating trainees into new workflows.

Since telemedicine will likely be part of our clinical landscape in the future, clinician educators will need educational strategies to teach patient-centered virtual visit practices to trainees. Additionally, since patient-centeredness is intricately tied to care access and health equity [7], clinician educators and trainees alike must learn how to approach telemedicine from an individualized, patient-centered standpoint, understanding how it can both enhance care for some vulnerable communities [8,9] as well as ways it can widen health care disparities for others [10-13]. With this in mind, we will discuss what is known about patient-centered care, particularly as it applies to virtual visits.

We will propose strategies for teaching patient-centered virtual practices to trainees with the guidance of the framework "TELEMEDS," which is based on a literature review and input from key stakeholders, including trainees and practicing clinicians (Figure 1). Although some of the tips we share in this paper are specific to video visits and the added benefit of connecting visually across a screen, many of our strategies (eg, reviewing a virtual clinic schedule and verbal communication tips) also apply to telephone visits, so we will use the term "virtual visit" to apply broadly to both scenarios. Finally, we will discuss how best to integrate trainees into virtual clinic workflows.

Figure 1. The TELEMEDS mnemonic, based on a literature review and input from key stakeholders, presents a framework for teaching patient-centered virtual practices to trainees.

TELEMEDS

Tips to Optimize Virtual Visits

T	Test it out first	Prior to the visit, **practice** using your virtual visit platform. Check audio & video. Test mute & screen share. Practice **splitting the screen** to allow you to see your patient & the EHR at the same time.
E	Evaluate your schedule	Identify patients that **should not** have virtual visits. Proactively **anticipate** needs for the visit (outside records, translation services, etc).
L	Layout an agenda	**Contextualize** your visit agenda by reviewing your patient's interval history (last note, labs, etc). Note any outstanding orders or preventative health needs that should be addressed.
E	Establish visit rules	**Introduce** yourself, team members & verify your patient. Determine a technical **back-up** plan. Identify your patient's **goals** for the visit & balance those with your agenda items.
M	Modify your speech	**Vary** tone & inflection. Speak **slowly** to allow for buffering & lag. **Pause** for questions often. Check for understanding.
E	Encourage patient engagement	Look for **opportunities** to educate patients using **screen share** - demonstrate websites, review EHR information. Engage patients in **note writing** when appropriate and jointly create an **after visit summary** to reinforce the plan.
D	Demonstrate positive nonverbal communication	Maintain good **eye** contact. Smile or express concern when appropriate. Signal **active listening** by nodding or shaking your head.
S	Summarize next steps	Be specific about **when** & **how** to follow up. Encourage **patient portal** use to review their after visit summary & chart updates for reference. Elicit direct patient **feedback**.

Our recommendations provide practical tips for incorporating patient-centered telemedicine into clinical training; however, more work is needed to refine and implement these strategies. Thus, we recognize the need to develop telemedicine curricula for senior clinicians and trainees alike. We call on the medical education community to prioritize the development, equitable implementation, and study of evidence-based telemedicine training and the meaningful evaluation of trainees with regard to these skills.

What We Know About Patient-Centered Care and Telemedicine

Patient-centered care is defined as "providing care that is respectful of and responsive to individual patient preferences, needs and values and ensuring that patient values guide all clinical decisions" [14]. Prior studies have shown patient-centered care in the in-person setting is associated with higher patient satisfaction and positive health outcomes [15,16]. As the patient-centered medical home [17] extends into a virtual space, the same guiding principles of patient-centered care are still possible, if not more so. In fact, simply providing virtual visit options may allow patients to access care more easily, improve communication with their care team, and give patients more control over where and how they choose to interact with the health care system—all important and fundamental tenets of providing the right care, at the right time, in the right place [18].

Additional studies have demonstrated several benefits of virtual visits, including ease of use, low cost, ability to improve patient-provider communication, decreased travel time, increased access to care for patients, and high patient satisfaction [19-21]. Despite these benefits, telemedicine may risk further fragmentation of care if not implemented correctly [22]. In particular, it raises issues related to equitable care delivery and concerns of exacerbating the digital divide, where access to the technology required for telehealth differs along sociodemographic lines [10-12]. Further, the virtual nature of telemedicine has the potential to hinder patient-provider communication; for example, in one study where patients expressed concerns about errors in their care due to the lack of physical exam, they reported feeling less involved during the visit and had difficulty finding opportunities to speak [23]. Other studies have summarized further communication drawbacks, including lack of physical touch, difficulty building rapport, and decreased ability to recognize subtle nonverbal cues and expressions [2,24].

Although we are still discovering barriers and solutions to patient-provider communication through the lens of this new technology, we can look to recent history for cues on how to overcome challenges in an increasingly tech-centric world. For instance, as electronic health records (EHRs) became the norm across institutions, studies found that providers spent more than half of their time in a patient encounter navigating the EHR system, which resulted in a struggle for providers to give adequate time to direct patient care [25]. Another study on patient perceptions of EHR use found that patients expressed concern that their physicians were more focused on the computer than on them during in-person clinic visits [26]. However, over the course of time, providers found ways to utilize the EHR to improve patient-doctor communication, to engage patients visually, and to actively promote discussion, education, and shared decision-making [25,27].

Some more recent work has helped elucidate how the core principles of patient-centered care can be applied to telemedicine. In the midst of the COVID-19 pandemic, some institutions developed checklists or principles to guide clinicians on how to carry in-person patient-centered communication into the virtual world [5,6]. Others have recommended helping patients understand their role in telemedicine communication, emphasizing the importance of preparing for and engaging in virtual visits [2]. The Association of American Medical Colleges (AAMC) has also released a report on telehealth competencies for trainees and providers across the continuum [28]. Although all these guidelines provide a base for improving patient-provider communication in the virtual setting, more evidence is needed to ascertain how these guidelines impact patients' perceptions of their care as well as their health outcomes. Additional guidance for medical educators is also needed on how to teach these emerging "best-practices" and competencies to trainees, how to meaningfully integrate trainees into virtual clinic workflows, and how to provide feedback on patient-centered virtual communication.

Teaching Patient-Centered Telemedicine

Preparing for a virtual visit clinic day with trainees necessitates deliberate planning on the part of both the supervising clinician and the trainee. For virtual sessions, trainees are still expected to review their schedule, chart review, and ensure adequate follow-up for patients, all while considering the limitations of the virtual setting. Supervising clinicians should teach trainees how each of these tasks looks different in the virtual setting and coach them on how to troubleshoot technological and communication issues before they arise (Figure 1) [3,4,6]. Additionally, preceptors should pursue opportunities to teach learners how to assess which patients are *appropriate* for video or phone visits and which situations may be more suited for an in-person visit [6,24]. Supervising attendings should focus on virtual visit communication skills, efficient utilization of the visit platform, setting expectations for the visit with patients, the importance of body language and speech [3,4,6], and strategies to engage patients by using video tools such as "screen share" (Figure 1).

It is also critical to train learners on how to leverage telemedicine to do things we cannot do in the in-person clinic setting. For example, the ability to have a family member join in from a separate location for a virtual visit with their elderly parent may add critical information that would not have been obtainable otherwise [29]. Similarly, information can be gleaned by using video as an opportunity to assess relevant parts of a patient's home environment in a way that is akin to the traditional and time-honored home-visit. In this way, video visits can be used to identify potential fall risks in a patient's home, accurately review how patients organize and take their medications [29], or to identify safety hazards present in the homes of pediatric patients. Virtual visits can also be used to augment in-person care to allow for touchpoints between clinic visits; for example, to assess medication tolerance or symptom relief or for follow-up educational sessions that may not require a full physical exam or assessment.

Finally, it is important to foster trainee awareness of patient-related telemedicine *challenges* and to present those from the perspective of health equity and access to care. As medical educators, we must not only look for ways to educate our learners on the factors that contribute to the creation of a digital divide, but we must also proactively cultivate opportunities for trainees to become involved in advocacy and quality improvement efforts to address these barriers head-on.

Embedding Trainees into Virtual Clinic Workflows

Integrating trainees into telehealth experiences not only provides opportunities for experiential learning and professional identity development but also contributes to improved patient health and extended capabilities of health care teams [30]. Therefore, thinking critically about the design of a virtual clinic workflow is crucial to ensuring successful clinical encounters and a supportive learning environment.

Unlike in-person clinic days where communication can be done face-to-face, virtual clinic days require clear expectations for how and when trainees should connect with patients, as well as a direct line of communication with their faculty preceptors so that they are quickly and easily accessible when needed. When multiple trainees (eg, medical student, resident, and fellow) are involved in a visit, each should have a specific role and understand how to quickly communicate with their supervisor if a need arises. Coordinating such a *dance* takes effort and skill, but with practice, it can become a meaningful care experience not just for trainees but for patients as well.

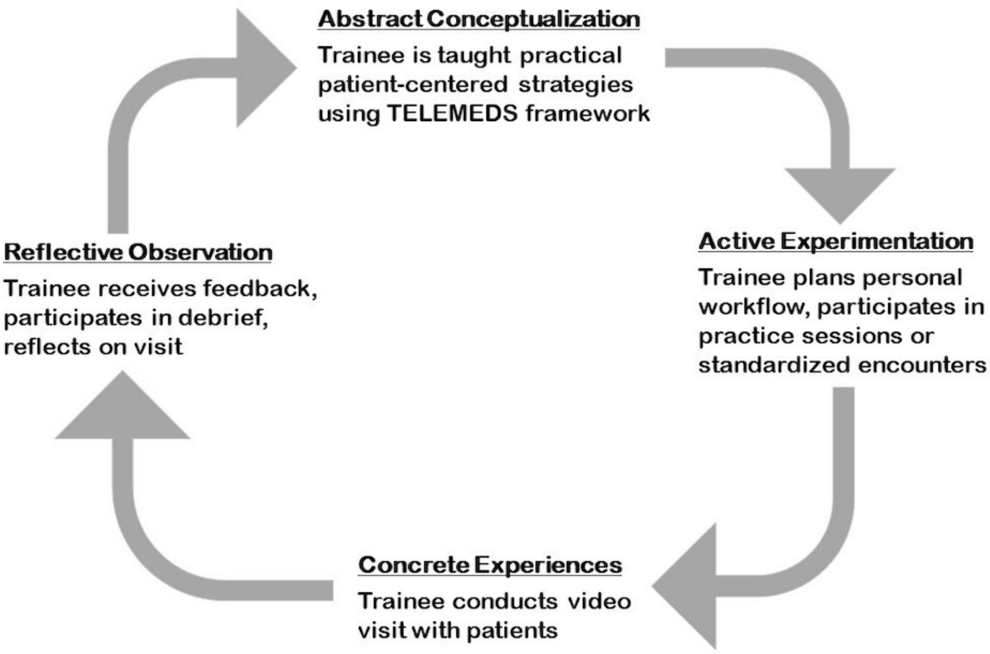
Although some clinicians may choose to communicate with trainees using nonvisual methods (eg, phone calls and text messaging) for simple questions throughout a virtual visit session, conducting an in-person or videoconference pre- and post-visit huddle can provide the added benefit of connecting in a more personal way and allows educators to read their trainees' verbal and non-verbal cues. Additionally, post-visit sessions provide opportunities for trainees to receive feedback on their patient-centered virtual visit skills as well as for the supervising clinician to receive feedback on their workflow, communication, and patient teaching in addition to a review of their documentation using the screen share function.

In the process of workflow development, it is important to note that no workflow is perfect or universal; workflows may change as we begin to better understand how various setups impact patient-centered care. For example, if multiple trainees are involved in the same call with one patient, this may enhance education, but it may be overwhelming for the patient. This example underscores the importance of setting expectations with patients at the start of a visit and obtaining feedback at its conclusion, which will allow individual clinicians to make important and necessary changes to their workflows over time. A virtual clinic workflow may also differ across providers and institutions, depending on the needs of each organization and the infrastructure of the virtual visit platform used. Knowledge of the benefits and limitations of the technology one has access to is inherent to developing workflows for individual educators. At the institutional level, organizations should strive to integrate Health Insurance Portability and Accountability Act (HIPAA)-compliant platforms that support *various* workflows and consider trainee education along with platform selection. Furthermore, organizational buy-in is needed to integrate *time* for trainee education, debrief, and feedback sessions within a virtual clinic schedule and for observation and assessment during the continuum of their training.

Establishing Telemedicine Curricula for Graduate Medical Education

Given the limited use of telemedicine prior to the COVID-19 pandemic, it is unlikely that many current trainees have received formal telemedicine training prior to or during residency. Moving forward, medical school, residency, and fellowship programs should develop purposeful telemedicine curricula for the trainees by considering the proposed AAMC telemedicine competencies and by using the aforementioned strategies and Kolb's Experiential Learning Cycle [31], a four-stage learning theory to promote effective learning (Figure 2).

Figure 2. Kolb's Experiential Learning Cycle [27]. Four stages to promote effective learning of patient-centered virtual visit practices.



Applying Kolb's Experiential Learning Cycle to teaching patient-centered virtual communication, the trainee should first be introduced to the TELEMEDS framework to better understand practical, patient-centered virtual communication skills (ie, abstract conceptualization). Medical educators should then provide arenas (eg, standardized encounters or virtual visit practice sessions) that reinforce the TELEMEDS concepts (ie, active experimentation) to be used when trainees conduct virtual visits with patients (ie, concrete experiences). Ideally, supervising attendings should provide real-time feedback for trainees on directly observed behaviors in order to encourage continued reflection and skill development (ie, reflective observation).

Other effective strategies for teaching patient-centered telemedicine may rely on competency-based medical education (CBME), focusing on measuring goal-oriented outcomes for learners, such as mastering the technology, performing a comprehensive video-based physical exam, and understanding professionalism in telemedicine [32]. Finally, educators should seek opportunities to serve as role models for trainees, as well as foster and nurture trainee involvement in advocacy and quality improvement efforts to improve health care access and telehealth equity for patients. Thus, medical educators should strive to develop formal tools to guide this feedback, standardize assessment among learners, and assess how proficiency in these competencies affects patient outcomes.

Conclusions

Virtual visits will likely be a part of our clinical world moving forward. As medical educators adjust to this new form of care delivery, it is important to take a proactive approach to educate trainees on patient-centered telemedicine practices and integrate trainees into new, thoughtful, and deliberate workflows. It is important to note that future curricula for trainees will likely parallel that for preceptors, as many faculty members may not have received prior training, and some may not yet have attained proficiency in the skills of patient-centered virtual communication or teaching telemedicine best-practices. As such, faculty development will play a large role in this process. The TELEMEDS framework can be used by senior clinicians to provide structure and meaningful feedback to trainees to improve their virtual visit skills. Although further study on virtual visit communication skills is needed, our strategies provide important initial guidance for medical educators on how to promote meaningful, patient-centered virtual care.

Acknowledgments

The authors would like to thank Dr Lisa Vinci for her assistance and support.

Conflicts of Interest

None declared.

References

1. McGrail KM, Ahuja MA, Leaver CA. Virtual visits and patient-centered care: Results of a patient survey and observational study. J Med Internet Res 2017 May 26;19(5):e177 [FREE Full text] [doi: 10.2196/jmir.7374] [Medline: 28550006]
2. Frankel RM, Beckman H. "Won't You Be My Doctor?": Four keys to a satisfying relationship in an increasingly virtual world. J Patient Exp 2020 Dec;7(6):851-855 [FREE Full text] [doi: 10.1177/2374373520957184] [Medline: 33457511]
3. Gough F, Budhrani S, Cohn E, Dappen A, Leenknecht C, Lewis B, et al. ATA practice guidelines for live, on-demand primary and urgent care. Telemed J E Health 2015 Mar;21(3):233-241. [doi: 10.1089/tmj.2015.0008] [Medline: 25658882]
4. American Medical Association Digital Health Implementation Playbook. American Medical Association. 2018. URL: https://www.ama-assn.org/system/files/2018-12/digital-health-implementation-playbook.pdf [accessed 2021-03-01]
5. Modic MB, Neuendorf K, Windover AK. Enhancing your webside manner: Optimizing opportunities for relationship-centered care in virtual visits. J Patient Exp 2020 Dec;7(6):869-877 [FREE Full text] [doi: 10.1177/2374373520968975] [Medline: 33457513]
6. Wong A, Bhyat R, Srivastava S, Boissé Lomax L, Appireddy R. Patient care during the COVID-19 pandemic: Use of virtual care. J Med Internet Res 2021 Jan 21;23(1):e20621 [FREE Full text] [doi: 10.2196/20621] [Medline: 33326410]
7. Levesque J, Harris MF, Russell G. Patient-centred access to health care: conceptualising access at the interface of health systems and populations. Int J Equity Health 2013 Mar 11;12:18 [FREE Full text] [doi: 10.1186/1475-9276-12-18] [Medline: 23496984]
8. Talal AH, Sofikitou EM, Jaanimägi U, Zeremski M, Tobin JN, Markatou M. A framework for patient-centered telemedicine: Application and lessons learned from vulnerable populations. J Biomed Inform 2020 Dec;112:103622. [doi: 10.1016/j.jbi.2020.103622] [Medline: 33186707]
9. Gagnon M, Lamothe L, Hebert M, Chanliau J, Fortin J. Telehomecare for vulnerable populations: The evaluation of new models of care. Telemed J E Health 2006 Jun;12(3):324-331. [doi: 10.1089/tmj.2006.12.324] [Medline: 16796500]
10. Gilson SF, Umscheid CA, Laiteerapong N, Ossey G, Nunes KJ, Shah SD. Growth of ambulatory virtual visits and differential use by patient sociodemographics at one urban academic medical center during the COVID-19 pandemic: Retrospective analysis. JMIR Med Inform 2020 Dec 04;8(12):e24544 [FREE Full text] [doi: 10.2196/24544] [Medline: 33191247]
11. Rodriguez JA, Betancourt JR, Sequist TD, Ganguli I. Differences in the use of telephone and video telemedicine visits during the COVID-19 pandemic. Am J Manag Care 2021 Jan;27(1):21-26 [FREE Full text] [doi: 10.37765/ajmc.2021.88573] [Medline: 33471458]
12. Schifeling CH, Shanbhag P, Johnson A, Atwater RC, Koljack C, Parnes BL, et al. Disparities in video and telephone visits among older adults during the COVID-19 pandemic: Cross-sectional analysis. JMIR Aging 2020 Nov 10;3(2):e23176 [FREE Full text] [doi: 10.2196/23176] [Medline: 33048821]
13. Nouri S, Khoong E, Lyles C, Karliner L. Addressing equity in telemedicine for chronic disease management during the Covid-19 pandemic. NEJM Catal 2020 May [FREE Full text] [doi: 10.1056/CAT.20.0123]
14. Leavitt M. Medscape's response to the Institute of Medicine Report: Crossing the quality chasm: a new health system for the 21st century. MedGenMed 2001 Mar 05;3(2):2 [FREE Full text] [Medline: 11549951]
15. Stewart M, Brown JB, Donner A, McWhinney IR, Oates J, Weston WW, et al. The impact of patient-centered care on outcomes. J Fam Pract 2000 Sep;49(9):796-804. [Medline: 11032203]
16. Rathert C, Wyrwich MD, Boren SA. Patient-centered care and outcomes: a systematic review of the literature. Med Care Res Rev 2013 Aug;70(4):351-379. [doi: 10.1177/1077558712465774] [Medline: 23169897]
17. American Academy of Family Physicians. Joint principles of the Patient-Centered Medical Home. Del Med J 2008 Jan;80(1):21-22. [Medline: 18284087]
18. What Is Patient-Centered Care? NEJM Catal 2017 Jan [FREE Full text]
19. Agha Z, Schapira RM, Laud PW, McNutt G, Roter DL. Patient satisfaction with physician-patient communication during telemedicine. Telemed J E Health 2009 Nov;15(9):830-839. [doi: 10.1089/tmj.2009.0030] [Medline: 19919189]
20. Kruse CS, Krowski N, Rodriguez B, Tran L, Vela J, Brooks M. Telehealth and patient satisfaction: a systematic review and narrative analysis. BMJ Open 2017 Aug 03;7(8):e016242 [FREE Full text] [doi: 10.1136/bmjopen-2017-016242] [Medline: 28775188]
21. Nguyen M, Waller M, Pandya A, Portnoy J. A review of patient and provider satisfaction with telemedicine. Curr Allergy Asthma Rep 2020 Sep 22;20(11):72 [FREE Full text] [doi: 10.1007/s11882-020-00969-7] [Medline: 32959158]
22. Liaw WR, Jetty A, Coffman M, Petterson S, Moore MA, Sridhar G, et al. Disconnected: a survey of users and nonusers of telehealth and their use of primary care. J Am Med Inform Assoc 2019 May 01;26(5):420-428 [FREE Full text] [doi: 10.1093/jamia/ocy182] [Medline: 30865777]
23. Gordon HS, Solanki P, Bokhour BG, Gopal RK. "I'm Not Feeling Like I'm Part of the Conversation" Patients' perspectives on communicating in clinical video telehealth visits. J Gen Intern Med 2020 Jun;35(6):1751-1758. [doi: 10.1007/s11606-020-05673-w] [Medline: 32016705]
24. Reeves JJ, Ayers JW, Longhurst CA. Telehealth in the COVID-19 era: A balancing act to avoid harm. J Med Internet Res 2021 Feb 01;23(2):e24785 [FREE Full text] [doi: 10.2196/24785] [Medline: 33477104]
25. Zhang J, Chen Y, Ashfaq S, Bell K, Calvitti A, Farber NJ, et al. Strategizing EHR use to achieve patient-centered care in exam rooms: a qualitative study on primary care providers. J Am Med Inform Assoc 2016 Jan;23(1):137-143 [FREE Full text] [doi: 10.1093/jamia/ocv142] [Medline: 26568605]

26. Lee WW, Alkureishi MA, Ukabiala O, Venable LR, Ngooi SS, Staisiunas DD, et al. Patient perceptions of electronic medical record use by faculty and resident physicians: A mixed methods study. J Gen Intern Med 2016 Nov;31(11):1315-1322 [FREE Full text] [doi: 10.1007/s11606-016-3774-3] [Medline: 27400921]
27. Alkureishi MA, Lee WW, Lyons M, Press VG, Imam S, Nkansah-Amankra A, et al. Impact of electronic medical record use on the patient-doctor relationship and communication: A systematic review. J Gen Intern Med 2016 May;31(5):548-560 [FREE Full text] [doi: 10.1007/s11606-015-3582-1] [Medline: 26786877]
28. Telehealth Competencies Across the Learning Continuum. AAMC New and Emerging Areas in Medicine Series.: Association American Medical Colleges; 2021 Mar. URL: https://store.aamc.org/downloadable/download/sample/sample_id/412/ [accessed 2021-04-23]
29. Gomez T, Anaya YB, Shih KJ, Tarn DM. A qualitative study of primary care physicians' experiences with telemedicine during COVID-19. J Am Board Fam Med 2021 Feb;34(Suppl):S61-S70 [FREE Full text] [doi: 10.3122/jabfm.2021.S1.200517] [Medline: 33622820]
30. Muntz M, Franco J, Ferguson C, Ark T, Kalet A. Telehealth and medical student education in the time of COVID-19 and beyond. Academic Medicine 2021 Feb:16. [doi: 10.1097/ACM.0000000000004014]
31. Schultz K, McEwen L, Griffiths J. Applying Kolb's Learning Cycle to competency-based residency education. Acad Med 2016 Feb;91(2):284. [doi: 10.1097/01.ACM.0000479943.21563.6f] [Medline: 26813655]
32. Stovel RG, Gabarin N, Cavalcanti RB, Abrams H. Curricular needs for training telemedicine physicians: A scoping review. Med Teach 2020 Nov;42(11):1234-1242. [doi: 10.1080/0142159X.2020.1799959] [Medline: 32757675]

Abbreviations

AAMC: Association of American Medical Colleges
CBME: competency-based medical education
EHR: electronic health record
HIPAA: Health Insurance Portability and Accountability Act

Edited by G Eysenbach; submitted 25.03.21; peer-reviewed by S Sabarguna, J Zhang; comments to author 12.04.21; revised version received 14.04.21; accepted 15.04.21; published 29.04.21.

Please cite as:
Alcocer Alkureishi M, Lenti G, Choo ZY, Castaneda J, Weyer G, Oyler J, Lee WW
Teaching Telemedicine: The Next Frontier for Medical Educators
JMIR Med Educ 2021;7(2):e29099
URL: https://mededu.jmir.org/2021/2/e29099
doi:10.2196/29099
PMID:33878011

Viewpoint

The United States Medical Licensing Exam Step 2 Clinical Skills Examination: Potential Alternatives During and After the COVID-19 Pandemic

Rawish Fatima[1], MD; Ahmad R Assaly[2], BSc; Muhammad Aziz[3], MD; Mohamad Moussa[4], MD; Ragheb Assaly[5], MD

[1]Department of Internal Medicine, University of Toledo Medical Center, Toledo, OH, United States
[2]College of Medicine and Life Sciences, The University of Toledo, Toledo, OH, United States
[3]Division of Gastroenterology and Hepatology, University of Toledo Medical Center, Toledo, OH, United States
[4]Department of Emergency Medicine, University of Toledo Medical Center, Toledo, OH, United States
[5]Division of Pulmonary and Critical Care Medicine, University of Toledo Medical Center, Toledo, OH, United States

Corresponding Author:
Rawish Fatima, MD
Department of Internal Medicine
University of Toledo Medical Center
2100 W Central Avenue
Toledo, OH, 43606
United States
Phone: 1 5674201613
Email: rawish.f@gmail.com

Abstract

We feel that the current COVID-19 crisis has created great uncertainty and anxiety among medical students. With medical school classes initially being conducted on the web and the approaching season of "the Match" (a uniform system by which residency candidates and residency programs in the United States simultaneously "match" with the aid of a computer algorithm to fill first-year and second-year postgraduate training positions accredited by the Accreditation Council for Graduate Medical Education), the situation did not seem to be improving. The National Resident Matching Program made an official announcement on May 26, 2020, that candidates would not be required to take or pass the United States Medical Licensing Examination Step 2 Clinical Skills (CS) examination to participate in the Match. On January 26, 2021, formal discontinuation of Step 2 CS was announced; for this reason, we have provided our perspective of possible alternative solutions to the Step 2 CS examination. A successful alternative model can be implemented in future residency match seasons as well.

(JMIR Med Educ 2021;7(2):e25903) doi:10.2196/25903

KEYWORDS

USMLE; United States Medical Licensing Examination; The National Resident Matching Program; NRMP; Step 2 Clinical Skills; Step 2 CS; medical school; medical education; test; medical student; United States; online learning; exam; alternative; model; COVID-19

COVID-19, a novel disease caused by SARS-CoV-2, was first recognized in Wuhan, China, in late 2019; it continued to spread globally, leading to a pandemic [1]. Efforts are being implemented to control this pandemic, prevent health care services from being overwhelmed, and minimize the effects of the pandemic on the economy while work progresses on vaccine development and antiviral therapy. The surging demands on medical systems have forced hospitals to make modifications such as deploying specialists in intensive care units and emergency departments and inviting medical students to graduate early and start working as interns.

The National Resident Matching Program (NRMP) residency match ("the Match") was also affected. Recommendations regarding limited travel and continued social distancing for the health and safety of applicants and program staff were taken into consideration. Adding to the uncertainty, on May 26, 2020, NRMP announced suspension of the United States Medical Licensing Examination (USMLE) Step 2 Clinical Skills (CS) examination for a period of 12-18 months. It was stated that "The NRMP does not specifically require applicants to take or pass the CS examination in order to participate in the Match. The NRMP requires that US applicants meet the requirements for graduation set by their medical school and the eligibility criteria set by their matched residency training program. International medical graduate (IMG) applicants must meet the exam requirements set by the Educational Commission for Foreign Medical Graduates (ECFMG) to achieve ECFMG certification [2].” ECFMG later announced that they would accept the Occupational English Test for health care. Listening, Reading, Writing, and Speaking are the components that are tested in this examination [3]. Remote proctoring was established to provide wide availability for applicants. On January 26, 2021, formal discontinuation of Step 2 CS was announced [4]. The eligibility criteria for taking the Step 3 examination were modified, and completion of Step 2 CS was no longer required to take the Step 3 examination. ECFMG introduced pathways for IMGs to obtain ECFMG certification.

The first round of clinical skills testing for all medical students under the name of Step 2 CS was conducted by USMLE in 2004 at a national level. Before 2004, an analogous exam, the Clinical Skills Assessment, was used to assess the clinical skills of foreign medical graduates [5]. The Step 2 CS exam was conducted by the Clinical Skills Evaluation Collaboration at six test centers (Atlanta, Chicago, Illinois, Houston, Los Angeles, and Philadelphia) within the United States. The state medical licensing boards delineated that the aim of this examination was “to ensure the ability to communicate effectively with patients and colleagues along with standards of safe practice of medicine.” The examination had three components: Communication and Interpersonal Skills (CIS), Spoken English Proficiency (SEP), and Integrated Clinical Encounter (ICE). During this examination, examinees encountered 12 standardized patients and were given 15 minutes to take a complete history and perform a clinical examination for each patient; they were then given 10 additional minutes to write a patient note describing the findings and to generate an initial differential diagnosis list and a list of initial tests. The objectives of this examination were to assess communication skills, collect and provide information, assist patients with decision-making, provide emotional support to patients, gather data, and assess English language proficiency [6].

In a study published by Rosenthal et al in 2019 [7], an analysis was performed of 1041 graduates of a medical school from 2014-2017. The authors observed that candidates who failed the Step 2 CS examination had risk factors such as low National Board of Medical Examiners scores, low Objective Structured Clinical Examination (OSCE) scores, and poor faculty ratings. Thus, one can presume a direct correlation between the Step 2 CS examination performance of global applicants and their performance on other standardized examinations. Mehta et al [8] expressed their views in an article published in 2005, titled “A Critique of the USMLE Clinical Skills Examination,” in which the authors expressed frustration regarding unhelpful feedback from their Step 2 CS score reports as compared to other USMLE examinations.

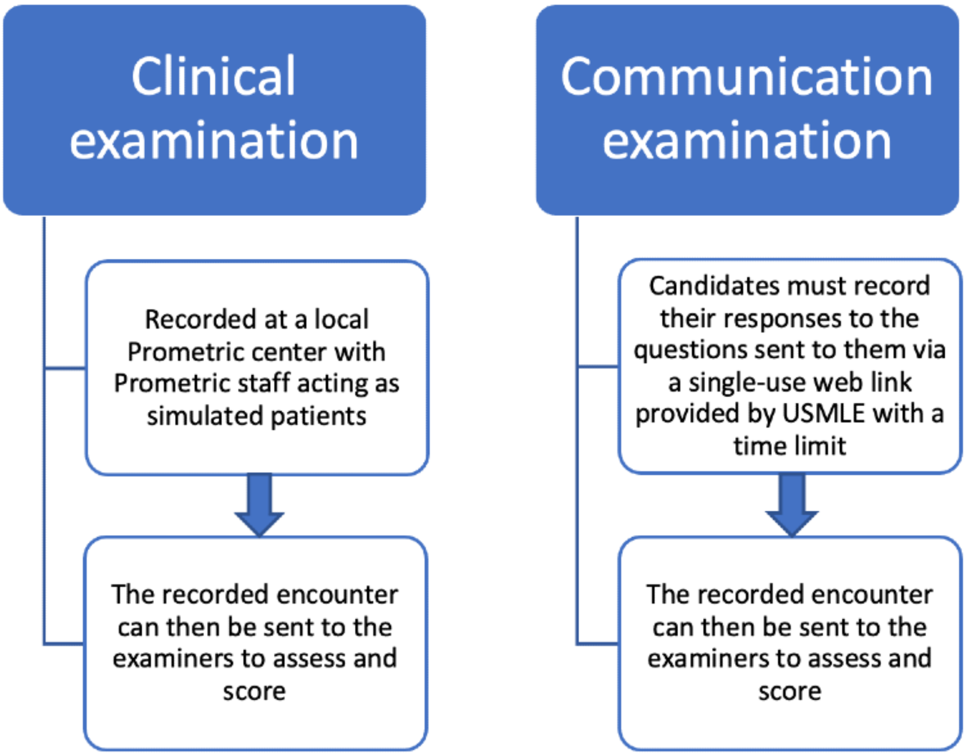
As with everything else that has been changing in medical education in the last few months, it is worth visiting the question of whether the Step 2 CS examination needs to change. The expense and travel involved do not currently seem to be very practical, which leads to the idea of administering a gateway virtual assessment instead. Consideration should be given to the cost of the examination (US $1600), time and money spent on traveling, date availability in limited centers, and visa issues being faced by IMGs, while simultaneously considering the need for an alternate standardized performance assessment of US and international candidates. The aforementioned challenges are not concealed; in fact, the often-used guide, *First Aid for the USMLE Step 2 CS* [9], offers pages of lists of transportation, restaurants, and hotels with varying price points in these major cities to attempt to alleviate stressors for candidates.

The nonuniformity of OSCE and examination patterns in international medical schools raises the question of possible solutions to prevent non-US physicians from demonstrating subpar performance. The USMLE Step 2 CS website reports a pass rate of 94% (ICE 96%, CIS 98%, SEP >99%) for candidates from US and Canadian medical schools on the first attempt and 73% (ICE 81%, CIS 94%, SEP 93%) for candidates from non-US/Canadian schools [10]. These statistics are reflective of the continuing need to practice prerequisite assessments before granting an interview at the minimum for IMGs.

In 2016, the Association of American Medical Colleges (AAMC) launched an initial pilot program of standardized video interviews (SVIs) for all emergency medicine residency applicants; however, AAMC decided that there would be no SVIs beginning in the 2020-21 residency application cycle. The purpose of these interviews was to assess an applicant’s “Knowledge of Professional Behaviors and Interpersonal and Communications Skills.” Although it was stated that the AAMC reckoned the SVI to be a reliable and valid assessment, the decision to not expand the SVI to other residencies and to discontinue its use in emergency medicine was due to lack of and sometimes hesitant use of SVI in the selection process [11]. We believe that the most important part of the examination is demonstrating the ability to communicate with a patient. A study published in 2014 showed that communication issues were often the top reason for complaints against physicians in North Carolina [12]. Another study showed a modest correlation between Step 2 CS Communication and Interpersonal Skills ratings and the communication skills of interns [13].

Given the need of the hour, it may be the right time to revisit the idea of the SVI. A new version of the SVI can be conducted with two components: clinical and communication examinations (Figure 1). The communication part can be conducted at any place and time. Candidates will need to record their responses to the questions sent to them via a single-use web link with a time limit provided by USMLE and will be required to send the responses back for evaluation. The purpose of this examination will be to assess interpersonal communication and decision-making skills. For the assessment of clinical skills and history taking, Prometric staff can be trained in different countries to simulate patients, and the recorded encounters can then be sent to the examiners to assess and score. This step will not only help with the cost of the examination but will also decrease the stress of travelling and scheduling for all candidates, including national and international candidates.

Figure 1. Pictorial illustration of the standardized video interview model. USMLE: United States Medical Licensing Examination.



Other alternate solutions could be to provide training in these clinical and soft skills during the first 6 months of intern year or relying on the candidate's performance on medical school and other USMLE exams. This approach may result in more focus on OSCE examinations during medical school training. A study published in 2015 [14] showed that US medical students did not perform well on physical examinations, especially musculoskeletal and neurology examinations. Further examining student performance and having medical schools focus on their weaknesses may eradicate the need to conduct Step 2 CS for American medical graduates. Most medical students at the University of Toledo Medical Center expressed that they felt more than prepared for their physical skills examinations because of the multidisciplinary approach taken at their school. They discerned that as they needed to fit the scheduling and cost of this examination into their busy fourth year schedule, the experience was not worthwhile. They stated that they do not believe it is necessary to test their proficiency in speaking to patients again, as this proficiency is tested and improved upon each day on the wards.

Moving toward a virtual examination based on the model of SVI, relying on medical school examination performance, and provision and grooming of skills during internship instead of conducting USMLE Step 2 CS are some adaptations that seem like they can be given consideration. Well-designed and conducted studies are needed to provide further information and may lead to dramatic changes in the testing and interview process.

Acknowledgments

No funding was received for the preparation of this manuscript.

Conflicts of Interest

None declared.

References

1. Coronavirus disease (COVID-19) pandemic. World Health Organization. URL: https://www.who.int/emergencies/diseases/novel-coronavirus-2019 [accessed 2021-04-21]
2. NRMP FAQs During COVID-19 Pandemic. National Residency Matching Program. 2020 May 27. URL: https://www.nrmp.org/covid-faqs-3-2/ [accessed 2021-04-21]
3. Assessment structure. Occupational English Test. URL: https://www.occupationalenglishtest.org/test-information/healthcare-professions/medicine/ [accessed 2021-04-21]
4. Work to relaunch USMLE Step 2 CS discontinued. United States Medical Licensing Examination. 2021 Jan 26. URL: https://www.usmle.org/announcements/?ContentId=309 [accessed 2021-04-21]

5. Scott S, Hearns V, Barker M. Testing Clinical Skills: A Look at the OSCE and USMLE Clinical Skills Exams. S D Med 2019 Oct;72(10):451-453. [Medline: 31816205]
6. USMLE Step 2 Clinical Skills. Wikipedia. URL: https://en.wikipedia.org/wiki/USMLE_Step_2_Clinical_Skills [accessed 2021-04-27]
7. Rosenthal S, Russo S, Berg K, Majdan J, Wilson J, Grinberg C, et al. Identifying students at risk of failing the USMLE Step 2 Clinical Skills Examination. Fam Med 2019 Jun 6;51(6):483-499 [FREE Full text] [doi: 10.22454/fammed.2019.429968]
8. Mehta N, Kramer D. A Critique of the USMLE clinical skills examination. MedGenMed 2005 May 23;7(2):76 [FREE Full text] [Medline: 16369454]
9. Le T, Bhushan V. First Aid for the USMLE Step 2 CS, Sixth Edition. New York, NY: McGraw-Hill Professional Publishing; Nov 03, 2017.
10. Performance data. United States Medical Licensing Examination. URL: https://www.usmle.org/performance-data/default.aspx#2018_step-2-cs [accessed 2020-06-11]
11. Gallahue FE, Hiller KM, Bird SB, Calderone Haas MR, Deiorio NM, Hern HG, et al. The AAMC Standardized Video Interview. Academic Medicine 2019;94(10):1506-1512. [doi: 10.1097/acm.0000000000002714]
12. Davignon P, Young A, Johnson D. Medical board complaints against physicians due to communication: analysis of North Carolina Medical Board data, 2002?2012. J Med Regul 2014;100(2):A. [doi: 10.30770/2572-1852-100.2.28]
13. Winward ML, Lipner RS, Johnston MM, Cuddy MM, Clauser BE. The relationship between communication scores From the USMLE Step 2 Clinical Skills Examination and communication ratings for first-year internal medicine residents. Acad Med 2013;88(5):693-698. [doi: 10.1097/acm.0b013e31828b2df1]
14. Peitzman SJ, Cuddy MM. Performance in Physical Examination on the USMLE Step 2 Clinical Skills Examination. Academic Medicine 2015;90(2):209-213. [doi: 10.1097/acm.0000000000000570]

Abbreviations

AAMC: Association of American Medical Colleges
CIS: Communication and Interpersonal Skills
CS: clinical skills
ECFMG: Educational Commission for Foreign Medical Graduates
ICE: Integrated Clinical Encounter
IMG: international medical graduate
OSCE: Objective Structured Clinical Examination
SEP: Spoken English Proficiency
SVI: standardized video interview
USMLE: United States Medical Licensing Examination

Edited by G Eysenbach; submitted 19.11.20; peer-reviewed by H Ahmmed, R Zaini, M Grasl; comments to author 15.03.21; revised version received 24.03.21; accepted 12.04.21; published 30.04.21.

Please cite as:
Fatima R, Assaly AR, Aziz M, Moussa M, Assaly R
The United States Medical Licensing Exam Step 2 Clinical Skills Examination: Potential Alternatives During and After the COVID-19 Pandemic
JMIR Med Educ 2021;7(2):e25903
URL: https://mededu.jmir.org/2021/2/e25903
doi:10.2196/25903
PMID:33878014

Original Paper

Audiovisual Content for a Radiology Fellowship Selection Process During the COVID-19 Pandemic: Pilot Web-Based Questionnaire Study

Ivan Rodrigues Barros Godoy[1,2], MD; Luís Pecci Neto[1,2,3], MD; Abdalla Skaf[1,3], MD; Hilton Muniz Leão-Filho[1], MD; Tomás De Andrade Lourenço Freddi[1], MD; Dany Jasinowodolinski[1], MD; André Fukunishi Yamada[1,2,3], MD, PhD

[1]Department of Radiology, Hospital do Coração and Teleimagem, São Paulo, Brazil
[2]Department of Diagnostic Imaging, Universidade Federal de São Paulo, São Paulo, Brazil
[3]ALTA Diagnostic Center (DASA Group), São Paulo, Brazil

Corresponding Author:
Ivan Rodrigues Barros Godoy, MD
Department of Radiology, Hospital do Coração and Teleimagem
Rua Desembargador Eliseu Guilherme 147
São Paulo, 04004-030
Brazil
Phone: 55 11996171704
Email: ivanrbgodoy@gmail.com

Abstract

Background: Traditional radiology fellowships are usually 1- or 2-year clinical training programs in a specific area after completion of a 4-year residency program.

Objective: This study aimed to investigate the experience of fellowship applicants in answering radiology questions in an audiovisual format using their own smartphones after answering radiology questions in a traditional printed text format as part of the application process during the COVID-19 pandemic. We hypothesized that fellowship applicants would find that recorded audiovisual radiology content adds value to the conventional selection process, may increase engagement by using their own smartphone device, and facilitate the understanding of imaging findings of radiology-based questions, while maintaining social distancing.

Methods: One senior staff radiologist of each subspecialty prepared 4 audiovisual radiology questions for each subspecialty. We conducted a survey using web-based questionnaires for 123 fellowship applications for musculoskeletal (n=39), internal medicine (n=61), and neuroradiology (n=23) programs to evaluate the experience of using audiovisual radiology content as a substitute for the conventional text evaluation.

Results: Most of the applicants (n=122, 99%) answered positively (with responses of “agree” or “strongly agree”) that images in digital forms are of superior quality to those printed on paper. In total, 101 (82%) applicants agreed with the statement that the presentation of cases in audiovisual format facilitates the understanding of the findings. Furthermore, 81 (65%) candidates agreed or strongly agreed that answering digital forms is more practical than conventional paper forms.

Conclusions: The use of audiovisual content as part of the selection process for radiology fellowships is a new approach to evaluate the potential to enhance the applicant’s experience during this process. This technology also allows for the evaluation of candidates without the need for in-person interaction. Further studies could streamline these methods to minimize work redundancy with traditional text assessments or even evaluate the acceptance of using only audiovisual content on smartphones.

(JMIR Med Educ 2021;7(2):e28733) doi:10.2196/28733

KEYWORDS

audiovisual reports; COVID-19; fellowship; radiology; smartphones; video recording; web technology

Introduction

Fellowship programs in radiology are usually 1- or 2-year clinical trainings in a subspecialty area after completion of a 4-year residency program. These fellowships therefore represent an optional sixth and seventh year of clinical training, although this may vary in different countries. Most radiologists trained in the United States complete a fellowship before formally entering practice. In a survey from 1999, 80% of fourth-year and 84.6% of third-year trainee respondents had accepted or were expected to accept fellowship offers [1]. In a survey from 2009, 93.4% of senior resident respondents planned to pursue fellowships [2]. Fellowship trainees often believe that they are less competitive in the job market without a fellowship, and that they may have an advantage in seeking subsequent employment in the same geographic region as that of their fellowship [3]. Starting salaries have also been noted to be low for residency-only graduates [4]. Furthermore, the selection process of the applicants could vary in different countries and institutions. Recent fellows appear to be more satisfied with their selection and application process than their program directors [4]. This study aimed to investigate the utility of audiovisual content as a part of the applicant selection process through the use of the applicants' smartphones. The applicant's experiences and perceptions with digital forms and questions were evaluated in comparison with traditional paper-printed tests currently used as the evaluation method in medical school and during radiology residency in the country where this study was performed.

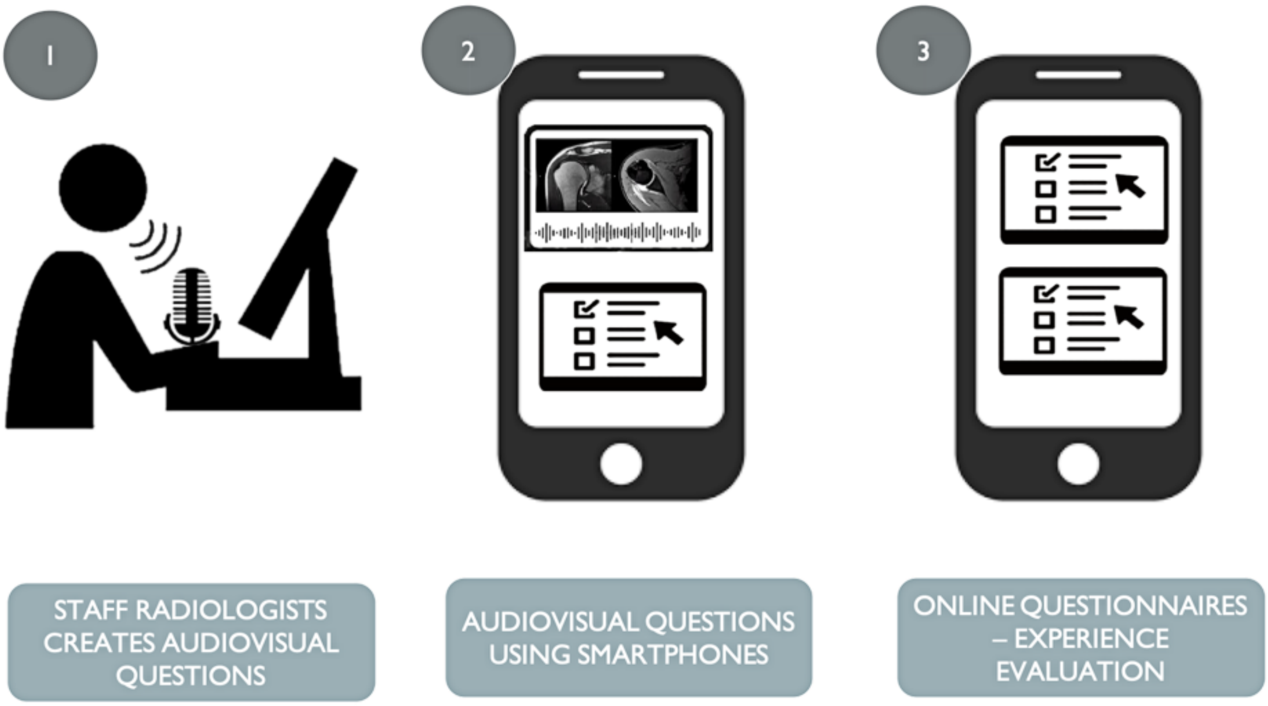
The current literature contains little information regarding the audiovisual content of radiology studies, especially regarding fellowship candidate selection methods during the application process [5,6]. Modern web-based technology and screen capture software allow for the development of an environment where audiovisual files can be easily created and shared for clinical and educational purposes, using cloud technology.

The COVID-19 pandemic has evolved rapidly in most countries and widely disrupted personal and professional lives, having also affected the process of selecting radiology fellows and radiology education [7,8]. In this study, audiovisual content using smartphones was used as a supplemental material for the radiology fellowship selection process. The aim of this study is to evaluate candidates' experience in using audiovisual content with their own smartphones, especially as an alternative method of evaluation during the COVID-19 pandemic while maintaining social distancing.

Methods

This study was approved by the institutional review board of the participating institutions and was compliant with the guidelines of the Health Insurance Portability and Accountability Act of 1996. Informed consent was waived for participants included in the study after institutional review board approval. Our study used a 3-step approach (Figure 1).

Figure 1. Summary of the steps of the workflow of this study.



Step 1: one radiology staff member of each specialty (musculoskeletal, internal medicine, and neuroradiology) generated 4 audiovisual questions, each referring to radiology cases from institutional records. These audiovisual questions were generated using Screencast-O-Matic screen capture software (version 3.8.0, Screencast-O-Matic) in a personal password-protected computer from the hospital. A standard radiology workstation dictaphone was used for audio recording. Videos were saved in MP4 format and uploaded to the institution's picture archiving and communication system using the software´s application programming interface in accordance with the guidelines of the Health Insurance Portability and

Accountability Act of 1996 with interoperability via HL7. This study included typical cases such as a "bucket handle" meniscal tear, subdural hematoma, and appendicitis, with a total of 6 questions in the audiovisual format. The cases included in the questions were anonymized using a built-in hot-key feature of the picture archiving and communication system to prevent the release of personal information contained in the radiology cases.

Step 2: the candidates received a web-based questionnaire (Google Forms) via email, which contained 4 audiovisual questions with multiple-choice answers for the subspecialty the candidate applied for. Each correct answer was automatically computed in the candidate's profile, and upon completion of the test, all the participants received an updated ranking of the evaluation via email.

Step 3: The candidates answered a final web-based questionnaire about their experience with using their own smartphones to access the test with questions in the audiovisual format. The questionnaire included questions to measure concordance with a Likert-type scale, with the exception of the question on the operating system of the smartphone and one regarding the use of earphones. The scoring system was based on a 5-point scale with scores ranging 0-4, where 0="totally disagree," 1="partially disagree," 2="neither agree nor disagree," 3="partially agree," and 4="totally agree."

The questions of the second questionnaire were as follows: (1) I would like to view my score immediately after the test is over; (2) I am used to watching audiovisual content on my smartphone; (3) I prefer to answer questions on traditional paper instead of the digital form; (4) answering digital forms is more practical than conventional paper forms; (5) images in digital forms have superior quality than printed in paper; (6) I feel safer answering in printed text than in digital forms; (7) the presentation of the cases in an audiovisual format facilitates the understanding of the findings; and (8) I felt in disadvantage due to the screen size of my smartphone.

The generation of the audiovisual radiology questions lasted <5 minutes for each case once each radiologist was familiar with the screen capture software. The purpose of the videos is to reflect the radiologist´s viewpoint in each case, including the sequences used to evaluate the findings and pointing to relevant alterations (Multimedia Appendix 1). Each audiovisual question comprised a video of <2 min, ranging in size from 2 to 12 megabytes. Those videos were uploaded in MP4 format to the web-based questionnaire (a Google Form) with the respective question and multiple-choice answers. All questions were sent to the applicants via email and contained a password-protected weblink. The candidates were instructed to open the questionnaires on their own smartphones and watch the audiovisual questions, using earphones for better audio quality.

The results are summarized using simple and relative (percentages) frequencies and represented by bar graphs and pie charts. The Fisher exact test was performed to analyze the associations between the questions and the candidate groups. Data graphics were produced using Microsoft Excel. Data analysis was performed using the R statistical program for Windows (The R Foundation) using the Rcmdr package and RStudio platform.

Results

The mean age of the candidates was 30.1 (SD 2.6) years, and the mean period since their graduation from medical school was 5.4 (SD ± 2.2) years. Most of the applicant's smartphones had an iOS operating system (n=77/98, 78.6%), and the remaining had Android smartphones. This difference was not significant among candidates of musculoskeletal, internal medicine, and neuroradiology subspecialties (*P*=.38).

Regarding the use of smartphones to watch any type of audiovisual content, most of the candidates answered that they frequently use their own device (n=77/123, 62.6%) and also using earphones for better audio quality (n=108/123, 87.7%). These findings are not significantly different among the 3 radiology subspecialties (*P*=.88).

To the question, "I would like to view my score immediately after the test is over," most of the applicants responded with "strongly agree" (n=94/123, 76.4%), although there was a significant difference among the 3 subspecialty groups where 51/61 (83.6%) strongly agreed in the internal medicine group, 30/39 (76.9%) in the musculoskeletal group, and 13/23 (56.5%) in the neuroradiology group (*P*=.02).

To the question, "I feel safer answering questions in printed text than in digital forms," most of the candidates responded with "neutral" (n=36/98, 36.7%). There was a significant difference in responses among the 3 subspecialty groups, with 8/19 (42.1%) of the internal medicine applicants, 3/32 (9.4%) of the musculoskeletal applicants, and 18/47 (38.3%) of the neuroradiology applicants responding with "agree" (*P*=.04).

The answers to the other questions were not significantly different among the radiology subspecialty groups (*P*>.05). Our findings regarding the responses from all candidates are summarized in Table 1. The great majority of applicants (n=122, 99%) agreed or strongly agreed that images in digital forms have superior quality to those printed on paper. In total, 101 (82%) applicants concurred with the statement that the presentation of the cases in audiovisual format facilitates the understanding of the findings. Furthermore, most candidates agreed or strongly agreed that answering digital forms is more practical than answering conventional paper forms (n=81, 65%).

Table 1. Distribution of questionnaire responses from all candidates (N=123).

Total	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Images in digital forms have superior quality than printed in paper, n (%)	0 (0)	1 (1)	0%	49 (40)	*73 (59)*[a]
The case presentation in audiovisual format facilitates the understanding of the findings, n (%)	0 (0)	6 (5)	16 (13)	*65 (53)*	36 (29)
I feel safer answering in printed text than in digital forms, n (%)	7 (6)	15 (12)	*46 (37)*	37 (30)	18 (15)
Answering digital forms is more practical than in conventional paper forms, n (%)	4 (3)	21 (17)	17 (14)	*54 (43)*	27 (22)
I prefer to answer questions on traditional paper instead of this digital form, n (%)	10 (8)	27 (22)	44 (35)	22 (18)	20 (16)
I felt unfavored due to the screen size of my smartphone, n (%)	21 (17)	39 (32)	*41 (33)*	22 (18)	0 (0)

[a]Italicized values represent the preferred answer.

Discussion

Principal Findings

This study was focused on the experiences of users with audiovisual content in digital questionnaires and not on the answers to the radiology questions that the candidates ranked by themselves. Most of the answers regarding the experience with this technology were positive, especially those suggesting that digital forms are more practical than conventional paper forms, radiology images and videos have superior quality than those printed on paper, and the presentation of the cases in an audiovisual format facilitates the understanding of imaging findings. These findings suggest that the adoption of this technology may increase the perception of quality during the selection process, especially during the COVID-19 pandemic.

During the last few years, little progress has been made in the format of the selection process of radiology fellows. The process usually varies from country to country and even among different programs in the same city. Program directors usually include traditional tests printed in paper, curriculum analysis, and interviews for a candidate's selection. In our institution, the fellows are selected on the basis of a multiple-choice test printed on paper, often in a spacious room with capacity of 200-300 people. After the printed test, the applicants are divided in 3 groups, namely musculoskeletal, internal medicine, and neuroradiology, for curriculum analysis and interviews. The ranking of the candidates is later publicized for all the participants.

New challenges have emerged from this pandemic, mostly regarding how to balance activities as close to normal as possible and following all security measures. A recent study proposed measures to maintain radiology education during the COVID-19 pandemic, including the use of web-based platforms constantly with case-based teaching, with read outs that can be attended over the internet and with screen sharing and chats [7]. Furthermore, "virtual rounds" with multidisciplinary case discussions and weekly article discussions are interesting approaches to preserve the feeling of normalcy [8]. Another study by Chong et al [9] suggested the development of a specific plan in response to the pandemic to ensure the safety and well-being of the radiology trainees. Those measures should include redistribution of work based on the clinical demand and pandemic status, promoting social distancing by reducing the number of radiologists in each rotation and reading rooms, using personal protective equipment for patient and staff protection, and maintaining radiology teaching using web-based platforms [9].

Audiovisual content using screen capture software is a promising tool with few reports in the literature, with applications in research and academia [10] and recently described as a technology to enhance traditional text reports of emergency musculoskeletal cases [6]. Videos narrated by the radiologist showing imaging findings have the potential to generate high-quality content useful for education and facilitate the understanding of imaging studies for the ordering physicians [6].

The dedicated audiovisual content in this study was focused on enhancing the experience of candidates during the selection process to simulate the evaluation of an actual case through narrated videos. Live or recorded audiovisual material may be used to increase communication between physicians and radiologists and may also be used as a teaching platform for case conference presentations and clinical rounds [6,10]. This technology could also enable physicians to better explain imaging findings to their patients on handheld devices, such as smartphones and tablets [10].

Social restrictions have been imposed during the COVID-19 pandemic, such as those on face-to-face clinical consultations and the increased use of alternative technologies such as telemedicine and the use of smartphones [11]. Studies have reported the successful use of smartphones for fracture diagnosis in musculoskeletal trauma cases [12] and for the identification of pediatric supracondylar fractures [13]. In particular, 5G smartphone technology is a step forward in connection speed and efficiency, with the potential to facilitate web-based interactions as close to in-person activities, including patient consultations, monitoring, and high-speed data file transfer, including imaging studies [14]. To our knowledge, this is the first study to include smartphones and digital questionnaires with audiovisual content as part of the radiology fellowship selection process; therefore, the potential of this technology is still not fully evaluated.

An unexpected observation of our study was that 29.6% of the candidates indicated that they usually feel safer taking paper-printed tests rather than completing digital forms, and 18.4% felt disadvantaged while answering the questions on their own smartphones owing to the size of the screen. This may be due to an insecurity of the impact of this new technology in the selection process. In our opinion, digital forms containing videos with the radiologist narrating the findings is a great tool to increase the experience of the candidates and approximate the viewer close to a real-time evaluation of cases. Another interesting observation is that most of the interviewed candidates frequently consume audiovisual content on their own smartphones (62.6%). A recent study demonstrated that approximately 59% of adults recently consumed health information on the internet, including social media platforms such as YouTube [15]. Furthermore, radiologic content on social media, usually accessed on smartphones, is an emerging technology with the benefit of reaching larger audiences than traditional educational methods [16]. We speculate that an audiovisual report with medical content meets the patient´s expectation of a dynamic way of expressing the findings of their imaging studies.

Limitations

One limitation that was noted during the study is that smartphone screen size and operating systems were not standardized. A bigger screen or even using tablets or notebooks could improve the experience of evaluating the audiovisual content of the questionnaires, but we opted to have our candidates use their own smartphones owing to the familiarity of the user with the device and its functionalities and to simulate the experience of receiving an examination to be evaluated on a smartphone, which is a situation often encountered by radiologists. We encouraged the applicants to use earphones and to rotate the smartphone horizontally for better audio and video quality, but we acknowledge that a bigger screen in notebooks could be better.

Furthermore, the questionnaires have important considerations, such as a limited number of questions (information bias) and a small sample size with a probable selection bias. Another limitation is that candidates may feel as though they are being watched during step 3 of the process, which could affect their behavior, as described by the Hawthorne effect [17]. Even with these limitations, the results show the potential of this new form of radiological fellowship selection. Therefore, these findings can be complemented by studies with a larger sample size and more comprehensive questionnaires.

Based on the data obtained in this study, the web-based questionnaire with audiovisual content using smartphones seems to have potential for the application process of candidates for radiology fellowship programs. There was a good response in terms of agility of evaluation and quality of information passed on to the applicants during the selection process, helping them during their first trimester of 2020 with the beginning of the COVID-19 pandemic.

Conclusions

This study focused on creating web-based questionnaires with smartphones and audiovisual radiology content as an alternative for the traditional in-person selection process with tests printed on paper. This was a pilot study during the onset of the COVID-19 pandemic when measures have been taken to ensure social distancing and attempt to flatten the contagion curve. This method includes the potential to provide quick results, with the safety of password-protected questionnaires. Our evaluation suggests that audiovisual questions may simulate a real-time evaluation of radiology cases and may improve communication between the program directors and the candidates. The fact that the applicants found the audiovisual content in smartphones easier and faster to understand supports that observation. Further studies are necessary to access the acceptance of this form of the radiology selection process in other medical specialties. Additionally, video technology for interviews or the evaluation of remote procedures as part of the selection process should be included. Continued development of standardized web-based tests and questionnaires may encourage future acceptance.

Conflicts of Interest

None declared.

Multimedia Appendix 1
Example of an online question using audiovisual radiology content.
[MP4 File (MP4 Video), 1886 KB - mededu_v7i2e28733_app1.mp4]

References

1. Goodman CJ, Lindsey JI, Whigham CJ, Robinson A. Diagnostic radiology residents in the classes of 1999 and 2000: fellowship and employment. AJR Am J Roentgenol 2000 May;174(5):1211-1213. [doi: 10.2214/ajr.174.5.1741211] [Medline: 10789764]
2. Baker SR, Luk L, Clarkin K. The trouble with fellowships. J Am Coll Radiol 2010 Jun;7(6):446-451. [doi: 10.1016/j.jacr.2010.01.020] [Medline: 20522398]
3. Mitchell JM, Sunshine JH. Determinants of differences among radiologists in starting salaries. AJR Am J Roentgenol 2002 May;178(5):1067-1073. [doi: 10.2214/ajr.178.5.1781067] [Medline: 11959703]
4. Mulcahy H, Chew FS, Mulcahy MJ. The radiology fellowship application and selection process in the United States: experiences and perceptions from both sides. Radiol Res Pract 2012;2012:875083 [FREE Full text] [doi: 10.1155/2012/875083] [Medline: 22848822]

5. Rose G. Audio/video interface as a supplement to radiology reports. US Patent 20100011296A1. Google Patents. URL: https://patents.google.com/patent/US20100011296 [accessed 2021-05-13]
6. Neto LP, Godoy IRB, Yamada AF, Carrete H, Jasinowodolinski D, Skaf A. Evaluation of Audiovisual Reports to Enhance Traditional Emergency Musculoskeletal Radiology Reports. J Digit Imaging 2019 Dec;32(6):1081-1088 [FREE Full text] [doi: 10.1007/s10278-019-00261-9] [Medline: 31432299]
7. Alvin MD, George E, Deng F, Warhadpande S, Lee SI. The Impact of COVID-19 on Radiology Trainees. Radiology 2020 Aug;296(2):246-248 [FREE Full text] [doi: 10.1148/radiol.2020201222] [Medline: 32216719]
8. Slanetz PJ, Parikh U, Chapman T, Motuzas CL. Coronavirus Disease 2019 (COVID-19) and Radiology Education-Strategies for Survival. J Am Coll Radiol 2020 Jun;17(6):743-745 [FREE Full text] [doi: 10.1016/j.jacr.2020.03.034] [Medline: 32335184]
9. Chong A, Kagetsu NJ, Yen A, Cooke EA. Radiology Residency Preparedness and Response to the COVID-19 Pandemic. Acad Radiol 2020 Jun;27(6):856-861 [FREE Full text] [doi: 10.1016/j.acra.2020.04.001] [Medline: 32307269]
10. Menashe S, Otjen J, Thapa MM. Techniques for creating video content for radiology education. Radiographics 2014;34(7):1819-1823. [doi: 10.1148/rg.347130122] [Medline: 25384282]
11. Iyengar K, Upadhyaya GK, Vaishya R, Jain V. COVID-19 and applications of smartphone technology in the current pandemic. Diabetes Metab Syndr 2020;14(5):733-737 [FREE Full text] [doi: 10.1016/j.dsx.2020.05.033] [Medline: 32497963]
12. Naqvi GA, Daly M, Dawood A, Kurkuri A, Kutty S. Smart consultation for musculoskeletal trauma: accuracy of using smart phones for fracture diagnosis. Surgeon 2014 Feb;12(1):32-34. [doi: 10.1016/j.surge.2013.09.001] [Medline: 24090680]
13. Kapıcıoğlu M, Erden T, Ağır M, Küçükdurmaz F. The reliability of use of WhatsApp in type 1 and type 2 pediatric supracondylar fractures. Eklem Hastalik Cerrahisi 2019 Aug;30(2):149-154 [FREE Full text] [doi: 10.5606/ehc.2019.66166] [Medline: 31291864]
14. Chih-Lin I, Han S, Xu Z, Sun Q, Pan Z. 5G: rethink mobile communications for 2020+. Philos Trans A Math Phys Eng Sci 2016 Mar 06;374(2062):20140432. [doi: 10.1098/rsta.2014.0432] [Medline: 26809577]
15. Drozd B, Couvillon E, Suarez A. Medical YouTube Videos and Methods of Evaluation: Literature Review. JMIR Med Educ 2018 Feb 12;4(1):e3 [FREE Full text] [doi: 10.2196/mededu.8527] [Medline: 29434018]
16. Ranginwala S, Towbin AJ. Use of Social Media in Radiology Education. J Am Coll Radiol 2018 Jan;15(1 Pt B):190-200. [doi: 10.1016/j.jacr.2017.09.010] [Medline: 29102536]
17. McCambridge J, Witton J, Elbourne DR. Systematic review of the Hawthorne effect: new concepts are needed to study research participation effects. J Clin Epidemiol 2014 Mar;67(3):267-277 [FREE Full text] [doi: 10.1016/j.jclinepi.2013.08.015] [Medline: 24275499]

Edited by G Eysenbach; submitted 14.03.21; peer-reviewed by A Taneja, AR Razavi; comments to author 02.05.21; revised version received 04.05.21; accepted 06.05.21; published 20.05.21.

Please cite as:
Godoy IRB, Neto LP, Skaf A, Leão-Filho HM, Freddi TDAL, Jasinowodolinski D, Yamada AF
Audiovisual Content for a Radiology Fellowship Selection Process During the COVID-19 Pandemic: Pilot Web-Based Questionnaire Study
JMIR Med Educ 2021;7(2):e28733
URL: https://mededu.jmir.org/2021/2/e28733
doi:10.2196/28733
PMID:33956639

Original Paper

Novice and Advanced Learners' Satisfaction and Perceptions of an e-Learning Renal Semiology Module During the COVID-19 Pandemic: Mixed Methods Study

Ido Zamberg[1,2,3], MD; Eduardo Schiffer[1,3], MD, PhD; Catherine Stoermann-Chopard[4], MD

[1]Division of Anesthesiology, Department of Anesthesiology, Emergency Medicine, Clinical Pharmacology and Intensive Care, Geneva University Hospitals, Geneva, Switzerland

[2]School of Education, Johns Hopkins University, Baltimore, MD, United States

[3]Unit of Development and Research in Medical Education, University of Geneva, Geneva, Switzerland

[4]Division of Nephrology, Department of Medicine, Geneva University Hospitals, Geneva, Switzerland

Corresponding Author:
Ido Zamberg, MD
Division of Anesthesiology
Department of Anesthesiology, Emergency Medicine, Clinical Pharmacology and Intensive Care
Geneva University Hospitals
Rue Gabrielle-Perret-Gentil 4
Geneva, 1205
Switzerland
Phone: 41 022 372 33 11
Email: idozamberg@gmail.com

Abstract

Background: Nephrotic syndrome is a unique clinical disorder, which provides interesting teaching opportunities that connect physiological and pathological aspects to clinical practice. During the current COVID-19 outbreak, in-person teaching in our institution was not permitted, thus creating a unique challenge for clinical skills teaching. A case-based electronic learning (e-learning) activity was designed to replace the traditional in-person teaching of renal semiology. e-Learning activities have been shown to be effective for knowledge retention and increasing novice learners' performance. However, major knowledge gaps exist concerning the satisfaction of learners with e-learning activities as the sole form of teaching, specifically for undergraduate clinical skills education.

Objective: Our study aimed to prospectively assess undergraduate medical students' perceptions of and satisfaction with an e-learning activity teaching renal semiology.

Methods: All second-year medical students (novice learners) from the medical faculty of the University of Geneva, Switzerland, undertook the e-learning activity and were invited to participate in a nonmandatory, validated web-based survey, comprising questions answered using a 10-point Likert scale and one qualitative open-ended question. For comparison and to provide further insights, 17 fourth- to sixth-year students (advanced learners) were prospectively recruited to participate in both the e-learning activity and the evaluation. A mixed methods analysis was performed.

Results: A total of 88 (63%) out of 141 novice learners and all advanced learners responded to the evaluation survey. Advanced learners reported significantly higher satisfaction with the e-learning activity (mean 8.7, SD 1.0 vs mean 7.3, SD 1.8; $P<.001$), clarity of objectives (mean 9.6, SD 0.8 vs mean 7.7, SD 1.7; $P<.001$), and attainability of objectives (mean 9.8, SD 0.5 vs mean 7.3, SD 1.3; $P<.001$). Both groups showed high interest in the inclusion of the activity as part of a blended learning approach; however, there was low interest in the activity being the sole means of teaching.

Conclusions: Case-based e-learning activities might be better suited for advanced learners and could increase learners' satisfaction within a blended teaching instructional design. More research on students' satisfaction with e-learning activities in the field of clinical skills education should be done. In addition, more effort should be put into finding alternative teaching tools for clinical skills education in light of the ongoing COVID-19 pandemic and future health crises.

(JMIR Med Educ 2021;7(2):e29216) doi:10.2196/29216

KEYWORDS

COVID-19; e-learning; medical education; eHealth; novice; advanced; students; undergraduate education; satisfaction; perception; renal; qualitative; prospective; case study; design; clinical skills; clinical skills education

Introduction

Nephrotic syndrome, a potentially life-threatening clinical disorder, occurs due to the increased permeability of the basal membrane of the renal glomerulus, which could be caused by different etiologies. It is more common among children; however, it can occur at any age [1]. Due to its distinct clinical and biological symptoms, relatively high incidence rate, and potentially related poor outcomes, it is important that medical students recognize it in clinical settings. Due to its physiopathology, nephrotic syndrome causes distinct and recognizable clinical and biological changes, such as peripheral edema, shortness of breath, proteinuria, and more, which could provide an interesting teaching opportunity to connect physiological, pathological, and clinical aspects with emphasis on history taking, clinical examination, differential diagnosis, and interpretation of laboratory results (eg, urinary sample).

In the medical faculty of the University of Geneva, Switzerland, a 2-hour session on teaching mentioned elements of nephrotic syndrome is typically held in a small group (10-12 students) and uses problem-based learning (PBL) based on a clinical vignette. Due to the ongoing COVID-19 pandemic, in-person teaching activities at our institution have been canceled. Videoconference-based lessons did not yield student engagement during the sessions. Therefore, our team sought to design an alternative learning activity to replace the traditional way of teaching nephrological semiology.

Electronic learning (e-learning) modules have been shown to be as effective as traditional teaching [2] and to improve novice learners' performance in situated case-based learning [3]. Moreover, the use of rich media and visuals for teaching has been shown to improve and support learners' experience, understanding, and engagement [4]. Finally, case-based and self-directed activities have been shown to be effective and to increase engagement and motivation for both students and teachers [5-7].

Redesigning our traditional activity as an e-learning module could therefore provide several advantages both in the context of the current pandemic as well as for future teaching activities. Students will have a didactic and validated source of information that meets the expectations of their educators. With the ubiquity of smartphones and other internet-connected devices [8-10], students will be able to easily access the module and repeat it as many times as they like, without being limited by location. Lastly, as this is a clinically pertinent subject, the module could serve as a reference later on in their clinical environment.

While several recent systematic reviews and meta-analyses provide evidence on the potentially beneficial nature of e-learning modules compared to traditional learning in terms of knowledge acquisition and clinical performance [11], important knowledge gaps exist on learners' satisfaction with this type of teaching. Moreover, a paucity of evidence exists on the use and outcomes of e-learning interventions among undergraduate students and on the use of e-learning as a sole teaching method, especially in the context of clinical skills education.

In our paper, we aimed to prospectively study second-year (out of six) medical students' satisfaction and perceptions of an e-learning module designed to replace the traditional teaching of nephrological semiology and compare the results to those of more advanced learners undertaking the same activity and evaluation. Our main hypotheses were that students would consider e-learning engaging due to the use of rich media and flexible since they would be able to perform it asynchronously, and that the proposed instructional design would be preferred to videoconference-based lessons.

Methods

Ethics Committee Approval

As the study was based on the analysis of anonymous data, no ethics committee approval from our institution was required.

Clinical Skills Medical Curricula

In the medical faculty of the University of Geneva, Switzerland, clinical skills teaching begins in the second year of medical school and continues in a transversal fashion throughout the whole 6-year curricula [12]. Teaching is usually conducted in small groups, led by an experienced physician, and is reinforced by training sessions led by pretrained advanced medical students. Nephrological semiology is, as mentioned, one of the many clinical skills seminars offered by our faculty.

Study Population

We prospectively included all second-year medical students (novice learners) from our institution. It should be noted that due to the COVID-19 pandemic, these students have never experienced in-person PBL classes. As data were anonymous, we do not have precise baseline characteristics; however, the students' ages ranged from 20 to 27 years.

For comparison and to provide further insights, 17 fourth- to sixth-year medical students (advanced learners) were invited to undertake the same e-learning activity and evaluation. Of importance, all advanced learners previously participated in the same activity in its traditional in-person PBL form during their second year of medical school.

e-Learning Instructional Design and Timing Considerations

The e-learning activity was designed using the latest evidence-based teaching methods. Instructional design was based on self-directed learning using a case-based learning activity of a patient presenting symptoms suspected of nephrotic syndrome. The learning objectives, which are listed in Table 1, were defined based on Bloom's taxonomy for cognitive learning outcomes [13] and using the SMART (specific, measurable, achievable, relevant, and time-bound) criteria for well-defined objectives [14].

Students were provided with reading material to review before completing the e-learning module. The activity concentrated on history taking, clinical examination, differential diagnosis, laboratory examination, and treatment plans for a patient presenting with symptoms suspected of nephrotic syndrome.

The estimated time to complete both the readings and the e-learning module was approximately 2 to 3 hours long in a self-paced manner. Students were given 2 weeks to complete the module.

Table 1. Learning objectives for the nephrological semiology e-learning module within the cognitive learning domain (translated from French).

Number	Learning objectives
1	Cite the key body systems to concentrate on during system-based history taking of a patient suspected of nephrotic syndrome as evaluated by the self-assessment quiz.
2	List the key symptoms of nephrotic syndrome to look for during history taking as evaluated by the self-assessment quiz.
3	List the body systems to concentrate on during the clinical examination of a patient with a suspected case of nephrotic syndrome as evaluated by the self-assessment quiz.
4	List the differential diagnosis of peripheral edema as evaluated by the self-assessment quiz.
5	Cite the indicated paraclinical examination to be done in an ambulatory setting when suspecting nephrotic syndrome as evaluated by the self-assessment quiz.
6	Recognize the components of a urinary band strip typical of urinary infection, urinary lithiasis, and nephrotic syndrome by matching urinary elements to the corresponding syndrome in the evaluation quiz.
7	Cite the key feature of a urinary band strip for a patient with nephrotic syndrome as evaluated by the self-assessment quiz.
8	List the three elements of the diagnostic criteria of nephrotic syndrome as evaluated by the self-assessment quiz.

Technology and Media Use

The e-learning module was created using Rise Articulate 360 (Articulate Global Inc) [15]. The activity itself was based on multiple-choice questions, text explanations, images, videos, and self-evaluation questions (Figures 1 and 2). The videos concentrated on cardiac, respiratory, and renal examination as well as skills to assess the presence of ascites. All videos were validated by expert faculty staff and were retrieved from the AMBOSS repository (Figures 3 and 4) [16].

Figure 1. An example of a multiple-choice question from the e-learning activity.

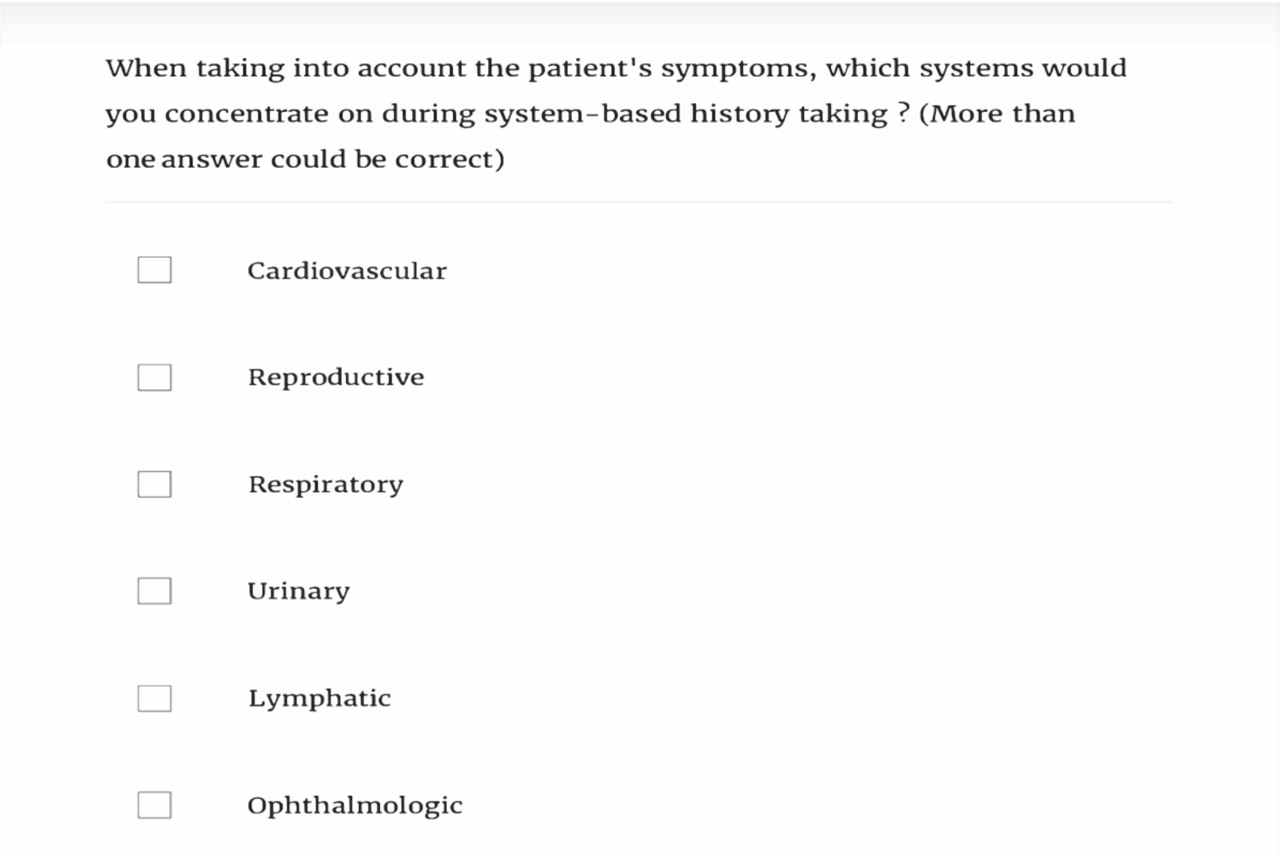


Figure 2. An example of the use of rich media in the e-learning activity.

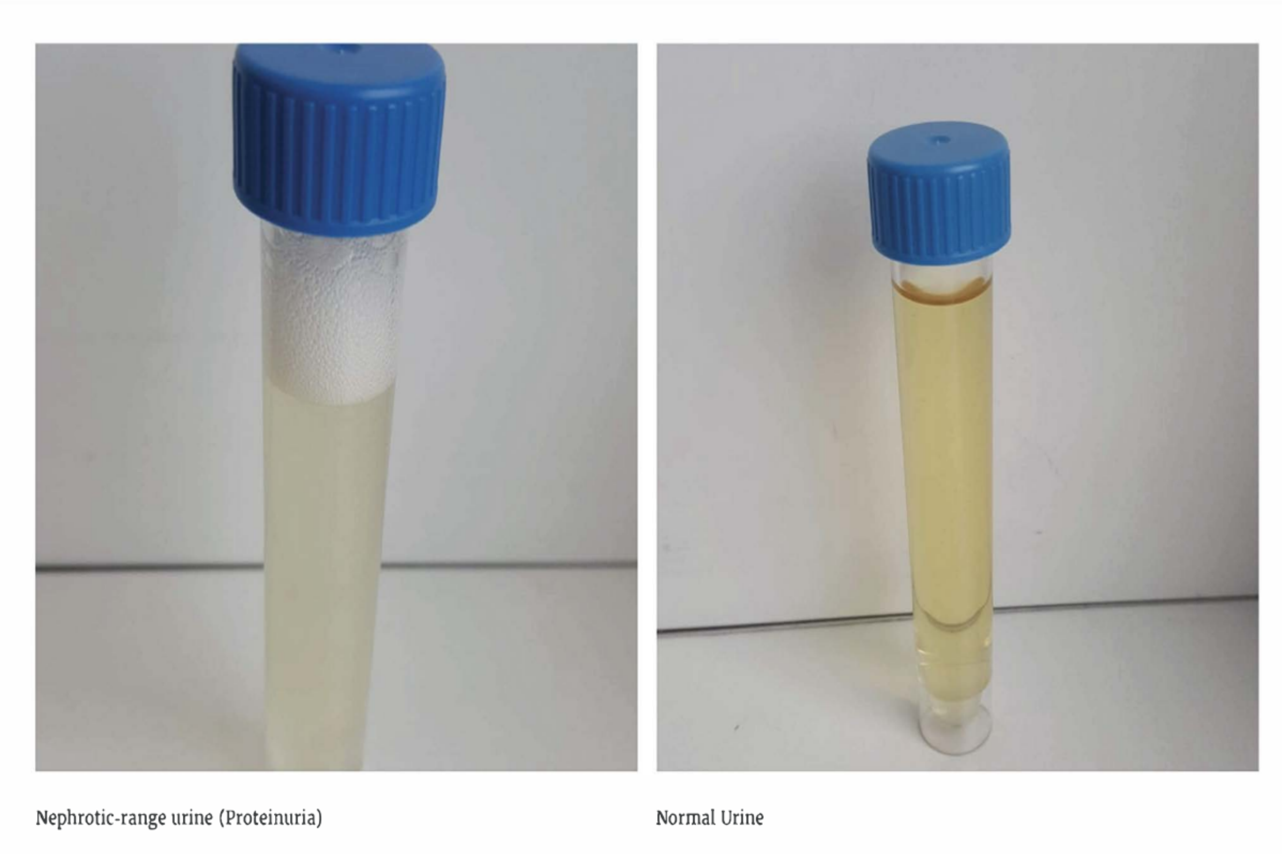


Figure 3. A locally validated and endorsed video of cardiac examination integrated into the e-learning activity [16].

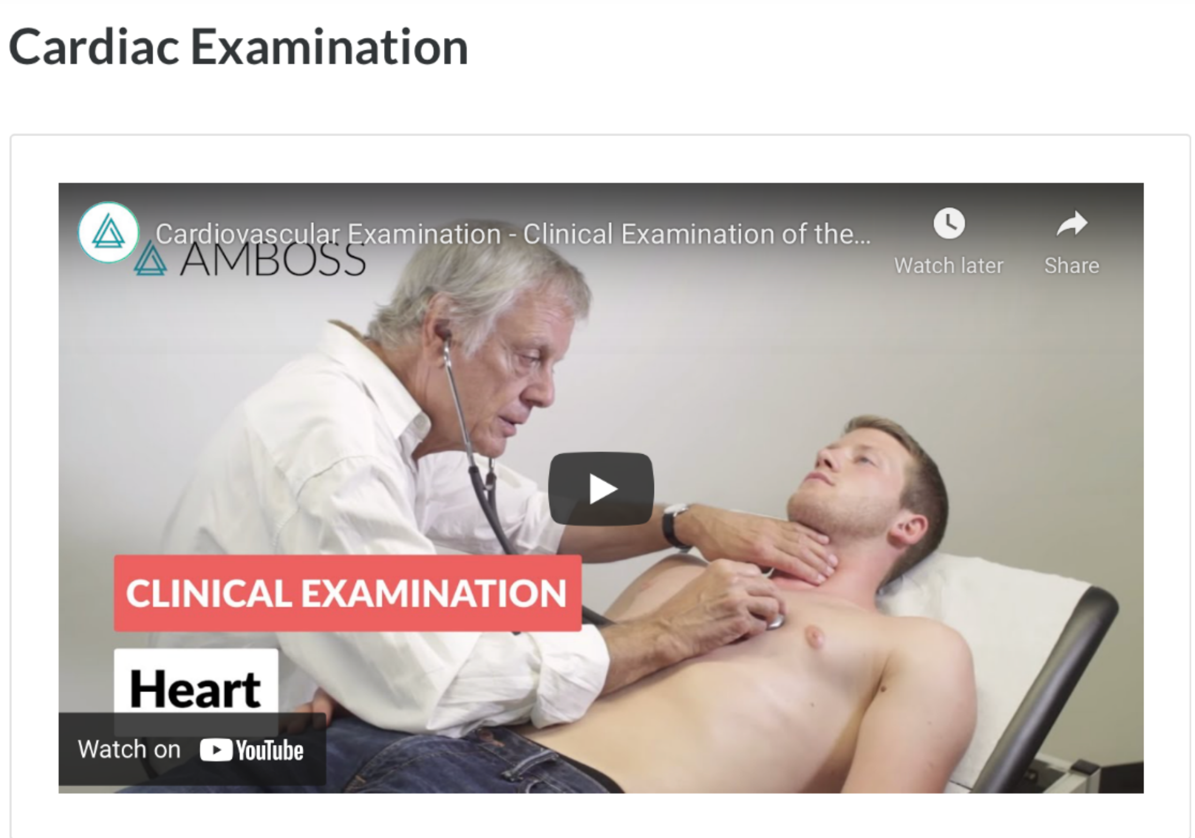
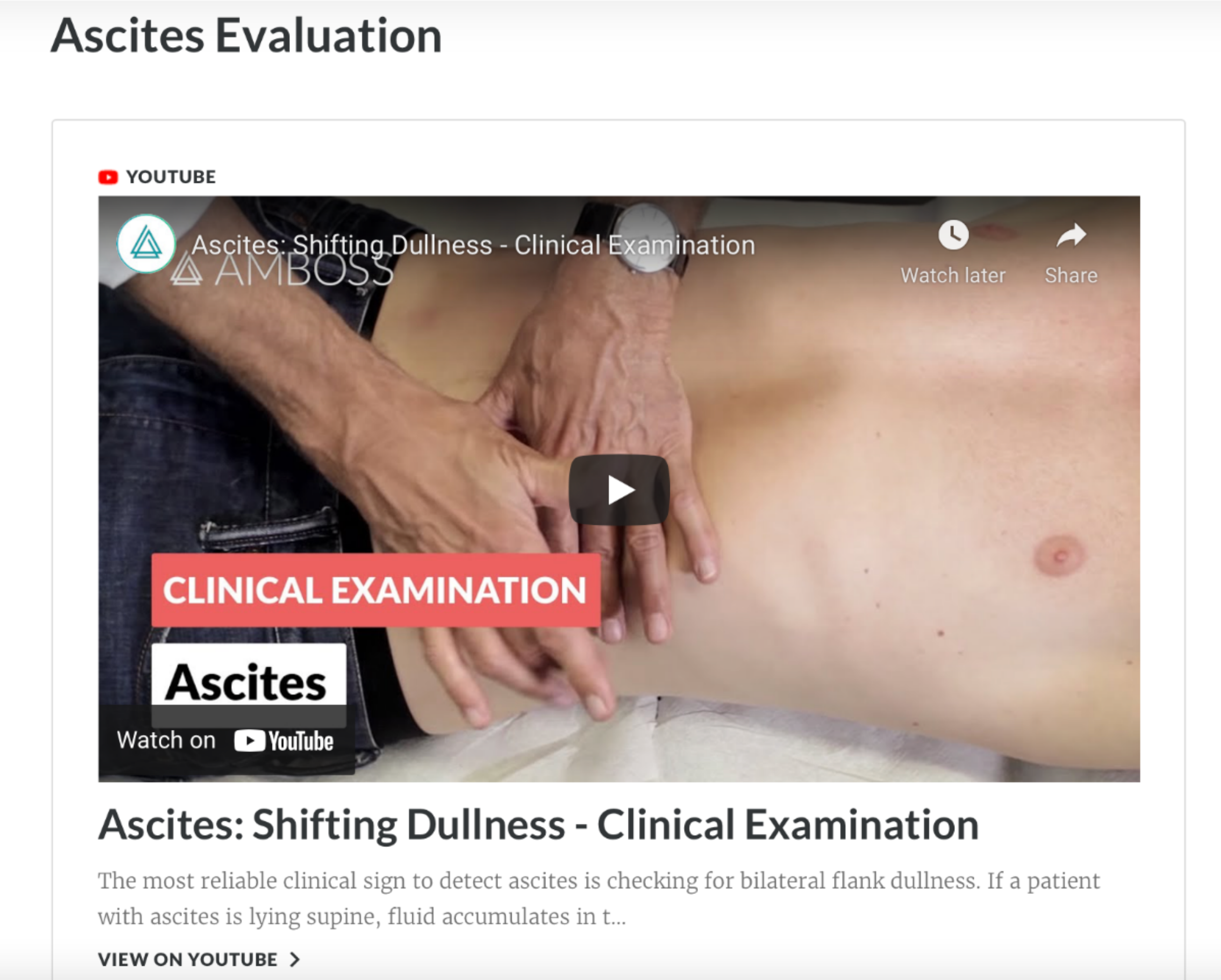


Figure 4. A locally validated and endorsed video of ascites evaluation integrated into the e-learning activity [16].



Activity Assessment

At the end of the module, students were provided with self-assessment multiple-choice questions based on knowledge acquired through the module.

Postsession Evaluation

All students were given the opportunity to complete a 13-question survey. Survey questions were based on a validated tool (A Rubric for Evaluating E-Learning Tools in Higher Education) [17] and were conveyed using the SurveyMonkey platform (Momentive Global Inc) [18]. Students were asked to answer the questions using a 10-point Likert scale. A score of more than 7 for each question was considered a positive rating of the activity's quality. In addition, a 1-hour videoconference session using Zoom (Zoom Video Communications) [19] was set in order to receive students' live feedback and responses to questions regarding the learning activity.

Statistical Analysis

A mixed methods analysis was performed. Quantitative data were presented as mean (SD). We compared data between the 2 student groups using the *t* test for means. Stata, version 16 (StataCorp LLC), was used for all statistical analysis [20]. A two-sided $P<.05$ was used to indicate significance. Qualitative data were analyzed using a thematic analysis approach.

Results

Overview

In total, 141 second-year medical students (novice learners) and 17 advanced medical students (advanced learners) undertook the e-learning activity. Among the novice learners, 88 (62%) students responded to the web-based survey, of whom 81 (92%) said they had completed the activity using their personal computer, 9 (10%) used a tablet, and 1 (1%) used a smartphone. Among advanced learners, all 17 students participated in the evaluation, of whom 12 (71%) used their personal computer and 5 (29%) used a smartphone to complete the activity.

Survey Results

Both novice and advanced learners' survey results are summarized in Table 2. Mean global satisfaction and user-friendliness of the e-learning activity was rated significantly higher among advanced versus novice learners (satisfaction: mean 8.7, SD 1.0 vs mean 7.3, SD 1.8, $P<.001$; user-friendliness: mean 9.0, SD 1.1 vs mean 7.6, SD 1.8, $P<.001$). Similarly, clarity and attainability of learning objectives were rated significantly higher among advanced versus novice learners (clarity: mean 9.6, SD 0.8 vs mean 7.7, SD 1.7, $P<.001$; attainability: mean 9.8, SD 0.5 vs mean 7.3, SD 1.3, $P<.001$). Both groups showed moderate to low preference for e-learning activities compared to videoconference-based activities, though e-learning preference was significantly higher among the advanced students (mean 7.5, SD 1.5 vs mean 5.8, SD 3; *P*=.02). Both groups showed a low and similar preference for in-person traditional PBL learning over the proposed e-learning module (mean 4.7, SD 2.7 vs mean 4.7, SD 1.8; *P*=.95). However, while significantly higher among advanced learners, both groups saw a high to extremely high need for the e-learning module to coexist and be complementary to traditional learning activities (mean 9.8, SD 0.5 vs mean 7.7, SD 2.5; *P*<.001). Both groups appreciated the integration of rich media in the e-learning module, with significantly higher satisfaction among the advanced learners (mean 9.5, SD 1.2 vs mean 8.2, SD 1.6; *P*<.001). Both groups highly and similarly appreciated the possibility to undertake the learning activity in an asynchronous fashion (mean 9.2, SD 1.2 vs mean 8.3, SD 1.9; *P*=.16) and moderately appreciated the lack of need to physically attend the class (mean 7.6, SD 2.5 vs mean 7.2, SD 2.6; *P*=.46).

Table 2. Comparison between novice and advanced learners' web-based survey responses.

Question	Novice learners (n=88), mean (SD)	Advanced learners (n=17), mean (SD)	*P* value
Rate your overall satisfaction with the e-learning activity.	7.3 (1.8)	8.7 (1.0)	<.001
In my opinion, the interface used for the e-learning activity is user-friendly.	7.6 (1.8)	9.0 (1.1)	<.001
The learning objectives were clear to me.	7.7 (1.7)	9.6 (0.8)	<.001
I was able to attain the learning objectives thanks to the e-learning module.	7.3 (1.3)	9.8 (0.5)	<.001
I believe that the e-learning module is a more efficient way of teaching than videoconference-based (Zoom) activities (in terms of knowledge acquisition and in-class engagement).	5.8 (3)	7.5 (1.5)	.02
Compared to traditional learning (in-person problem-based learning classes), e-learning activities seem to me more efficient (in terms of knowledge acquisition and in-class engagement).	4.7 (2.7)	4.7 (1.8)	.95
This e-learning module needs to coexist as a complementary module to traditional teaching activities.	7.7 (2.5)	9.8 (0.5)	<.001
Integration of rich media (texts, quizzes, videos, images) facilitated my learning process.	8.2 (1.6)	9.5 (1.2)	<.001
The possibility to undertake the activity in an asynchronous fashion, according to my own time constraints, is a significant advantage for me.	8.3 (1.9)	9 (1.2)	.16
The possibility to undertake the activity via distance learning, without the need to physically attend the class, is a significant advantage for me.	7.2 (2.6)	7.8 (2.5)	.46

Open-Ended Answers and Postactivity Zoom Session

A total of 22 (25%) novice learners and 11 (65%) advanced learners answered the open-ended comments section. Most comments from novice learners concentrated on three main themes. Students' reflections are summarized in Tables 3 and 4. First, students stated that they enjoyed the activity in its present form; however, as formulized by 1 second-year student, "No activity can replace an in-person learning session with an experienced medical doctor." Second, students from both groups suggested providing more text explanations for wrong answers to the multiple-choice questions. Finally, both novice and advanced learners showed interest in having the proposed e-learning module as a teaching activity complementary to in-person PBL classes for nephrological semiology.

During the postactivity Zoom session, the main themes discussed in the open-ended comments section were repeated by novice learners. Objective appreciation by the teachers leading the activity, however, indicated good attainability of the learning objectives, as manifested by the pertinent questions raised by students about the material and a good level of group discussion throughout the session.

Table 3. Novice learners' qualitative inputs (translated from French).

Theme	Response
Advantages of blended learning	• "The e-learning activity needs to co-exist with in-person learning, mainly because the in-person activity summarizes some points of the e-learning. Moreover, text-based material with the absence of a teacher makes memorization difficult." • "Instead of the usual 2-hour Zoom sessions, it would be interesting to integrate the e-learning in the activity with 1-hour Zoom followed by the e-learning activity. This will help us integrate the information" • "I think that the e-learning activity is good but should be complementary to in-person activities." • "This type of resource would be a great advantage for learning and to practice our skills. In fact, we often lack good references" • "We should keep the e-learning as complementary to in-person activities. The in-person activity allows us to profit from the real-life and concrete experience of a physician"
Lack of explanations	• "The e-learning activity presented answers to the questions but not enough explanations, which could have been more useful." • "Maybe the Q&A zoom session should be directly after the e-learning activity so we won't forget our questions. Other than that, it was interesting and interactive, thank you" • "I would have liked more explanations for the answers to the multiple-choice questions" • "More explanations for the answers to the multiple-choice questions" • "More explanations for the answers to the multiple-choice questions could help us better understand our errors"
Need for in-person group activities	• "We already do everything by distance learning. I find it crucial that we could practice history taking with a real physician and be able to reflect together through group discussion. This will help me to better understand." • "The e-learning is well-made and stimulating but in-person PBL activity is primordial in my opinion" • "Nothing can replace an in-person session" • "The e-learning activity repeats the text in our references. An interaction with a real physician would be more stimulating, and hopefully more interesting than watching videos online. That said, the videos are useful for self-training" • "Studying practical aspects with e-learning is difficult"

Table 4. Advanced learners' qualitative inputs (translated from French).

Theme	Response
Advantages of blended learning	• "Would be very useful to combine this activity with an in-person class by a nephrologist using more clinical vignettes and more teaching about nephrotic syndrome physiopathology. Nonetheless, the rich media is excellent and the interface very user-friendly"
Lack of explanations	• "I feel that there are many elements of explanations that are lacking. In the in-person class, we had more detailed explanations, and it made it easier to understand" • "Very good learning tool, maybe consider adding more photos for clinical signs as it will help us visualize and remember. Other than that, excellent learning method, which I would have loved to have earlier in the curricula" • "Would be of value to add more explanations for wrong answers in the quizzes" • "Very well-structured activity with a clear and logic sequence. Difficulty is adapted to the level of learners. Adding more explanations to wrong answers would be of value" • "Write more explanations for wrong answers"
Need for in-person group activities	• "Very good interface, fluid, and stimulating. I really appreciate the videos, and the quizzes allow a good synthesis of the learned material and help to achieve learning objectives. However, I am convinced that an in-person activity should be done in order to practice, and that the e-learning activity should exist in addition as it is very useful."

Discussion

Principal Findings

Our study examined the satisfaction and perceptions of novice and advanced learners from an e-learning module designed to teach nephrological semiology as part of a mandatory clinical skills seminar targeted at second-year medical students in the medical faculty of the University of Geneva, Switzerland, during the COVID-19 pandemic. We provide several important insights. First, advanced learners showed significantly greater satisfaction with the e-learning activity and seemed to prefer this format over videoconference-based activities. Second, both novice and advanced learners seemed highly opposed to the idea of replacing in-person PBL activities with e-learning as the sole means of teaching but presented high interest in having the e-learning module as part of a blended learning approach. Finally, the integration of rich media seems to improve satisfaction and engagement for both novice and advanced learners in the presented e-learning module.

Several studies have already examined undergraduate students' satisfaction and acceptability of e-learning–based activities [21,22] and have shown little or no significant preference for this type of learning. However, these studies were done outside of the current COVID-19 pandemic context, which presents a different learning reality where many novice learners never experienced in-person activities; this warrants the need to re-examine student satisfaction with and perception of traditional versus electronic-based activities. Only a few studies have examined this topic within the context of the current pandemic [23,24]; however, they considered videoconference-based activities as e-learning, which is different from the definition used in our study. Finally, major knowledge gaps exist concerning the acceptance and satisfaction of e-learning–based activities as the sole means of teaching compared to blended learning activities, especially for clinical skills undergraduate teaching, which in the current reality is of major importance in our opinion.

In fact, the current outbreak caused a major disruption within higher education and forced many institutions to revisit and reinvent teaching activities with the upscaling of online learning, as in-person teaching was not allowed for sanitary reasons [25]. Clinical skills teaching within health sciences education programs during pandemics presents a unique challenge for faculties as the need to teach and train competent future health care workers, who would soon actively participate in patient care, is put in the balance of their own safety as in-person teaching and contact with patients may come with the risk of infection. Therefore, finding and assessing alternative ways to teach clinical skills to future health professionals during this and future outbreaks is of significance.

In our study, novice learners showed only moderate satisfaction and attested to only moderate clarity and attainability of learning objectives after following the e-learning activity for nephrological semiology. Advanced learners, however, attested to a significantly higher level of satisfaction, as well as clarity and attainability of objectives, from the same activity. This could be explained in several ways. First, our instructional design was based on self-directed learning, which was shown to be more challenging and less accepted by beginners [26] as they might lack the maturity and experience to reach learning outcomes with minimally guided activities. This could explain as well why novice learners did not show a preference for the e-learning activity as compared to videoconference-based activities, even though students' engagement with the latter was judged low by faculty members. Second, the novice learners in our study had never experienced in-person PBL lessons and seemed to be frustrated with distance-learning activities and feared not returning to in-person clinical skills activities as evidenced from the open-ended comments of the survey. This could have decreased their satisfaction with the activity, whereas advanced learners are more implicated in the clinical environment and have already experienced the same activity in its traditional form. Finally, as evidenced both by the survey responses as well as the postactivity videoconferencing session, certain novice students seemed to undertake the e-learning activity with their own learning agenda, which may not align with the actual learning objectives, a notion that has been demonstrated in past studies [27]. In fact, many of the comments from novice learners were related to their inability to practice renal and urological clinical examination, as these were not part of the activity's learning objectives. This issue was further confirmed in the postactivity videoconference session, as objective evaluation by the teachers appraised good attainability of learning objectives.

Interestingly, both groups similarly agreed that online-based learning should not replace traditional in-person learning activities, and that blended learning, with the e-learning module as a complement to traditional teaching, could present an important learning benefit. This may be more evidence of medical students' preference for in-person learning, especially in clinical skills education, as well as for the possible benefits of e-learning modules for life-long learning since this type of activity was highly valued by the students in our study who had already undertaken the activity in its traditional form and might have seen the module as an efficient repetition of already-acquired knowledge. Lastly, both student groups seemed to find asynchronous e-learning to be significantly advantageous in terms of individual time constraints, which could provide insights into the acceptability of this form of learning among medical students and as a means for increasing engagement in certain activities and earlier introduction of self-directed learning in the curricula.

Strengths and Limitations

Our study has several limitations. The sample size of both groups was small, and the observational nature of this monocentric study could decrease the level of confidence in the results. Moreover, we did not directly compare traditional and online activities in different groups due to the pandemic situation. Finally, we did not assess knowledge retention using a standardized test as this was out of the scope of this study. However, the fact that both the activity and the evaluation were prospectively designed and were based on current evidence-based teaching methods and validated evaluation tools highlights important strengths of our work. The high survey response rate in both groups was another strength of the evaluation and may be indicative of undergraduate students' motivation to actively participate in this curricular design. Lastly, the evaluation was made on an actual, ongoing teaching activity, which could provide real-world and important insights concerning learners' satisfaction with e-learning–based activities.

Conclusion

In the context of the current pandemic, novice medical students expressed only moderate satisfaction from an e-learning module intended as the sole means of nephrological semiology teaching and showed a clear preference for in-person, problem-based teaching complemented by e-learning for blended learning activities in the future. In addition, case-based e-learning activities might be better fitted for more advanced learners. Additional and larger studies should be performed to assess medical students' satisfaction with online-based versus traditional learning activities in order to adapt the instructional design of alternative clinical skills teaching among health professionals and to improve preparation and clinical training in the context of future pandemics.

Acknowledgments

We would like to thank Anne E Belcher, PhD, RN, ANEF, FAAN, associate professor (clinical) from the Master of Education in the Health Professions program at the Johns Hopkins School of Education for her guidance.

Authors' Contributions

IZ, the main investigator, wrote the manuscript, designed the activity and evaluation, and performed the literature review and statistical analysis. ES critically revised the manuscript and took part in and approved the design of the activity and evaluation. CS-C critically revised the manuscript, assured clinical quality, and took part in and approved the design of the activity and evaluation.

Conflicts of Interest

None declared.

References

1. Tapia C, Bashir K. Nephrotic Syndrome. Treasure Island, FL: StatPearls Publishing; 2020.
2. Zogas S, Kolokathi A, Birbas K, Chondrocoukis G, Mantas J. The e-Learning Effectiveness Versus Traditional Learning on a Health Informatics Laboratory Course. Stud Health Technol Inform 2016;226:109-112. [Medline: 27350479]
3. Feng J, Chang Y, Chang H, Erdley WS, Lin C, Chang Y. Systematic review of effectiveness of situated e-learning on medical and nursing education. Worldviews Evid Based Nurs 2013 Aug;10(3):174-183. [doi: 10.1111/wvn.12005] [Medline: 23510119]
4. Dempsey JV, Reiser RA. Using rich media wisely. In: Trends and Issues in Instructional Design and Technology, 4th Edition. United Kingdom: Pearson; 2018.
5. Thistlethwaite JE, Davies D, Ekeocha S, Kidd JM, MacDougall C, Matthews P, et al. The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. Medical Teacher 2012 May 11;34(6):e421-e444. [doi: 10.3109/0142159x.2012.680939]
6. Bi M, Zhao Z, Yang J, Wang Y. Comparison of case-based learning and traditional method in teaching postgraduate students of medical oncology. Medical Teacher 2019 Jun 19;41(10):1124-1128. [doi: 10.1080/0142159x.2019.1617414]
7. Weiner GM, Menghini K, Zaichkin J, Caid AE, Jacoby CJ, Simon WM. Self-directed versus traditional classroom training for neonatal resuscitation. Pediatrics 2011 Apr 07;127(4):713-719. [doi: 10.1542/peds.2010-2829] [Medline: 21382953]
8. Zamberg I, Windisch O, Agoritsas T, Nendaz M, Savoldelli G, Schiffer E. A Mobile Medical Knowledge Dissemination Platform (HeadToToe): Mixed Methods Study. JMIR Med Educ 2020 May 27;6(1):e17729 [FREE Full text] [doi: 10.2196/17729] [Medline: 32249758]
9. Zamberg I, Manzano S, Posfay-Barbe K, Windisch O, Agoritsas T, Schiffer E. A Mobile Health Platform to Disseminate Validated Institutional Measurements During the COVID-19 Outbreak: Utilization-Focused Evaluation Study. JMIR Public Health Surveill 2020 Apr 14;6(2):e18668 [FREE Full text] [doi: 10.2196/18668] [Medline: 32250958]
10. Windisch O, Zamberg I, Zanella M, Gayet-Ageron A, Blondon K, Schiffer E, et al. Using mHealth to Increase the Reach of Local Guidance to Health Professionals as Part of an Institutional Response Plan to the COVID-19 Outbreak: Usage Analysis Study. JMIR Mhealth Uhealth 2020 Aug 19;8(8):e20025 [FREE Full text] [doi: 10.2196/20025] [Medline: 32749996]
11. Vaona A, Banzi R, Kwag KH, Rigon G, Cereda D, Pecoraro V, et al. E-learning for health professionals. Cochrane Database Syst Rev 2018 Jan 21;1:CD011736 [FREE Full text] [doi: 10.1002/14651858.CD011736.pub2] [Medline: 29355907]
12. Vu NV, Bader CR, Vassalli JD. [The current curriculum in medicine at the University of Geneva]. Rev Med Suisse Romande 1997 Jan;117(1):65-68. [Medline: 9082540]
13. Adams NE. Bloom's taxonomy of cognitive learning objectives. J Med Libr Assoc 2015 Jul;103(3):152-153 [FREE Full text] [doi: 10.3163/1536-5050.103.3.010] [Medline: 26213509]
14. Chatterjee D. How to Write Well-Defined Learning Objectives. JEPM 2017 Oct 1;19(4):1-4. [doi: 10.46374/volxix-issue4-chatterjee]
15. Articulate 360. 2021. URL: https://articulate.com/360/rise [accessed 2021-03-19]
16. AMBOSS. 2021. URL: https://www.amboss.com/us [accessed 2021-03-19]
17. Anstey L, Watson G. A Rubric for Evaluating E-Learning Tools in Higher Education. Educause Review. 2018 Sep 10. URL: https://er.educause.edu/articles/2018/9/a-rubric-for-evaluating-e-learning-tools-in-higher-education [accessed 2021-06-22]
18. SurveyMonkey. 2021. URL: https://www.surveymonkey.com/ [accessed 2021-03-19]
19. Zoom. 2021. URL: https://zoom.us/ [accessed 2021-03-25]
20. Stata. StataCorp LLC. 2021. URL: https://www.stata.com/ [accessed 2021-03-19]
21. George PP, Papachristou N, Belisario JM, Wang W, Wark PA, Cotic Z, et al. Online eLearning for undergraduates in health professions: A systematic review of the impact on knowledge, skills, attitudes and satisfaction. J Glob Health 2014 Jun;4(1):010406 [FREE Full text] [doi: 10.7189/jogh.04.010406] [Medline: 24976965]

22. Chen M, Su Z, Wu T, Shieh T, Chiang C. Influence of dentistry students' e-Learning satisfaction: a questionnaire survey. J Med Syst 2011 Dec 12;35(6):1595-1603. [doi: 10.1007/s10916-010-9435-x] [Medline: 20703759]
23. Abbasi MS, Ahmed N, Sajjad B, Alshahrani A, Saeed S, Sarfaraz S, et al. E-Learning perception and satisfaction among health sciences students amid the COVID-19 pandemic. WOR 2020 Dec 01;67(3):549-556. [doi: 10.3233/wor-203308]
24. Ibrahim NK, Al Raddadi R, AlDarmasi M, Al Ghamdi A, Gaddoury M, AlBar HM, et al. Medical students' acceptance and perceptions of e-learning during the Covid-19 closure time in King Abdulaziz University, Jeddah. J Infect Public Health 2021 Jan;14(1):17-23 [FREE Full text] [doi: 10.1016/j.jiph.2020.11.007] [Medline: 33341480]
25. Burki TK. COVID-19: consequences for higher education. The Lancet Oncology 2020 Jun;21(6):758. [doi: 10.1016/s1470-2045(20)30287-4]
26. Robinson JD, Persky AM. Developing Self-Directed Learners. Am J Pharm Educ 2020 Mar 12;84(3):847512 [FREE Full text] [doi: 10.5688/ajpe847512] [Medline: 32313284]
27. Senko C, Miles KM. Pursuing their own learning agenda: How mastery-oriented students jeopardize their class performance. Contemporary Educational Psychology 2008 Oct;33(4):561-583. [doi: 10.1016/j.cedpsych.2007.12.001]

Abbreviations

e-learning: electronic learning
PBL: problem-based learning
SMART: specific, measurable, achievable, relevant, and time-bound

Edited by G Eysenbach; submitted 30.03.21; peer-reviewed by T Alessa; comments to author 21.04.21; revised version received 21.04.21; accepted 22.04.21; published 28.06.21.

Please cite as:
Zamberg I, Schiffer E, Stoermann-Chopard C
Novice and Advanced Learners' Satisfaction and Perceptions of an e-Learning Renal Semiology Module During the COVID-19 Pandemic: Mixed Methods Study
JMIR Med Educ 2021;7(2):e29216
URL: https://mededu.jmir.org/2021/2/e29216
doi:10.2196/29216
PMID:34048357

Tutorial

Incorporating Medical Students Into Primary Care Telehealth Visits: Tutorial

Aanika Balaji[1], MPH; Sarah Lou Clever[1,2], MHS, MD

[1]Johns Hopkins University School of Medicine, Baltimore, MD, United States

[2]Department of Medicine, Johns Hopkins University, Baltimore, MD, United States

Corresponding Author:
Sarah Lou Clever, MHS, MD
Johns Hopkins University School of Medicine
1600 McElderry
Baltimore, MD,
United States
Phone: 1 4109555550
Email: sclever@jhmi.edu

Related Articles:

Comment in: https://mededu.jmir.org/2022/1/e30703/

Comment in: https://mededu.jmir.org/2022/1/e37401/

Abstract

Background: The COVID-19 pandemic has brought about sweeping change in health care delivery, which has shifted from in-person consultations to a web-based format. Few medical schools provide web-based medicine or telemedicine training to their learners, though this is likely to be important for future medical practice.

Objective: This tutorial communicates a framework for incorporating medical students into primary care telemedicine clinics.

Methods: A third-year medical student and internal medicine attending physician from the Johns Hopkins University completed telemedicine clinic visits in April 2020 by using a variety of video platforms and via telephone calls.

Results: Nine telemedicine visits were completed over 4 clinic days. Our patients were, on average, aged 68 years. The majority of patients were female (6/9, 67%), and most appointments were completed via a video platform (6/9, 67%). Additionally, our experience is summarized and describe (1) practical tips for how to prepare for a telehealth visit; (2) technology considerations; (3) recommendations for participation during a telehealth visit; (4) debriefing and feedback; (5) challenges to care; and (6) student, care provider, and patient reactions to telemedicine visits.

Conclusions: Telemedicine clinics have been successfully used for managing patients with chronic conditions, those who have attended low-risk urgent care visits, and those with mental health concerns. Patients have reported high patient satisfaction scores for telemedicine visits, and the majority of patients are comfortable with having medical students as part of their care team. Moving forward, telemedicine will remain a popular method for receiving health care. This study has highlighted that medical students can successfully be integrated into telemedicine clinics and that they should be exposed to telehealth whenever possible prior to residency.

(JMIR Med Educ 2021;7(2):e24300) doi:10.2196/24300

KEYWORDS

medical student; education; primary care; telehealth; video visits; internal medicine; medical education; teleconsultation; digital health; COVID-19

Introduction

The COVID-19 pandemic era is a historic moment that is ushering in waves of challenges and the need for innovation. As a society, we have had to adapt to wearing face masks, working from home, and practicing social distancing measures to prevent the further spread of SARS-CoV-2 [1]. In alignment with these recommendations, the Association of American Medical Colleges requested a temporary suspension of medical student involvement in on-site clerkships that involve direct patient contact between March and April 2020 [2]. Almost overnight, medical schools and health care systems had to shift from in-person learning and appointments to a web-based format.

Defined as the use of telecommunication and electronic information to promote long-distance health care among patients and care providers, telemedicine is well suited to fill this gap. The practice of telemedicine is relatively new; its expanded use began in the 2010s [3,4]. In spite of this increased amount of use, a review by Pourmand et al [5] highlighted that nearly 40% of medical schools did not offer any formal instruction in telemedicine as part of their curriculum in the 2017-2018 academic year. Without a standardized curriculum or learning objectives, medical schools and residency programs have independently adapted and created new web-based clerkships and telemedicine electives for medical students and trainees during the pandemic [6-8]. These web-based experiences provide opportunities for advancing students' clinical education but often have either limited or no patient interaction components [9]. However, there is no literature that informs clinicians and medical students about how to participate in telehealth visits in the primary care setting.

To address this gap in knowledge, this tutorial aims to provide a summary of experiences, methods, the lessons learned about telehealth from both the student and attending physician perspective, and a framework for incorporating future learners into telemedicine clinics.

Background

As in-person clinical clerkships were suspended for 2 months at the Johns Hopkins University School of Medicine (March to May 2020), students were able to enroll in web-based learning offerings. However, these courses did not involve patient interaction. Prior to the COVID-19 pandemic–related suspension of clinical clerkships, the coauthors (an attending internal medicine physician [SC] and third-year medical student [AB]) had begun working together as part of an elective primary care clerkship while AB completed her Master of Public Health program. AB had attended 4 in-person clinic sessions and, by the last clinic session, had been interviewing patients independently and reporting to SC. In March 2020, SC's clinic was converted to a fully remote, video visit–only clinic [10]. In April 2020, SC decided to try incorporating AB into the web-based clinic. The experience is summarized below.

Telehealth Visits: A Practical Guide

Prior to the Start of Web-Based Visits

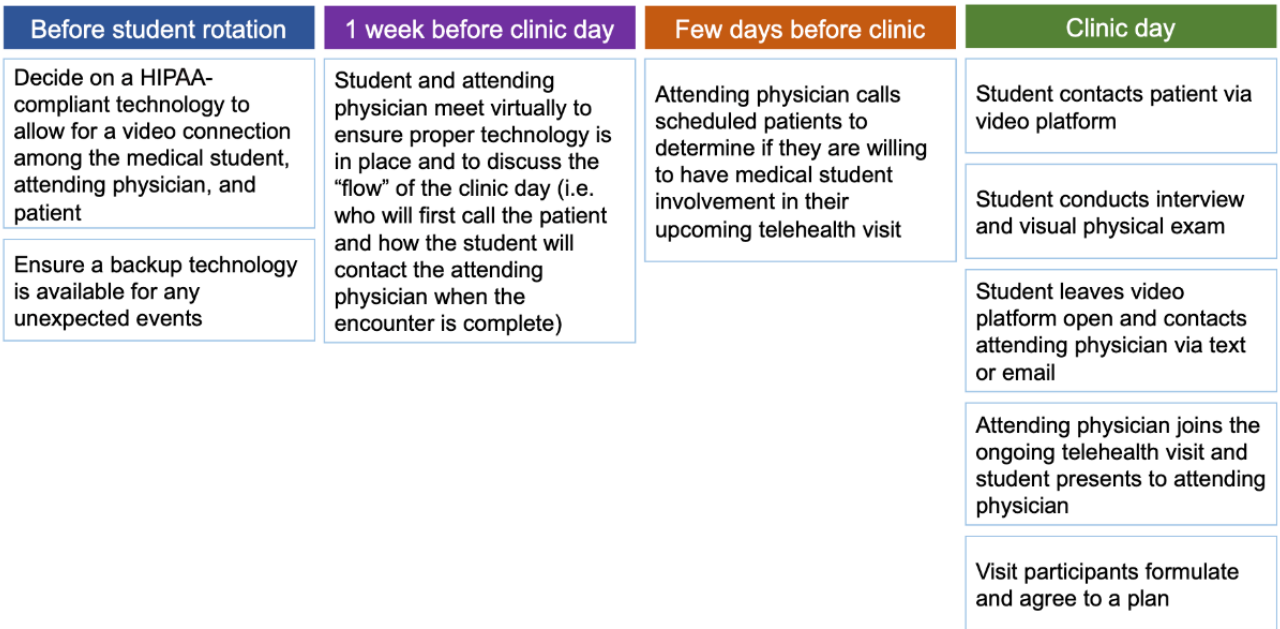
SC and AB met via Zoom (Zoom Video Communications Inc) prior to the first clinic day to discuss the new clinic format, review expectations and objectives (Textbox 1), and practice navigating options for patient communication. It was agreed that SC would contact her patients prior to the clinic day to inquire whether they were comfortable with having a medical student start the visit, and AB would prepare for visits by reviewing each patient's medical record. As they had previously worked together, SC was comfortable with having AB connect to patients and start visits on her own for 10 to 15 minutes before SC joined the web-based room to hear AB present the interval history and jointly create an assessment and plan. They had decided that all communication about the patient would occur while the patient was present "in the room," as had been done in prior in-person visits. This information, and that which follows, is presented as a flowchart in Figure 1.

Textbox 1. Outlined objectives and expectations for medical students attending telehealth clinics. These objectives were adapted from the Genes to Society Longitudinal Clerkship Curriculum from the Johns Hopkins School of Medicine.

Medical student expectations and objectives from telehealth clinic

- Experience the clinical practice of telehealth in a primary care setting through interviewing patients
- Assist in managing chronic disease in a telehealth setting
- Learn about how illness may be impacted by the COVID-19 pandemic
- Foster clinical skills by delivering ambulatory telehealth care
  - Review a patient's medical record prior to the visit
  - Conduct a focused interview
  - Gather objective clinical data in lieu of an in-person physical exam
  - Formulate an appropriate assessment and plan
  - Communicate information to both care providers and patients

Figure 1. Flowchart of steps for including medical students in telehealth. The flowchart is organized by the time periods before a clinic day. HIPAA: Health Insurance Portability and Accountability Act.



Technology

The Johns Hopkins health system uses Epic (Epic Systems Corporation), which has Polycom Telecommunications (Polycom Inc) built in as the default web-based visit communication app. This service accommodates up to 4 users, thereby allowing a medical student, patient, and attending physician to be present on the same screen during the visit. All users must download the Polycom app onto their computers, tablets, or phones and have access to both video cameras and microphones for communication. Polycom does not support direct messaging among parties. Recently, our hospital's Epic system has transitioned to using WebEx, a video platform hosted by Cisco that has an interface and functionalities that are similar to those of Polycom in terms of video visits. Messages between patients and care providers had to be sent through MyChart, a secure messaging platform hosted on Epic.

Another option for video visits was the Doximity app (Doximity Inc). Doximity can be used to conduct video visits with 3 users via cell phones or a desktop browser. When the care provider starts a video call, the patient receives a text message to join a secure video room via their cell phone's internet browser. A third user can be added by the provider who started the call. Doximity calls do not support synchronous messaging.

Zoom technologies can be used as well but were not explored for this clinical elective, as they were not approved for use in clinical encounters by our institution. Zoom meeting links must be password-protected to be used. All audio, video, and screen sharing data are encrypted, and the platform does not have access to identifiable patient health information. This service can host multiple parties and has synchronous messaging capabilities.

If patients are not able to join the visit via video link, the Doximity dialer was used by AB or SC to call patients from their private phones. This app displays the clinic's telephone number on the patient's phone, not the provider's personal phone number. A third party can be added to the call line.

All of the apps discussed are Health Insurance Portability and Accountability Act compliant and use encryption methods so that both videos and messages between patients and care providers are secure [11]. Zoom technologies, Cisco technologies (WebEx), and Doximity all use the Advanced Encryption Standard (AES) with 256-bit keys to encrypt meetings [12-14]. Polycom uses the AES with 128-bit encryption [15].

During the Visit

Before beginning the clinic day, both SC and AB were in private rooms in their homes to ensure patient confidentiality. These rooms provided neutral backgrounds and adequate lighting. Both SC and AB used headphones to prevent patient conversations from being heard by others if other people were present in their homes.

For each visit, AB and SC called patients 10 to 15 minutes before the visit start time. SC briefly introduced herself, explained her role during the visit, and provided context for why visits had shifted to a web-based format before exiting the meeting. Each visit was scheduled for 30 minutes. She gathered information about patients' reasons for the visit, their interval history, and performed a brief physical exam (appearance, mental state, and skin exams, if appropriate). Some patients recorded their blood glucose or blood pressure readings and, if they were relevant to their medical histories, AB collected these data. A handful of patients had physical exam findings captured on their cell phones as photos (eg, skin rashes), which they were able to share by presenting their phones to the webcam.

AB wrote progress notes in each patient's electronic medical record and pended relevant orders during visits. After 15 minutes, SC rejoined the room and AB provided a brief patient presentation as well as her initial thoughts. Then, SC gathered more relevant data, and with the patient's input, all three participants discussed the next steps for the patient's care.

Debriefing and Feedback

After the last patient visit, AB and SC debriefed quickly to go over notes and what orders needed to be placed. AB completed progress notes within 1 hour after the visit. Afterward, she and SC conducted a longer (about 30 minutes) call to go over further feedback.

During the feedback call, which mirrored the feedback provided during an in-person clinical session, SC and AB discussed each patient visit to highlight teaching points and offer feedback to AB. A summary of the guidelines from this section is provided and outlined in Textbox 2.

Textbox 2. Tips for incorporating medical students into primary care telehealth visits collected over 4 telehealth sessions. The tips are subdivided into the following categories: (1) prior to the telehealth visit, (2) technology considerations, (3) during the telehealth visit, and (4) debriefing and feedback.

Prior to the telehealth visit

- Decide what role the student will play during the visit (shadowing vs completing part or all of the web-based visit)
- Have the attending physician or a medical assistant reach out to patients to obtain permission for students to be a part of their care
- Frequent communication between the medical student and attending physician before, during, and after telemedicine visits is recommended.

Technology considerations

- Have a back-up plan if the first video communication platform does not work
- Use Doximity to mask outgoing phone numbers if communicating via phone

During the telehealth visit

- Conduct each visit in a quiet, private room to protect patient confidentiality
- Ensure that the patient is in a quiet, secure location at the beginning of the interview
- Describe the student's role in the patient's visit
- Student may exit the web-based clinic room if all materials have been covered prior to the attending physician's return
- Student may complete the patient presentation while in the web-based room

Debriefing and feedback

- Set time aside after each clinic day to provide timely and constructive feedback.
- The medical student can collect questions about patients and discuss them with the attending physician during this time.

Visit Characteristics

Over the course of 4 telehealth clinic sessions, SC and AB interviewed 9 patients. Patients were included if (1) their visits coincided with the clinic days when AB was able to join SC and (2) they were amenable to having a medical student involved in their care. Most appointments were completed via a video platform (6/9) instead of via telephone (3/9). Of the 9 appointments, 6 were annual or routine checkups and 3 were problem-focused visits (blood pressure, diabetes medication change, and posthospital discharge visits). At the time of writing, Maryland had mandated a stay-at-home order, and only urgent visits requiring in-person services were conducted in the office. None of the 9 patients we saw were invited for further in-person follow-ups after their initial appointment.

Challenges to Care

During this outpatient elective, a few challenges arose that were unique to telemedicine. Physical exams in telemedicine consults are limited to visual inspections and verbal interactions. One patient had a rash on his leg, and while it was initially difficult to share the image he had captured on his phone, he was able to align both screens to provide the team with a clear view. Based on the image and his history of present illness, we offered conservative topical therapy and advised that if symptoms worsen, he would need to follow up with the dermatology department. Relying on visual inspection for more complex diagnoses can be challenging and may not be feasible through telemedicine alone. Perkins et al [16] described in their letter to the editor how their practice has conducted teledermatology visits—they relied on patients taking multiple high-resolution images and uploading them to MyChart (a patient portal that provides access to patients' medical records and facilitates communication with care providers) before their appointments. These hybrid approaches (ie, combining stored data with synchronous visits) can result in better, informed, visual physical exams and evaluations of patient concerns. Other studies have reported using guides for having patients conduct a self-physical exam either alone or with a partner [17].

A third (3/9, 33%) of the patients seen had conducted their visits via telephone, as patients were unable to troubleshoot their video connections. This means of communication further limits the physical examination of patients and increases the difficulty of building rapport with patients. However, for noncomplicated visits, the medical team was able to triage patient health concerns, reorder medications, and provide health counseling without difficulty.

SC and AB relied on patients to provide their own health data. This became important for focused follow-up visits in which blood pressure or blood glucose were monitored. These data are limited by patients' ability to use home health care devices and the accuracy of the devices themselves. The medical team did not have the capability at the time to validate self-reported data through home nursing or to invite patients to the clinic for blood pressure or point-of-care blood glucose tests. At the time of writing, the outpatient elective coincided with a state-mandated stay-at-home order issued by Maryland. Therefore, patients were only offered in-person consultations if they had urgent symptoms and were not routinely seen in person for follow-ups.

Reactions to Telemedicine Visits

Student Perspective

At the time of this clerkship, it was unclear when medical students would be able to return to the wards. AB found that this telemedicine elective added value to her medical education, thereby allowing her to further hone her skills in understanding the patient history, formulating a differential diagnosis, and creating an appropriate assessment and plan. She learned to quickly build rapport with patients over web-based platforms, set an agenda, and adequately discuss health concerns. Similar to an in-person rotation, AB was able to present each patient case to the attending physician of her patients, pend orders, write clinical notes, and receive real-time feedback from the supervising physician. Importantly, while telemedicine is a step removed from physically seeing and touching patients, it provided the safest alternative during the COVID-19 pandemic that still emphasizes learning with and from patients. AB did not have formal training in telemedicine prior to this elective. She realized that training in telemedicine is a skill set that will be useful and necessary in the postpandemic world, especially for follow-ups that involve discussing results or conducting psychiatric-focused visits.

Attending Physician Perspective

SC was eager to include a student in telehealth visits, as it seemed clear that determining how to do so would be necessary to continue the meaningful education of medical students in outpatient care delivery during and after the pandemic. AB and SC were able to navigate the technology prior to the visits well enough that SC was confident that they could be successful in providing care and medical education at the same time. SC was concerned that contacting patients before the visits might be overly burdensome but found that it was not. Since AB was able to start the visits early, there was enough time for her to present patients to SC and keep within the visit time. SC's patients seemed to genuinely enjoy having a student involved in their care, and SC appreciated the opportunity to return to teaching during such a stressful time.

Patient Perspective

This study did not collect postvisit feedback from patients; therefore, the patient perspective was gleaned from interactions during visits and a review of the literature. All patients agreed to have a medical student as part of their care. Patients had extended appointment times, as the medical student started the visit early and the attending physician joined after 15 minutes. Additionally, patients were able to hear their visit presentation and add or clarify information. A survey of outpatients by Simons et al [18] showed the majority of patients are comfortable with medical students being involved in their care if permission was sought beforehand, they knew the role of the medical student, time limits were set, and patients were able to speak with the attending physician. Other studies have confirmed these findings—patients reported having more time with the care team and found that it was beneficial to have medical students involved in their care [19,20].

Discussion

The COVID-19 pandemic has highlighted that for some medical needs, such as managing patients with chronic conditions or mental health concerns and those who have attended low-risk urgent care visits, telehealth has successfully provided patients with a socially distanced means to receive care [21,22]. Although there is a loss of in-person connection, this method of care delivery provides both patients and care providers with the opportunity to connect without the need for personal protective equipment while decreasing the burden of travel for all participants, and the ability to receive and deliver medical care in a safe, comfortable environment. Early studies have reported that patient satisfaction scores for primary care and family practice telemedicine appointments were comparable to those for in-person visits [23]. Importantly, these data indicate that telemedicine is a successful alternative to in-person visits, especially during the COVID-19 pandemic [24].

From the learner perspective, telehealth visits do not fully replace the experience and education of seeing patients in clinics, such as the experience of completing physical exams and appreciating both normal and abnormal findings. Frequent and ample communication between an attending physician and student facilitated real-time discussions about patient health concerns, troubleshooting technology, and methods for improving visits with patients. Telemedicine has a valuable role in medical education and is an essential skill for the modern medical student [6,25].

This tutorial aims to provide practical advice from both the student and attending physician perspective to successfully integrate medical students into telehealth clinics. Medical students must be exposed to this method of care delivery prior to residency, and their practice can start now [26].

Conflicts of Interest

None declared.

References

1. Fong MW, Gao H, Wong JY, Xiao J, Shiu EYC, Ryu S, et al. Nonpharmaceutical measures for pandemic influenza in nonhealthcare settings-social distancing measures. Emerg Infect Dis 2020 May;26(5):976-984 [FREE Full text] [doi: 10.3201/eid2605.190995] [Medline: 32027585]
2. Guidance on medical students' participation in direct in-person patient contact activities. American Association of Medical Colleges. URL: https://www.aamc.org/system/files/2020-04/meded-April-14-Guidance-on-Medical-Students-Participation-in-Direct-Patient-Contact-Activities.pdf [accessed 2020-07-17]
3. Telehealth start-up and resource guide. Health Information Technology. URL: https://www.healthit.gov/sites/default/files/playbook/pdf/telehealth-startup-and-resource-guide.pdf [accessed 2021-05-11]
4. Vockley M. The rise of telehealth: 'Triple Aim,' innovative technology, and popular demand are spearheading new models of health and wellness care. Biomed Instrum Technol 2015;49(5):306-320. [doi: 10.2345/0899-8205-49.5.306] [Medline: 26443907]
5. Pourmand A, Ghassemi M, Sumon K, Amini SB, Hood C, Sikka N. Lack of telemedicine training in academic medicine: Are we preparing the next generation? Telemed J E Health 2021 Jan;27(1):62-67. [doi: 10.1089/tmj.2019.0287] [Medline: 32294025]
6. Buckely MRF. The mother of invention. The Harvard Gazette. 2020 May 15. URL: https://news.harvard.edu/gazette/story/2020/05/harvard-medical-school-uses-telemedicine-as-a-way-forward/ [accessed 2020-07-16]
7. Anwar A, Seger C, Tollefson A, Diachun CAB, Tanaka P, Umar S. Medical education in the COVID-19 era: Impact on anesthesiology trainees. J Clin Anesth 2020 Nov;66:109949 [FREE Full text] [doi: 10.1016/j.jclinane.2020.109949] [Medline: 32504968]
8. Dawoud RA, Philbrick B, McMahon JT, Douglas JM, Bhatia N, Faraj R, et al. Letter to the editor "Virtual Neurosurgery Clerkship for Medical Students". World Neurosurg 2020 Jul;139:456-459 [FREE Full text] [doi: 10.1016/j.wneu.2020.05.085] [Medline: 32426074]
9. Weiner S. No classrooms, no clinics: medical education during a pandemic. Association of American Medical Colleges. 2020 Apr 15. URL: https://www.aamc.org/news-insights/no-classrooms-no-clinics-medical-education-during-pandemic [accessed 2020-07-18]
10. Greenhalgh T, Wherton J, Shaw S, Morrison C. Video consultations for covid-19. BMJ 2020 Mar 12;368:m998. [doi: 10.1136/bmj.m998] [Medline: 32165352]
11. Notification of enforcement discretion for telehealth remote communications during the COVID-19 nationwide public health emergency. U.S. Department of Health & Human Services. URL: https://www.hhs.gov/hipaa/for-professionals/special-topics/emergency-preparedness/notification-enforcement-discretion-telehealth/index.html [accessed 2020-08-10]
12. HIPAA compliance datasheet. Zoom Video Communications Inc. URL: https://zoom.us/docs/doc/Zoom-hipaa.pdf [accessed 2021-05-11]
13. Webex Security and Strong Encryption. Cisco. URL: https://www.cisco.com/c/en/us/solutions/collaboration/webex-security.html [accessed 2020-11-02]
14. Doximity privacy policy. Doximity Inc. URL: https://www.doximity.com/clinicians/privacy [accessed 2020-11-02]
15. HIPAA- security document. Polycom Inc. URL: https://support.polycom.com/content/dam/polycom-support/products/uc-infrastructure-support/security-firewall-traversal/user/en/hipaa-security-document.pdf [accessed 2021-05-11]
16. Perkins S, Cohen JM, Nelson CA, Bunick CG. Teledermatology in the era of COVID-19: Experience of an academic department of dermatology. J Am Acad Dermatol 2020 Jul;83(1):e43-e44 [FREE Full text] [doi: 10.1016/j.jaad.2020.04.048] [Medline: 32305442]
17. Benziger CP, Huffman MD, Sweis RN, Stone NJ. The Telehealth Ten: A guide for a patient-assisted virtual physical examination. Am J Med 2021 Jan;134(1):48-51 [FREE Full text] [doi: 10.1016/j.amjmed.2020.06.015] [Medline: 32687813]
18. Simons RJ, Imboden E, Martel JK. Patient attitudes toward medical student participation in a general internal medicine clinic. J Gen Intern Med 1995 May;10(5):251-254. [doi: 10.1007/BF02599880] [Medline: 7616333]
19. York NL, DaRosa DA, Markwell SJ, Niehaus AH, Folse R. Patients' attitudes toward the involvement of medical students in their care. Am J Surg 1995 Apr;169(4):421-423. [doi: 10.1016/s0002-9610(99)80189-5] [Medline: 7694982]
20. Devera-Sales A, Paden C, Vinson DC. What do family medicine patients think about medical students' participation in their health care? Acad Med 1999 May;74(5):550-552. [doi: 10.1097/00001888-199905000-00024] [Medline: 10353290]
21. Weigel G, Ramaswamy A, Sobel L, Salganicoff A, Cubanski J, Freed M. Opportunities and barriers for telemedicine in the U.S. during the COVID-19 emergency and beyond. Kaiser Family Foundation. URL: https://tinyurl.com/ph9fda8s [accessed 2020-07-23]
22. Using telehealth to expand health services during the COVID-19 pandemic. Centers for Disease Control and Prevention. URL: https://www.cdc.gov/coronavirus/2019-ncov/hcp/telehealth.html [accessed 2020-07-23]
23. Prasad A. New trends in patient satisfaction emerge during COVID-19. Healthcare Global. URL: https://www.healthcareglobal.com/telehealth-and-covid-19/new-trends-patient-satisfaction-emerge-during-covid-19 [accessed 2020-11-02]
24. Ramaswamy A, Yu M, Drangsholt S, Ng E, Culligan PJ, Schlegel PN, et al. Patient satisfaction with telemedicine during the COVID-19 pandemic: Retrospective cohort study. J Med Internet Res 2020 Sep 09;22(9):e20786 [FREE Full text] [doi: 10.2196/20786] [Medline: 32810841]

25. Bakken S. Telehealth: Simply a pandemic response or here to stay? J Am Med Inform Assoc 2020 Jul 01;27(7):989-990. [doi: 10.1093/jamia/ocaa132] [Medline: 32692845]
26. Whiting G. Letter to the editor: Telehealth is the new normal. The Portland Press Herald. URL: https://www.pressherald.com/2020/04/27/letter-to-the-editor-tele-health-is-the-new-normal/ [accessed 2020-07-22]

Abbreviations

AES: Advanced Encryption Standard

Edited by G Eysenbach; submitted 13.09.20; peer-reviewed by B Narayan, K Yakubu; comments to author 13.10.20; revised version received 20.11.20; accepted 17.04.21; published 28.05.21.

Please cite as:
Balaji A, Clever SL
Incorporating Medical Students Into Primary Care Telehealth Visits: Tutorial
JMIR Med Educ 2021;7(2):e24300
URL: https://mededu.jmir.org/2021/2/e24300
doi:10.2196/24300
PMID:33974552

Original Paper

The Impact of Systematic Review Automation Tools on Methodological Quality and Time Taken to Complete Systematic Review Tasks: Case Study

Justin Clark[1], BA; Catherine McFarlane[2,3], PhD; Gina Cleo[1], PhD; Christiane Ishikawa Ramos[2,4], PhD; Skye Marshall[2,5], PhD

[1]Institute for Evidence-Based Healthcare, Bond University, Gold Coast, Australia

[2]Bond University Nutrition & Dietetics Research Group, Faculty of Health Sciences and Medicine, Bond University, Gold Coast, Australia

[3]Renal Department, Sunshine Coast University Hospital, Birtinya, Australia

[4]Nutrition Programme, Federal University of Sao Paulo, Sao Paulo, Brazil

[5]Department of Science, Nutrition Research Australia, Sydney, Australia

Corresponding Author:
Justin Clark, BA
Institute for Evidence-Based Healthcare
Bond University
Building 5, Level 4
14 University Drive, Robina
Gold Coast, 4226
Australia
Phone: 61 07 55855545
Email: jclark@bond.edu.au

Abstract

Background: Systematic reviews (SRs) are considered the highest level of evidence to answer research questions; however, they are time and resource intensive.

Objective: When comparing SR tasks done manually, using standard methods, versus those same SR tasks done using automated tools, (1) what is the difference in time to complete the SR task and (2) what is the impact on the error rate of the SR task?

Methods: A case study compared specific tasks done during the conduct of an SR on prebiotic, probiotic, and synbiotic supplementation in chronic kidney disease. Two participants (manual team) conducted the SR using current methods, comprising a total of 16 tasks. Another two participants (automation team) conducted the tasks where a systematic review automation (SRA) tool was available, comprising of a total of six tasks. The time taken and error rate of the six tasks that were completed by both teams were compared.

Results: The approximate time for the manual team to produce a draft of the background, methods, and results sections of the SR was 126 hours. For the six tasks in which times were compared, the manual team spent 2493 minutes (42 hours) on the tasks, compared to 708 minutes (12 hours) spent by the automation team. The manual team had a higher error rate in two of the six tasks—regarding *Task 5: Run the systematic search*, the manual team made eight errors versus three errors made by the automation team; regarding *Task 12: Assess the risk of bias*, 25 assessments differed from a reference standard for the manual team compared to 20 differences for the automation team. The manual team had a lower error rate in one of the six tasks—regarding *Task 6: Deduplicate search results*, the manual team removed one unique study and missed zero duplicates versus the automation team who removed two unique studies and missed seven duplicates. Error rates were similar for the two remaining compared tasks—regarding *Task 7: Screen the titles and abstracts* and *Task 9: Screen the full text*, zero relevant studies were excluded by both teams. One task could not be compared between groups—*Task 8: Find the full text*.

Conclusions: For the majority of SR tasks where an SRA tool was used, the time required to complete that task was reduced for novice researchers while methodological quality was maintained.

(JMIR Med Educ 2021;7(2):e24418) doi:10.2196/24418

KEYWORDS

systematic reviews; automation; technology assessment; methods evaluation; case study; comparison study

Introduction

Overview

Health care guidelines have reported systematic reviews (SRs) as providing the highest level of evidence to answer research questions [1]. The findings of SRs are favored as they synthesize all published evidence on a topic in a rigorous, reproducible, and transparent way [2]. SRs are used to answer any type of research question, including interventional, diagnostic, prognostic, or etiological [1]; in addition, they are pertinent to many different stakeholders' groups, from clinicians to researchers to policy makers. However, SRs are time and resource intensive [3] and may be out of date by the time they are published [4]. The time from SR registration to publication has been reported as taking five authors approximately 67 weeks [5], with time frames ranging from 6 months to 2 years [6]. Even rapid reviews, which omit some of the steps of a full SR, have been reported to take 7 to 12 months [7].

To improve time to completion, systematic review automation (SRA) tools have been developed to either fully automate or semi-automate one or more specific tasks involved in conducting an SR. These include searching multiple databases [8], deduplicating search results [9], identifying disagreements between screeners [10,11], and assessing risk of bias (RoB) in randomized controlled trials (RCTs) [12]. In 2015, the International Collaboration for the Automation of Systematic Reviews (ICASR) was formed to enable resource sharing between groups developing SRA tools [13].

However, despite SRA tool availability, the tools have not been translated into practice, primarily due to distrust of the tools [14]. This may be caused by a lack of transparency of machine learning systems and a shortage of studies evaluating the SRA tools [15]. The third ICASR meeting in 2017 identified the need to overcome barriers to SRA uptake [16]. A potential solution is to evaluate SRA tools in a real-world setting, on real SRs, to test their performance. This case study was designed to do that in the health care field of chronic kidney disease.

Research Questions

When comparing SR tasks done manually, using standard methods, versus those same SR tasks done using SRA tools, (1) what is the difference in time to complete the SR task and (2) what is the impact on the error rate of the SR task?

Methods

A case study on the methods used to undertake an SR of RCTs delivering a health care intervention was conducted and has been reported according to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement [17].

Ethics Approval and Consent to Participate

Ethics approval was not sought; all participants are authors on this manuscript and the SR tasks undertaken were in an SR in which ethical approval was not required.

Case Study Participants

An expression of interest was sent to the Bond University Faculty of Health Sciences and Medicine, Australia, seeking researchers planning to commence an SR of RCTs. The only group to volunteer had their SR used in this case study. The SR was conducted by a team of four researchers using current Cochrane methodology [2] and reported using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [18]. Two of these researchers (CM and CR) were novice researchers completing their first SR under the supervision of two experienced researchers who were not involved in this case study. These two novice researchers (CM and CR) were sampled as the participants on the manual team.

A second expression of interest was sent to the faculty seeking two other researchers not involved in the SR to comprise the automation team. This expression was sent to researchers in the same discipline (ie, nutrition and dietetics) to ensure sufficient knowledge of the SR topic. The only interested candidates (SM and GC) took on the role of the participants on the automation team. As new postdoctoral researchers, they had some experience of being part of an SR team (Table 1).

Table 1. Characteristics of study participants' roles and experience.

Team and participants (initials)	Team role	Research role	Coauthor of completed SRs[a] (eg, middle author), n	Lead author of completed SRs[a] (eg, first author), n
Manual team				
CM	Primary	PhD student	0	0
CR	Secondary	PhD student	0	0
Automation team				
SM	Primary	Postdoctoral researcher	0	3
GC	Secondary	Postdoctoral researcher	1	0

[a]SR: systematic review; published, accepted for publication, or under review.

Case Study Systematic Review

The SR used in this study—*Prebiotic, probiotic, and synbiotic supplementation in chronic kidney disease: A systematic review and meta-analysis*—has been published [19]. To complete the SR, four databases were searched, 717 results were deduplicated, 596 titles and abstracts were screened for inclusion, 16 studies were included, and 10 studies were meta-analyzed (Table 2).

Table 2. Characteristics of the completed and published systematic reviews (SRs) [19].

SR task	SR task description	Value, n
Run the SR	Databases searched	4
Run the SR	Trial registries searched	2
Deduplicate the search results	Records to be deduplicated	717
Deduplicate the search results	Records left after deduplication	586
Screen the titles and abstracts	Studies to screen	586
Find the full text	Full texts required	40
Screen the full text	Full texts for screening	40
Extract the data	Full-text articles extracted (ie, characteristics of studies and outcomes)	16
Assess the risk of bias	Full-text articles requiring risk-of-bias assessment	16
Write the results	Full-text articles qualitatively synthesized	16
Conduct a meta-analysis	Full-text articles meta-analyzed	10

The Systematic Review Tasks Conducted in the Study

The manual team conducted the SR tasks required to complete a draft of the background, methods, and results sections of the SR; in total, this comprised 16 SR tasks (Table 3 [8,9,12,20,21]) [22]. The automation team conducted the tasks that had an SRA tool available; this comprised six SR tasks. Where an SR task is normally done by a single investigator, such as deduplicating search results, it was done by a single participant—the primary researcher—on each team. Where an SR task is normally done by two people, such as screening the search results, it was done by two participants—the primary and secondary researchers—on each team.

Table 3. List and evaluation criteria of all systematic review (SR) tasks and systematic review automation (SRA) tools used.

SR task No.	SR task	SRA tool used	Evaluation criteria
1	Formulate the question	N/A[a]	N/A
2	Check for similar reviews	N/A	N/A
3	Write the protocol	N/A	N/A
4	Design the systematic search	N/A	N/A
5	Run the systematic search	Polyglot Search Translator [8]	Completed by one participant; the number of different types of errors were counted.
6	Deduplicate the search results	Deduplicator [9]	Completed by one participant; deduplicated EndNote libraries were compared to a deduplicated reference standard data set.
7	Screen the titles and abstracts	SRA-Helper[b] [20]	Completed by two participants; EndNote libraries of the included and excluded studies were compared. A wrongfully excluded study was considered an error.
8	Find the full text	EndNote, SRA-Helper [20], and SARA[c] [21]	Completed by one participant; the number of references ordered through the library was compared.
9	Screen the full text	SRA-Helper [20]	Completed by two participants; EndNote libraries of the included and excluded studies were compared.
10	Conduct a citation analysis	N/A	N/A
11	Extract the data	N/A	N/A
12	Assess the risk of bias	RobotReviewer [12]	Completed by two participants; the risk-of-bias assessments were compared to a reference standard created by two experienced systematic reviewers external to the two teams.
13	Synthesize the data	N/A	N/A
14	Rerun the systematic search	N/A	N/A
15	Conduct a meta-analysis	N/A	N/A
16	Write the results	N/A	N/A

[a]N/A: not applicable; this task did not have any relevant SRA tools.

[b]SRA-Helper: Systematic Review Accelerator Helper.

[c]SARA: System for Automatically Requesting Articles.

The Systematic Review Automation Tools Used in the Study

The decision-making framework used to select the five SRA tools used in this study considered the following: (1) tools that were freely (ie, no cost) available for use, (2) tools that were familiar to the experienced author (JC) in order to aid the participants, (3) availability of help guides, and (4) tools that could be applied to as many tasks as possible.

Polyglot Search Translator [8] was selected to automatically translate search strings between various health databases. Deduplicator was selected to detect duplicate records from the search results, allowing the user to view them and then select which ones to keep and which to discard. The Systematic Review Accelerator Helper (SRA-Helper) was selected to interface with EndNote to enable assignment to groups (ie, screening) using a hot key (eg, the space bar), thereby replacing the normal drag-and-drop method used when screening in EndNote. SRA-Helper was also used to help find the full text by interfacing with EndNote to enable hot keys to conduct a title search for articles in a set of predetermined locations: the Bond University Library catalog, PubMed, and Google Scholar. The System for Automatically Requesting Articles (SARA) was selected to interface directly with the Bond University Library system to request up to 500 full texts at a time with a single click. The fifth and final tool used was the RobotReviewer tool [12]. This tool allows users to upload the PDF of an RCT; it will then provide an RoB assessment in four of the seven domains of the Cochrane Collaboration's RoB tool [23]: random sequence generation, allocation concealment, blinding of participants and researchers, and blinding of outcome assessment (Table 4).

Table 4. Systematic review automation (SRA) tools used in this study.

SR[a] task No.	SR task	SRA tool used	SRA tool description
5	Run the systematic search	Polyglot Search Translator [8]	This tool translates searches from either a PubMed or Ovid MEDLINE search string into a search string that can be used in multiple other databases.
6	Deduplicate the search results	Deduplicator [9]	This tool allows the uploading of sets of references; it then detects and removes duplicate references.
7	Screen the titles and abstracts	SRA-Helper[b] [20]	This is an automation script used to move references into groups within EndNote software using a predetermined set of keyboard shortcuts.
8	Find the full text	SRA-Helper [20] and SARA[c] [21]	SRA-Helper is an automation script used to search predefined locations, such as library websites, PubMed, and Google Scholar. SARA is a tool that allows for the bulk requesting of articles (ie, document delivery) from an institutional library.
9	Screen the full text	SRA-Helper [20]	This is an automation script used to move references into groups within EndNote software using a predetermined set of keyboard shortcuts.
12	Assess the risk of bias (RoB)	RobotReviewer [12]	This is a machine learning system that automatically assesses RoB for four of the seven domains defined by the Cochrane Collaboration's RoB tool; it also highlights the supporting text for these assessments.

[a]SR: systematic review.

[b]SRA-Helper: Systematic Review Accelerator Helper.

[c]SARA: System for Automatically Requesting Articles.

Outcomes

The outcomes recorded and compared were (1) the time taken to complete each task (in minutes) and (2) the error rate for each task (count).

Comparison of Outcomes Between Teams

For the single-participant SR tasks (ie, run the systematic search, deduplicate the search results, and find the full text), the primary manual team participant (CM) was compared to the primary automation team participant (SM). For the dual-participant SR tasks (ie, screen the titles and abstracts, screen the full text, and assess the RoB), the time and errors of the primary and secondary participants on each team were added together.

Time Taken for the Systematic Review Tasks

The time taken for each SR task was recorded separately for (1) undertaking the SR task and (2) learning about the SR task. Learning about each SR task included discussion with experts, reading help guides, or watching help videos. Time was recorded by each individual participant by noting the time they started work on the SR task and noting the time they finished work on the SR task. The total time spent on each task was calculated by subtracting the start time from the finish time. If a task was split over several work sessions, participants added together the times for each work session for each task to give the total time. Timing was paused if the participants foresaw a delay of 5 minutes or longer. The recording of times by the manual team began at *Task 5: Run the systematic search*. Times reported before this were retrospective estimates made by the participants.

Measuring the Methodological Quality of Each Systematic Review Task

Methodological quality was measured by the number of errors each team made for each SR task. As most SR tasks, as well as errors made during task performance, differ substantially, so did the way we evaluated each SR task.

Evaluation of Systematic Review Task 5: Run the Systematic Search

The systematic search was evaluated by counting the number of different types of errors made during the translation process. The errors were determined by a Cochrane information specialist and health librarian (David Honeyman; see Acknowledgments) with over 10 years' experience. The librarian was blinded as to which team had done the translations. Error criteria are listed in Table S1 in Multimedia Appendix 1.

Evaluation of Systematic Review Task 6: Deduplicate the Search Results

The deduplicated EndNote libraries were compared to a reference standard data set. This reference standard was created and the comparison made by an experienced information specialist (JC). This reference standard was created blind prior to the results from the manual and automation teams being made available. Any unique studies removed and the number of duplicates missed were recorded as errors.

Evaluation of Systematic Review Tasks 7 and 9: Screen the Titles and Abstracts and Screen the Full Text

EndNote libraries of the studies after screening and dispute resolution from both teams were compared by an experienced information specialist. An incorrectly excluded study was considered an error. The total number of references that were included and moved to the next task (ie, obtain full text) was also recorded. Any incorrectly excluded studies were sent to the senior author on the published SR, who did not participate in this case study.

Evaluation of Systematic Review Task 8: Find the Full Text

Both teams ran the EndNote *Find Full Text* feature. Once this was completed and EndNote had automatically found as many full texts as it could, the teams attempted to find the remaining ones. This is when the evaluation between teams started. The number of references that were not found and had to be ordered through the library was the evaluation criterion. However, due to differences in institutional access by participants, the results of this evaluation were not reported.

Evaluation of Systematic Review Task 12: Assess the Risk of Bias

An RoB reference standard was created by two experienced systematic reviewers: an experienced information specialist and an epidemiologist. RoB assessments were compared to the reference standard by the experienced information specialist, and the number of disagreements with the reference standard were counted. A two-level deviation in the domain rating (eg, a *high* RoB rating instead of a *low* RoB rating) was counted as an error. A single-level deviation in the domain rating (eg, *unclear* RoB instead of *low* RoB) was recorded as a difference of opinion.

Results

The SR and comparison study began in August 2017. The comparison study was completed at the end of March 2018, while the SR was published in October 2018 [19].

Time Taken to Conduct Systematic Review Tasks

The approximate time taken for the manual team to produce a draft of the background, methods, and results sections (ie, 16 SR tasks) was 126 hours (Table 5). Approximately 101 hours were spent doing all the tasks, and approximately 25 hours were spent learning about the tasks. For the SR tasks where times were compared (ie, SR *Tasks 5-9* and *12*), the total time taken by the manual team was 41 hours and 33 minutes. The time spent doing the SR tasks was 35 hours and 28 minutes, while the time spent learning about the SR tasks was 6 hours and 5 minutes. The automation team took 11 hours and 48 minutes to complete all the SR tasks. The time spent doing the SR tasks was 10 hours and 30 minutes, while the time spent learning about the SR tasks was 1 hour and 18 minutes (Table 5). The times spent on *Task 12: Assess the RoB* were not equivalent, as the RobotReviewer tool only partially automates the task. It assessed RoB in four of the seven domains, while the manual team assessed RoB in seven of the seven RoB domains.

Table 5. Time taken for the manual and automation teams to learn and complete each systematic review (SR) task.

SR task No.	SR task	Total time, hours:minutes		Time doing task, hours:minutes		Time learning task, hours:minutes	
		Manual	Automation	Manual	Automation	Manual	Automation
1	Formulate the question	1:00[a]	N/A[b]	1:00[a]	N/A	0:00	N/A
2	Check for similar reviews	1:00[a]	N/A	1:00[a]	N/A	0:00	N/A
3	Write the protocol	4:00[a]	N/A	4:00[a]	N/A	0:00	N/A
4	Design the systematic search	13:00[a]	N/A	13:00[a]	N/A	0:00	N/A
5	Run the systematic search	6:15	1:20	5:00	0:37	1:15	0:43
6	Deduplicate the search results	2:09	0:36	2:09	0:12	0:00	0:24
7	Screen the titles and abstracts	5:10	3:33	4:40	3:28	0:30	0:05
8	Find the full text	0:50	0:23	0:50	0:18	0:00	0:05
9	Screen the full text	3:29	3:44	3:29	3:44	0:00	0:00
10	Conduct a citation analysis	7:43	N/A	7:43	N/A	0:00	N/A
11	Extract the data	9:42	N/A	9:42	N/A	0:00	N/A
12	Assess the risk of bias	23:40	2:12[c]	19:20	2:11[c]	4:20	0:01[c]
13	Synthesize the data	10:00	N/A	8:00	N/A	2:00	N/A
14	Rerun the systematic search	0:22	N/A	0:22	N/A	0:00	N/A
15	Conduct a meta-analysis	16:00	N/A	10:00	N/A	6:00	N/A
16	Write the results	21:20	N/A	10:40	N/A	10:40	N/A
All tasks	Tasks done by both teams	41:33	11:48	35:28	10:30	6:05	1:18
All tasks	Tasks done by manual team	125:40[a]	N/A	100:55[a]	N/A	24:45[a]	N/A

[a]Approximate time only.

[b]N/A: not applicable; task not done by automation team.

[c]Task partially completed; four of seven domains assessed.

Quality of the Systematic Review Tasks

The manual team had more errors in *Task 5: Run the systematic search*, with eight types of errors made compared to three by the automation team. Regarding *Task 12: Assess the RoB*, the manual team had a total of 25 differences in opinion from the reference standard compared to only 20 from the automation team. The manual team had fewer errors in *Task 6: Deduplicate the search results* by identifying all duplicates while excluding one unique study, compared to the automation team who missed seven duplicates and removed two unique studies. The teams performed similarly for both SR screening tasks (ie, *Tasks 7* and *9*) (Table 6).

Table 6. Quality indicators of each task in the systematic review (SR) process.

SR task No.	SR task	Evaluation criteria	Manual team, n	Automation team, n
5	Run the systematic search	Number of different types of errors made	8	3
6	Deduplicate the search results	Number remaining after deduplication	586	594
6	Deduplicate the search results	Unique studies removed	1	2
6	Deduplicate the search results	Duplicates missed	0	7
7	Screen the titles and abstracts	Studies included	38	38
7	Screen the titles and abstracts	Relevant studies excluded	0	0
8	Find the full text	Full texts ordered from library	—[a]	—
9	Screen the full text	Studies included	30	22
9	Screen the full text	Relevant studies excluded	0	0
12	Assess the risk of bias	Same domain	31	36
12	Assess the risk of bias	Different domain	25	20
12	Assess the risk of bias	Erross in domain	0	0

[a]Although done by both teams, a difference in institutional library access to journal subscriptions meant these tasks could not be compared.

Availability of Data and Materials

The data sets used and/or analyzed during this study are available from the corresponding author on reasonable request.

Discussion

Principal Findings

To complete a draft of the background, methods, and results of the SR, the manual team took approximately 126 hours. To complete the six SR tasks evaluated in this study, the manual team took approximately 42 hours while the automation team took 12 hours. This equates to potential time savings of 30 hours. Due to the small amount of time taken to learn how to use the SRA tools (ie, 2 hours), the time required to learn how to use SRA tools should not be a barrier to their uptake among novice researchers. Regarding methodological quality of SR tasks done with SRA tools, we found that the error rates between teams was minimal and would not significantly impact on the quality of the SR. The manual team had more errors in two of the SR tasks (*Tasks 5* and *12*) and fewer errors in one SR task (*Task 8*); neither team had errors in two of the SR tasks (*Tasks7* and *9*).

The automation team was faster in five of six of the SR tasks compared in this study, where the increased speed of four of the tasks was due to an improvement on a manual process. For instance, to modify search strings, researchers may use the *replace* tool in Microsoft Word to manually change the database syntax, or they may use a drag-and-drop process when screening in EndNote. This replacing of manual, tedious work with an SRA tool is an obvious benefit of automation. The other SR task where the automation team was faster was the RoB assessment. It is important to note that although the time reduction for assessing RoB was substantial in the automation team, this team only assessed four out of the seven domains while the manual team assessed all seven of them. The only SR task where the manual team was faster was *Task 8: Screen the full text*, although the times were similar (209 to 224 minutes; a difference of 7.5 minutes per researcher). This was most likely due to the SR task requiring the reading and comprehension of articles to determine if they were eligible; in this case, the manual team members were more experienced as the SR was on a topic of their expertise. This suggests that for SR tasks where the interpretation or understanding of information plays a major role, there are lessened potential time savings for SRA tools.

The total time difference between the manual team and the automation team was substantial and could be translated to significant cost savings in funded studies. The savings may be attributable to several factors. Due to variations within the novice researchers' experience (0-3 SRs each), it is likely that the time savings were due in part to participant experience. A lack of blinding and randomization may have contributed bias, where the automation team could have pushed themselves to finish the SR tasks faster than they would under normal circumstances. However, due to the vast time difference between groups and both groups being novice users, it is clear that the SRA tools were the primary contributor to the time savings. This finding has been confirmed in other studies. In an RCT, an SRA tool was found to speed up the translation of search strings across databases by 25%, or 15 minutes, per database [8]. A test of three different screening tools found time savings of 154 to 185 hours for a fully automated approach and 61 to 92 hours for a semi-automated approach [24]. Another test of an automated screening tool on three SRs found a 50% reduction in screening workload in two of the SRs and a 40% reduction in the third [25]. Findings from this study align more with the findings of Wallace et al [25], with time savings between 25% and 50%. Further research is required to replicate and confirm the findings from this study in novice researchers to better understand the estimated time savings produced by SRA tools.

As all participants were novice users of the automation tools, the process to learn a new SRA tool may be comparable to the manual team learning to complete a new SR task. Although the availability of training and support for the SRA tools would have reduced the time spent learning to use them, similar SR training and support is routinely available at universities for standard manual methods.

It currently takes a long time for an SR to go from conception to publication (mean 67.3 weeks) [5]. A recent case study looking at time logs across 12 simulated SRs found the average time to complete an SR (mean 3821 records screened; 20 studies included) was 463 days (66 weeks) and 881 person-hours [26]. Individual tasks required were selecting studies (229 hours, 26%), collecting data (211 hours, 24%), preparing the report (202 hours, 23%), conducting the meta-analysis (149 hours, 17%), and descriptive synthesis (52 hours, 6%) [26]. The SR used in this study [19] was substantially smaller (586 records screened; 16 studies included) and less time was required, but the percentage of time spent on comparable tasks generally aligned: selecting studies consumed 39 person-hours (31%), collecting data consumed 43 hours (35%), preparing the report consumed 26 hours (20%), and conducting the meta-analysis consumed 16 hours (12%).

The total time and person-hours from conception to publication is still substantial for SRs that employ SRA tools [26]. A recent case study found that by focusing on a single SR, using SRA tools, and having experienced reviewers, a medium-sized SR of RCTs (1381 records screened; 8 studies included) could be submitted for publication within 16 calendar days (10 working days; 66 person-hours) from conception [21]. This case study also highlights a significant difference between the findings in a novice versus experienced researcher team already familiar with the tools. However, the topics in the experienced case study and in this case study were different; in addition, further research is required to compare novice and experienced teams' performance on the same topic for firmer estimates of time and error rates to be obtained. Despite the topic difference, this case study had similarities in that it was a medium-sized review and it only included RCTs.

In the case study completed by the experienced reviewers, approximately 17 hours were required to conduct the six tasks that were completed by the automation team in this study, who took approximately 12 hours. Although the cases are not directly comparable, this suggests that while the experience of the researcher team is relevant, it is likely only a small driver of the time savings.

Limitations and Strengths of the Study

This study was limited by its case study design, with only a single SR used in the comparison as well as variation in the experience of the novice researchers. The times estimated for *Tasks 1* to *4* of the study have less reliability compared to other steps, which should be considered when interpreting findings. The study was limited by the assessment of each SR task individually, outside of the context of the entire SR, which makes results harder to apply to a full SR done with SRA tools. Additionally, due to the niche nature of the research question, the number of studies identified by the search strategy was small compared to other SRs in health; this may have implications for generalizing to other SRs the overall time required to complete the review. Further, this case study was not registered in a trial or study registry database. A strength of the study is that the time measured was the time that each person engaged in active SR tasks, with breaks excluded from the reported time. Another strength is that the time spent learning about the SR tasks was recorded independently from the time spent doing the tasks. The final strength is that the SR used was a real research project, which means the impact of SRA tools can be shown in a real-world setting.

Conclusions

For the majority of SR tasks where an SRA tool was used, the time required to complete that task was reduced for novice researchers while methodological quality was maintained. Further research is required to confirm these findings.

Acknowledgments

The authors would like to thank Chris Del Mar and Elaine Beller for help with the design of the study, Anna Mae Scott for help with assessing the RoB of the studies and for feedback on the manuscript, David Honeyman for help with assessing the quality of the translations of the search strings, Mina Bhakit for feedback on the manuscript, and Katrina Campbell for help with the design of the study and feedback on the manuscript. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' Contributions

JC, CM, and SM were responsible for study conception and design. CM, GC, CR, and SM were responsible for acquisition of the data. JC, GC, and SM were responsible for analysis and/or interpretation of the data. JC and SM were responsible for drafting of the manuscript. JC, CM, GC, CR, and SM were responsible for critical revision of the manuscript.

Conflicts of Interest

JC declares that he is a developer of some of the tools used in this study and has won prize money from the Australian Library Information Association to continue development of these tools.

Multimedia Appendix 1

Supplementary Table S1: Marking criteria for errors in search string translations.
[DOCX File , 36 KB - mededu_v7i2e24418_app1.docx]

References

1. Coleman K, Norris S, Weston A, Grimmer-Somers K, Hillier S, Merlin T, et al. NHMRC Additional Levels of Evidence and Grades for Recommendations for Developers of Guidelines. Canberra, Australia: National Health and Medical Research Council (NHMRC); 2009. URL: https://www.mja.com.au/sites/default/files/NHMRC.levels.of.evidence.2008-09.pdf [accessed 2021-05-11]
2. Higgins JPT, Green S. Cochrane Handbook for Systematic Reviews of Interventions. Version 5.1.0. London, UK: The Cochrane Collaboration; 2011.
3. Tsertsvadze A, Chen Y, Moher D, Sutcliffe P, McCarthy N. How to conduct systematic reviews more expeditiously? Syst Rev 2015 Nov 12;4:160 [FREE Full text] [doi: 10.1186/s13643-015-0147-7] [Medline: 26563648]
4. Créquit P, Trinquart L, Yavchitz A, Ravaud P. Wasted research when systematic reviews fail to provide a complete and up-to-date evidence synthesis: The example of lung cancer. BMC Med 2016 Jan 20;14:8 [FREE Full text] [doi: 10.1186/s12916-016-0555-0] [Medline: 26792360]
5. Borah R, Brown AW, Capers PL, Kaiser KA. Analysis of the time and workers needed to conduct systematic reviews of medical interventions using data from the PROSPERO registry. BMJ Open 2017 Feb 27;7(2):e012545 [FREE Full text] [doi: 10.1136/bmjopen-2016-012545] [Medline: 28242767]
6. Khangura S, Konnyu K, Cushman R, Grimshaw J, Moher D. Evidence summaries: The evolution of a rapid review approach. Syst Rev 2012 Feb 10;1:10 [FREE Full text] [doi: 10.1186/2046-4053-1-10] [Medline: 22587960]
7. Harker J, Kleijnen J. What is a rapid review? A methodological exploration of rapid reviews in Health Technology Assessments. Int J Evid Based Healthc 2012 Dec;10(4):397-410. [doi: 10.1111/j.1744-1609.2012.00290.x] [Medline: 23173665]
8. Clark JM, Sanders S, Carter M, Honeyman D, Cleo G, Auld Y, et al. Improving the translation of search strategies using the Polyglot Search Translator: A randomized controlled trial. J Med Libr Assoc 2020 Apr;108(2):195-207 [FREE Full text] [doi: 10.5195/jmla.2020.834] [Medline: 32256231]
9. Rathbone J, Carter M, Hoffmann T, Glasziou P. Better duplicate detection for systematic reviewers: Evaluation of Systematic Review Assistant-Deduplication Module. Syst Rev 2015 Jan 14;4:6 [FREE Full text] [doi: 10.1186/2046-4053-4-6] [Medline: 25588387]
10. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-A web and mobile app for systematic reviews. Syst Rev 2016 Dec 05;5(1):210 [FREE Full text] [doi: 10.1186/s13643-016-0384-4] [Medline: 27919275]
11. Covidence. Melbourne, Australia: Veritas Health Innovation; 2019. URL: https://www.covidence.org/ [accessed 2021-05-03]
12. Marshall IJ, Kuiper J, Wallace BC. RobotReviewer: Evaluation of a system for automatically assessing bias in clinical trials. J Am Med Inform Assoc 2016 Jan;23(1):193-201 [FREE Full text] [doi: 10.1093/jamia/ocv044] [Medline: 26104742]
13. Beller E, Clark J, Tsafnat G, Adams C, Diehl H, Lund H, Founding members of the ICASR group. Making progress with the automation of systematic reviews: Principles of the International Collaboration for the Automation of Systematic Reviews (ICASR). Syst Rev 2018 May 19;7(1):77 [FREE Full text] [doi: 10.1186/s13643-018-0740-7] [Medline: 29778096]
14. van Altena AJ, Spijker R, Olabarriaga SD. Usage of automation tools in systematic reviews. Res Synth Methods 2019 Mar;10(1):72-82. [doi: 10.1002/jrsm.1335] [Medline: 30561081]
15. O'Connor AM, Tsafnat G, Gilbert SB, Thayer KA, Wolfe MS. Moving toward the automation of the systematic review process: A summary of discussions at the second meeting of International Collaboration for the Automation of Systematic Reviews (ICASR). Syst Rev 2018 Jan 09;7(1):3 [FREE Full text] [doi: 10.1186/s13643-017-0667-4] [Medline: 29316980]
16. O'Connor AM, Tsafnat G, Gilbert SB, Thayer KA, Shemilt I, Thomas J, et al. Still moving toward automation of the systematic review process: A summary of discussions at the third meeting of the International Collaboration for Automation of Systematic Reviews (ICASR). Syst Rev 2019 Feb 20;8(1):57 [FREE Full text] [doi: 10.1186/s13643-019-0975-y] [Medline: 30786933]
17. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. J Clin Epidemiol 2008 Apr;61(4):344-349. [doi: 10.1016/j.jclinepi.2007.11.008] [Medline: 18313558]
18. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. BMJ 2009 Jul 21;339:b2535 [FREE Full text] [doi: 10.1136/bmj.b2535] [Medline: 19622551]

19. McFarlane C, Ramos CI, Johnson DW, Campbell KL. Prebiotic, probiotic, and synbiotic supplementation in chronic kidney disease: A systematic review and meta-analysis. J Ren Nutr 2019 May;29(3):209-220. [doi: 10.1053/j.jrn.2018.08.008] [Medline: 30366767]
20. Cleo G, Scott AM, Islam F, Julien B, Beller E. Usability and acceptability of four systematic review automation software packages: A mixed method design. Syst Rev 2019 Jun 20;8(1):145 [FREE Full text] [doi: 10.1186/s13643-019-1069-6] [Medline: 31221212]
21. Clark J, Glasziou P, Del Mar C, Bannach-Brown A, Stehlik P, Scott AM. A full systematic review was completed in 2 weeks using automation tools: A case study. J Clin Epidemiol 2020 May;121:81-90. [doi: 10.1016/j.jclinepi.2020.01.008] [Medline: 32004673]
22. Tsafnat G, Glasziou P, Choong MK, Dunn A, Galgani F, Coiera E. Systematic review automation technologies. Syst Rev 2014 Jul 09;3:74 [FREE Full text] [doi: 10.1186/2046-4053-3-74] [Medline: 25005128]
23. Higgins JPT, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, Cochrane Bias Methods Group, Cochrane Statistical Methods Group. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. BMJ 2011 Oct 18;343:d5928 [FREE Full text] [doi: 10.1136/bmj.d5928] [Medline: 22008217]
24. Gates A, Guitard S, Pillay J, Elliott S, Dyson M, Newton A, et al. Performance and usability of machine learning for screening in systematic reviews: A comparative evaluation of three tools. Syst Rev 2019 Nov 15;8(1):278 [FREE Full text] [doi: 10.1186/s13643-019-1222-2] [Medline: 31727150]
25. Wallace BC, Trikalinos TA, Lau J, Brodley C, Schmid CH. Semi-automated screening of biomedical citations for systematic reviews. BMC Bioinformatics 2010 Jan 26;11:55 [FREE Full text] [doi: 10.1186/1471-2105-11-55] [Medline: 20102628]
26. Pham B, Bagheri E, Rios P, Pourmasoumi A, Robson RC, Hwee J, et al. Improving the conduct of systematic reviews: A process mining perspective. J Clin Epidemiol 2018 Nov;103:101-111. [doi: 10.1016/j.jclinepi.2018.06.011] [Medline: 30297037]

Abbreviations

ICASR: International Collaboration for the Automation of Systematic Reviews
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT: randomized controlled trial
RoB: risk of bias
SARA: System for Automatically Requesting Articles
SR: systematic review
SRA: systematic review automation
SRA-Helper: Systematic Review Accelerator Helper
STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

Edited by G Eysenbach; submitted 18.09.20; peer-reviewed by J Kelly, A Lansky, EJ Welsh; comments to author 13.01.21; revised version received 03.03.21; accepted 04.04.21; published 31.05.21.

Please cite as:
Clark J, McFarlane C, Cleo G, Ishikawa Ramos C, Marshall S
The Impact of Systematic Review Automation Tools on Methodological Quality and Time Taken to Complete Systematic Review Tasks: Case Study
JMIR Med Educ 2021;7(2):e24418
URL: https://mededu.jmir.org/2021/2/e24418
doi:10.2196/24418
PMID:34057072

Viewpoint

Planning Engaging, Remote, Synchronous Didactics in the COVID-19 Pandemic Era

Ronald Rivera[1*], MD; Jonathan Smart[1*], MD; Sangeeta Sakaria[1*], MPH, MST, MD; Alisa Wray[1*], MAEd, MD; Warren Wiechmann[1*], MBA, MD; Megan Boysen-Osborn[1*], MHPE, MD; Shannon Toohey[1*], MAEd, MD

Department of Emergency Medicine, University of California Irvine Medical Center, Orange, CA, United States

[*]all authors contributed equally

Corresponding Author:
Ronald Rivera, MD
Department of Emergency Medicine
University of California Irvine Medical Center
333 City Boulevard West
Suite 640
Orange, CA, 92868
United States
Phone: 1 8186057379
Fax: 1 8188397326
Email: ronald.rivera.md@gmail.com

Abstract

As part of the Accreditation Council for Graduate Medical Education requirements, residents must participate in structured didactic activities. Traditional didactics include lectures, grand rounds, simulations, case discussions, and other forms of in-person synchronous learning. The COVID-19 pandemic has made in-person activities less feasible, as many programs have been forced to transition to remote didactics. Educators must still achieve the goals and objectives of their didactic curriculum despite the new limitations on instructional strategies. There are several strategies that may be useful for organizing and creating a remote residency didactic curriculum. Educators must master new technology, be flexible and creative, and set rules of engagement for instructors and learners. Establishing best practices for remote didactics will result in successful, remote, synchronous didactics; reduce the impact of transitioning to a remote learning environment; and keep educators and learners safe as shelter-at-home orders remain in place.

(JMIR Med Educ 2021;7(2):e25213) doi:10.2196/25213

KEYWORDS

distance education; videoconferencing; emergency medicine; teaching; learning; web-based lecture; medical education; technology; SARS-CoV-2; COVID-19

Introduction

Residency programs provide weekly or daily in-person, synchronous, didactic instruction to meet the Accreditation Council for Graduate Medical Education (ACGME) requirements for resident education [1]. Successful residency curricula are planned by using a thoughtful, systematic approach [2]. The ACGME recommends that educators establish appropriate goals and objectives for their curricula and decide on suitable instructional designs. Afterward, through program evaluation, educators use resident feedback, assessments, ACGME guidelines, graduate feedback, and specialty board certification requirements to make measured changes to their curricula [2]. As we transition to a more technologically advanced world, this approach has also been shown to work well in remote teaching [3].

In 2020, the implementation of shelter-in-place orders in response to the global COVID-19 pandemic, which was caused by the novel SARS-CoV-2, has tremendously disrupted regularly scheduled, in-person didactics for medical education programs [4-6]. Medical educators were compelled to transition from in-person lectures, simulations, and small groups to remote didactics [4,7,8]. Although many educators were familiar with accessing digital and prerecorded content for asynchronous learning, synchronous and remote didactics were less common prior to the COVID-19 pandemic [9]. Since 2008, the ACGME has allowed emergency medicine programs to use asynchronous-style learning to replace up to 20% of the required synchronous didactic time [1]. Approximately three-quarters of emergency medicine residencies have implemented web-based, self-directed learning with preselected resources [10]. Several small studies have suggested that web-based teaching modalities for residents and medical students may be equally as effective as in-person teaching modalities in various situations, including simulated patient encounters, ultrasound training, and procedural training [11-13]. However, remote didactics have traditionally only represented a small portion of didactics in graduate medical education. Educators previously chose from a potpourri of in-person instructional methods, such as lectures, labs, simulations, case discussions, team-based learning, and gamified didactics [1,14]. Now, educators must achieve the goals and objectives of their program by predominantly using remote instructional methods while maintaining the quality and integrity of their educational outcomes (generally defined by in-service scores and board scores) [1].

Popular videoconferencing platforms, such as Zoom, Microsoft Teams, StarLeaf, and WebEx, are the new classroom and meeting spaces. However, many remote "etiquette" items, such as keeping oneself muted or disabling cameras to conserve bandwidth, may hinder an instructor's ability to interact with their audience and undermine the educational value of lectures. Previously effective methods of instruction, such as small-group instruction, team-based learning, gamification, and the use of audience response systems, may also be challenging to implement through these platforms; there may be technical disruptions due to a lack of familiarity with technology or due to connection issues [15,16]. It may also be difficult for learners to find a quiet, private place at home to attend didactics. Faculty members and students may experience additional distractions, such as childcare or other home responsibilities [17,18]. Furthermore, learners and faculty members may face additional stressors associated with COVID-19, such as mental health struggles, financial concerns, and housing disruptions. Such stressors may hinder their ability to attend didactics or focus [17,18]. In order to prevent interruptions in resident education or the decreased efficacy of resident education, it is important that we address these issues and find innovative methods for remotely conducting effective and engaging synchronous didactic sessions until in-person sessions can resume, the decision to hybridize curricula is made, or a transition to fully remote curricula becomes a reality [19].

After reviewing pre–COVID-19 pandemic literature on remote didactics and seeing a paucity of literature at the time of writing this paper, we herein suggest a list of best practices for planning and executing successful, remote, synchronous didactics during and beyond the COVID-19 pandemic. By building on the framework of Rubinger et al [20], which provides a theoretical approach to planning and executing remote conferences, our viewpoint paper aims to provide practical suggestions for planning multiple types of curricula and focuses on adapting existing, in-person lessons for immediate use while planning engaging lessons for future use [20].

Update the Curriculum

Much of the success of asynchronous learning comes from an individual's ability to work at their own pace and in accordance with their own schedule [21,22]. Synchronous didactics are often face-to-face meetings that require interactions, cooperation among groups, and responses to social cues that can present unique challenges during remote meetings. When transitioning to remote didactics, it is important to decide in advance which elements of an educator's curriculum can be easily adapted to remote learning and implemented immediately and which elements require modification to be successfully integrated into a remote setting. There are specific ACGME guidelines that dictate the foundations of resident education [1]. These will likely be the initial focus of remote updates, since they are core requirements. Even educational activities that initially appear to be difficult to modify for remote learning, such as standardized patient cases, case-based role play, simulation, and skills training, may be implemented successfully [23,24].

Although the modality of didactics are changing during the transition from in-person didactics to remote didactics, curricular goals and objectives will still need to be met to ensure that learners continue to advance and didactic curricula comply with ACGME guidelines. The Kern 6-step curriculum model for planning traditional didactics remains applicable, but it has been successfully updated to meet the needs of remote learning [25,26]. The Council of Emergency Medicine Residency Directors Academic Assembly has already released guidelines for implementing and evaluating digital scholarship that may be used to plan ahead for these changes [27]. We recommend starting with the conversion of required didactics by using simple strategies like group lectures and audience participation. Afterward, additional time may be used to create more engaging and in-depth programs. Flexibility and creativity are critical for finding new ways to achieve a desired curriculum.

Choose the Platform to Support the Activity

It is important to choose a platform or software that will support a program's specific needs, whether the intention is to host a didactic session that involves small-group breakout sessions, audience participation, or even simple large-group discussions. Institutional subscriptions may dictate the software that residency programs have access to or are allowed to use, but these institutional subscriptions also often provide additional features and functions that are not available in individual subscriptions. Although most platforms have similar functions, there may be unique features that make one platform more advantageous than others (Table S1 in Multimedia Appendix 1). For example, videoconferencing tools enable video-based dialogue between participants and instructors. Video livestreams allow instructors to broadcast their content; however, participants do not have access to interactive videos and are reliant on chat features or polls for interactions. Messaging platforms allow for real-time discussions among participants without the use of video. It is important to discuss institutional options with information technology groups to determine which platforms are accessible within an institution and which ones are compliant with an institution's security policies. Consider using secondary applications and programs that can enhance one's ability to present an engaging didactic session that promotes participation. Audience response tools are useful for creating interactive presentations that allow for audience participation (Table S2 in Multimedia Appendix 1). Additionally, familiarize the team with each program's abilities and limitations and plan how to engage remote learners through the use of these tools. Be sure to also review a platform's how-to videos and tutorials when planning a meeting in order to become familiar with and effectively incorporate interactive features without disruptions. The tables included in Multimedia Appendix 1 are not an exhaustive list of options. New programs are continuously being released, and platform developers are adding new features on an almost daily basis to support customers' needs. This paper highlights some of the popular programs that we are familiar with and frequently use.

Learning Environment

A key element of being an engaging presenter is the optimization of both the audio and visual components of a setup [16,28]. Keep in mind that much of this advice applies to all meeting participants, regardless of participants' roles. In terms of audio quality, find a quiet space to host the presentation. Large rooms with bare walls and tiles will likely create distracting echoes, while small, carpeted rooms allow for clear sound quality [15]. Attempt to keep the amount of ambient noise to a minimum by alerting any housemates to the planned meeting or by leaving a sign on the door that tells housemates to not disturb the presenter. Avoid using high-demand internet streaming programs during the meeting to preserve bandwidth and prevent lag or a loss of connection. A clear, well-lit, and uncluttered video appearance is also important. Choose a space with minimal amounts of clutter or distractions in the background. Ideally, the camera should be placed just above eye level, which may require adjusting the chair or computer (eg, by using a stand or a stack of books) or using a free-moving camera [15,29]. When using multiple monitors, make sure to present from a front-facing monitor to allow for eye contact with the camera when presenting. Additionally, position the camera so that the speaker is seen from the chest up. This allows for a more natural view when showing any hand gestures. Everything that is needed for the meeting should be close to the presenter so that they can avoid standing up and moving around during the presentation [29]. Positioning the light sources in front of the speaker instead of behind the speaker will prevent backlight from obscuring the presenter's image [15]. Avoid the use of multiple different light sources, as this may "wash out" the image if the light sources are not correctly positioned. Additionally, the use of direct light often results in a harsh or stark appearance. This may be counteracted by using a light filter attachment or by bouncing indirect light off of a wall [29].

Technology

Once the meeting platform is chosen, ensure that the latest version of the software is downloaded and that there are no pending updates that will disturb the meeting. Use a computer rather than a smartphone or tablet to allow for large screen ratios [15]. Close any unnecessary background programs so that more computing memory is available. Turn on the "do not disturb" modes of the computer and surrounding devices that may interrupt the presentation [29]. Ensure that the program only shares the portion of the screen that participants should see and hide or close messaging services, emails, or other private information. Many experts suggest using headphones to avoid feedback loops from a computer's microphone, which can detect meeting sounds. However, many new devices have technology that automatically filters out sounds from meetings [29]. When using headphones, consider using the computer's microphone to achieve better sound quality. In our experience, computer microphones often provide better sound quality than headphone microphones, and professional microphones provide the best quality. Make sure all of the devices are powered and charged throughout the meeting [15]. When giving a presentation and using speaker notes, make sure to share the screen properly while still having access to the speaker notes. Additionally, be sure to have access to any other necessary tools while presenting, such as chat features, whiteboard features for annotations, and additional audience response programs that might be used during the presentation. Consider conducting a trial run with a friend or colleague to see how the setup appears on learners' screens, so that adjustments can be made as needed [29]. For certain activities, it may be helpful to have a cohost during the meeting to help with moderating chat rooms, asking questions, providing answers, or conducting breakout rooms. It is also important to ensure that technology is appropriately set up in advance to avoid interruptions that may reduce teaching efficacy and learner engagement [28].

Security

It is important to review the security options that are available on one's videoconferencing platform. In the COVID-19 pandemic era and remote meetings, "Zoombombings" (unwelcome and vocal meeting guests) are a potential security threat [30]. Especially when discussing patient care for the purpose of quality improvement, it is essential that one's videoconferencing platform has adequate security features, including encryption and meeting access control [31]. When creating a meeting, one should use a unique meeting ID instead of a repeated standard ID. This will limit a hacker's ability to find the meeting. Meetings can be protected by a password or be based on invitation lists, which only allow certain participants to enter a meeting. Zoom offers a "Waiting Room" feature that allows hosts to approve participants before they can enter a meeting. When setting up a meeting, restrict screen sharing so that permission must be granted for participants to share their screens. Settings can also be changed to mute all participants upon entry, which often eliminates disruptions from late attendees. With regard to meetings that are disrupted by a participant or hacker, Zoom offers a "Put Everyone on Hold" feature that stops the video and audio feeds until the host turns them back on. The host can also remove disruptive participants from a meeting. We recommend activating the feature that will not allow removed participants to rejoin the meeting. Knowing how to appropriately secure the meeting is incredibly important to protecting the learning environment and improving the efficacy of didactics [28].

Engagement

Based on an institution's goals, set up specific rules for didactic engagement that can be distributed to participants in advance. Our didactic programs have a variety of faculty members, different postgraduate year (PGY) levels, and senior medical students. We recommend asking participants to change their on-screen name so that it is displayed as their first name, last name, and position (eg, "medical student 3," "medical student 4," "PGY1," "PGY2," "Fellow," "Attending," etc). This allows for the easy provision of assignments to small groups and allows lecturers to identify participants by their learning levels. Participants should be asked to keep their cameras on when they are in front of the computer (as a way to monitor participants' engagement) and to only turn their cameras off when they need to momentarily step away. Keep in mind that some learners may need to turn their cameras off to improve streaming quality or for personal reasons (eg, a nursing mother). It is best to privately message participants when requesting them to turn on their cameras so that these exceptions can be discussed rather than publicly calling them out. Some institutions also encourage participants to list their gender pronouns (he/him, she/her, and they/their) to facilitate easy interactions with audience members who may not have their video stream activated. Microphones should be muted in large groups and unmuted during free-form discussions or in small groups. On some platforms, the meeting host can mute an individual or all participants with the click of a button. This is helpful in case someone forgets to mute or unmute themselves or if one's sound becomes disruptive [29]. If a group chat function is available, remind participants that the main group chatroom should not be used for side discussions during a presentation; the group chatroom should be used to ask pertinent questions, make comments, or provide resources. Some platforms offer participants the ability to signal the speaker when they have questions with a "Raise Hand" button. Remind participants that when asking questions, there is often a keyboard shortcut key (eg, space bar, "M" button, etc) that temporarily unmutes the microphone while it is held down. This is perfect for asking questions in large group settings because the participant becomes muted again when they are done asking their question. Cohosts may help manage chatrooms or alert instructors to questions. Most platforms use a participant list to record attendance. Remind participants about whether lectures are to be recorded and inform them that all messages (including private messages) are logged.

Large Groups

We separate large group activities (all participants are in a single remote space) from small group activities (participants are split into multiple interactive breakout rooms) when planning didactics. We found that it was easy to convert in-person sessions with large groups to remote sessions and that large group sessions were an ideal format for inviting distant or well-known speakers for whom an in-person lecture may not have previously been feasible. However, remote didactics in a large group setting can make audience engagement and participation difficult. Participants may be easily lost in the crowd, and instructors may feel as if they are speaking to an empty room. We recommend several methods for making these large group sessions more interactive. The simplest tool is the chat box, which allows instructors to ask questions and provide answers to participants. This feature works best when the instructor is looking for a single correct response, as numerous responses may quickly become unmanageable in this space. Some platforms offer a polling option that keeps participants' answers organized in a way that is easy for both instructors and participants to visualize. Some software platforms also possess a whiteboard option that allows for on-screen annotation by audience members. This feature is especially useful for visual topics such as electrocardiograms and radiology images, as it provides learners with the ability to mark findings that they believe are important in real time for everyone to see. Even platforms that are traditionally used for messaging or posting, like Instagram, Twitter, and Facebook, can be used to disseminate interesting cases, radiographs, or electrocardiograms and conduct real-time assessments [32]. Audience response programs also provide unique audience engagement features that scale well for large groups (Table S2 in Multimedia Appendix 1). Such programs may be paired with resources such as Emergency Medicine Coach, Emergency Medicine Foundations, ECG Stampede, and other question banks to facilitate large-group participation.

Small Groups

Successfully promoting the engagement of small groups requires more advanced planning than the planning required for other didactics. Based on the activity, divide participants into specific groups. This may take several minutes depending on the chosen platform. Didactics such as team-based learning or small group discussions often work best with an equal mix of students of various PGYs and medical students [33]. In many conferencing programs, the host can preassign breakout groups by using the email address that was used to create a participant's account. To make this process more rapid, we found it helpful to create a web-based form in which residents entered their account email addresses (in case the account was created using a noninstitutional email). Creating group matrices for each specific group type in advance may help with making the uploading process easier. However, preassigning groups may not work or may prove to be time consuming in small residency programs or programs without protected time for face-to-face didactics in which residents attend conferences based on their work schedule. In this case, having the name and PGY in each participant's screen handle allows the host to easily sort the participants as needed for each specific activity. This may be performed in the background during a large group lecture to limit the amount of lost time between activities. Ideally, groups should have 5-8 members and 1-2 leaders, if feasible [33]. Ultimately, it will be up to the group leader(s) to ensure that all participants are engaged, but this is no different from the expectations in face-to-face didactic sessions.

Standardized patient cases can be adapted and administered to small groups via videoconferencing platforms. Standardized patients can answer questions that are presented by the interviewer, physical exam maneuvers can be narrated by the interviewer, and findings can be presented by the instructor in real time. For example, after a verbal interview regarding the elements of a patient history, a learner can transition to the physical exam portion by saying, "I am now going to listen to the heart, what do I hear?" Afterward, the instructor can provide the pertinent positive and negative findings. This also works for case-based role play in small groups with instructor supervision and instruction. Simulation sessions can be remotely conducted in small groups after a small amount of advanced preparation. A simulation technician can prepare slides with pictures or videos of a patient monitor, electrocardiograms, imaging studies, and pertinent physical findings that will be shared by the facilitator. This is what would normally be done during in-person simulation sessions. The instructor is still able to act as the confederate or nurse while the technician shares their screen with the group. With even more preparation, skills training can also be remotely accomplished by sending kits with prearranged materials to learners by mail or having learners pick the items up from a central office. The learners will then have the training materials and be able to remotely follow a videoconference lesson in which an educator shares videos of how to use the materials and practice the skills intended. It is important to recognize that there may be a more time-intensive remote conversion for these types of synchronous didactics, and they can be difficult to administer without advance testing and practice.

Interaction

As previously mentioned, large group sessions can be made more interactive by asking questions to the audience and allowing them to respond verbally or write responses with the chat feature. Blank slides can be inserted into presentations to act as a whiteboard for group annotations. Polls can be added regularly throughout the lecture to keep the audience involved or to ask relevant questions. Kahoot! offers presenters the ability to ask questions in a competitive quiz format, and the premium version allows for presentations with integrated questions. Ultrasound and procedure lectures can be enhanced by using multiple cameras that allow the audience to see an ultrasound screen or procedure and the presenter at the same time. Game show–style didactics, such as Jeopardy and Family Feud, can also be used in both large and small group settings to promote engagement. Consider combining gamified learning with escape room–type challenges or pick-a-pathway–style learning sessions for smaller groups. We have successfully done this with toxicology-related and nervous system disorder–related materials [34,35]. Participants in gamified education sessions rated their engagement with these types of activities much higher than those in other types of small group sessions [36-38]. Even using collaborative webspaces, like those provided in Google Forms and Microsoft Forms, can allow participants to perform team brainstorming, provide responses to questions, or analyze patient cases. These webspaces can add important elements of group participation to remote didactics and breakout sessions. We have even used collaborative webspaces to allow learners to ask questions and confidentially provide comments during sensitive or controversial lectures as a way to promote the freedom of discussion.

Archival Methods

Many remote meeting platforms offer the ability to record lessons. Some platforms also have the ability to record the speaker and the shared screen at the same time and place them side by side in the video. These recordings are especially useful for creating free, open-access medical education materials if the institution chooses to publish them [39,40]. Sites such as YouTube, Instagram, and Facebook are excellent platforms for sharing lectures. Additionally, when creating an archive of lectures, any learners who cannot attend a session can refer back to the archive, thereby turning the synchronous learning activity into an asynchronous activity. Some technical experts also suggest using a smartphone to record a redundant copy of the audio during a didactic session so that it may be used to supplement any audio interruptions resulting from bandwidth issues [15]. iPhones have an app called Voice Memos and Android has an app called Voice Recorder; these apps can be used for audio recording purposes. Archived lectures can also be used as tools for recruiting prospective residents and medical students.

Evaluation

Feedback is essential for evaluating educational programs and improving learner engagement [2]. During remote didactics, this should be no different. Services like Google Forms, Microsoft Forms, Survey Monkey, and Qualtrics can be used to create standardized evaluation forms that use Likert scales and prompt participants to share learning points from each activity in the same way that continuing medical education activities are evaluated [41-44]. This feedback is essential for promoting individual presenters' engagement in the continuous quality improvement of their content and identifying areas for future faculty development [1,2]. At the program level, this feedback provides data about the effectiveness of didactic sessions and various modalities for remote didactics that are necessary for future curriculum planning.

Asynchronous Learning

ACGME requirements allow residents to supplement their synchronous learning with asynchronous activities [1], and we recommend conducting prelearning and follow-up activities to promote knowledge retention. Prereading activities, which are associated with the "flipped classroom" curriculum style, can be used to prepare for small-group and team-based learning exercises [45]. The continuation of topic discussions through resident interest groups or mini fellowships can also be remotely achieved by video or email. Supplemental articles can be assigned, allowing learners to create summaries or discussion points with their mentors or education leaders. Follow-up cases, such as oral boards or simulations, can also be used to reinforce learning. Other options for asynchronous resources are high-quality educational blogs with content that mirrors residency curriculum topics, such as the Academic Life in Emergency Medicine's Approved Instructional Resources Series [46]. Some board review sites and similar question bank sites allow for the selection of themed questions that can be assigned to learners as a supplemental activity. Do not forget to offer recorded lectures to learners who want to make up for a missed lecture or conference. Curating a variety of asynchronous learning options also helps learners identify resources and develop a sustainable strategy for their own self-directed and lifelong learning [47].

Conclusions

The world is experiencing difficult times during the COVID-19 pandemic, which has changed how we personally and professionally interact with each other. Educators are at a unique crossroad; they must update their teaching strategies and accommodate remote learning sessions that are equally as effective as in-person sessions. By embracing technology and taking a creative approach to develop engaging, remote, didactic sessions, we can limit the interruption of resident learning. The lessons we learned from our experiences may even change the way we approach in-person learning in graduate medical education in the future.

Conflicts of Interest

None declared.

Multimedia Appendix 1
Platforms, applications, and software adjuncts for remote synchronous education.
[XLSX File (Microsoft Excel File), 15 KB - mededu_v7i2e25213_app1.xlsx]

References

1. Common program requirements. Accreditation Council for Graduate Medical Education. URL: https://acgme.org/What-We-Do/Accreditation/Common-Program-Requirements [accessed 2020-04-16]
2. Thomas P, Kern D, Hughes M, Chen B. Curriculum Development for Medical Education: A Six-Step Approach, Third edition. Baltimore, MD: Johns Hopkins University Press; 2016.
3. Said JT, Schwartz AW. Remote Medical Education: Adapting Kern's Curriculum Design to Tele-teaching. Med Sci Educ 2021 Jan 25:1-8 [FREE Full text] [doi: 10.1007/s40670-020-01186-7] [Medline: 33520396]
4. Lucey CR, Johnston SC. The Transformational Effects of COVID-19 on Medical Education. JAMA 2020 Sep 15;324(11):1033-1034. [doi: 10.1001/jama.2020.14136] [Medline: 32857137]
5. Alsoufi A, Alsuyihili A, Msherghi A, Elhadi A, Atiyah H, Ashini A, et al. Impact of the COVID-19 pandemic on medical education: Medical students' knowledge, attitudes, and practices regarding electronic learning. PLoS One 2020 Nov 25;15(11):e0242905. [doi: 10.1371/journal.pone.0242905] [Medline: 33237962]
6. Moreland A, Herlihy C, Tynan MA, Sunshine G, McCord RF, Hilton C, CDC Public Health Law Program, CDC COVID-19 Response Team, Mitigation Policy Analysis Unit. Timing of State and Territorial COVID-19 Stay-at-Home Orders and Changes in Population Movement - United States, March 1-May 31, 2020. MMWR Morb Mortal Wkly Rep 2020 Sep 04;69(35):1198-1203 [FREE Full text] [doi: 10.15585/mmwr.mm6935a2] [Medline: 32881851]
7. Wilcha RJ. Effectiveness of virtual medical teaching during the COVID-19 crisis: Systematic review. JMIR Med Educ 2020 Nov 18;6(2):e20963 [FREE Full text] [doi: 10.2196/20963] [Medline: 33106227]
8. Paul N, Kohara S, Khera GK, Gunawardena R. Integration of technology in medical education on primary care during the COVID-19 pandemic: Students' viewpoint. JMIR Med Educ 2020 Nov 18;6(2):e22926 [FREE Full text] [doi: 10.2196/22926] [Medline: 33112760]
9. Wittich CM, Agrawal A, Cook DA, Halvorsen AJ, Mandrekar JN, Chaudhry S, et al. E-learning in graduate medical education: survey of residency program directors. BMC Med Educ 2017 Jul 11;17(1):114 [FREE Full text] [doi: 10.1186/s12909-017-0953-9] [Medline: 28697744]
10. Estes M, Gopal P, Siegelman JN, Bailitz J, Gottlieb M. Individualized interactive instruction: A guide to best practices from the Council of Emergency Medicine Residency Directors. West J Emerg Med 2019 Mar;20(2):363-368 [FREE Full text] [doi: 10.5811/westjem.2018.12.40059] [Medline: 30881558]
11. Farahmand S, Jalili E, Arbab M, Sedaghat M, Shirazi M, Keshmiri F, et al. Distance Learning Can Be as Effective as Traditional Learning for Medical Students in the Initial Assessment of Trauma Patients. Acta Med Iran 2016 Sep;54(9):600-604 [FREE Full text] [Medline: 27832693]
12. Winn S, McKeown P, Lotfipour S, Maguire GA, Youm JH, Wiechmann W, et al. Remote, Synchronous, Hands-On Ultrasound Education. Telemed J E Health 2015 Jul;21(7):593-597. [doi: 10.1089/tmj.2014.0050] [Medline: 25799127]
13. Schell SR, Flynn TC. Web-based minimally invasive surgery training: competency assessment in PGY 1-2 surgical residents. Curr Surg 2004;61(1):120-124. [doi: 10.1016/j.cursur.2003.08.011] [Medline: 14972187]

14. Toohey S, Wray A, Wiechmann W, Lin M, Boysen-Osborn M. Ten Tips for Engaging the Millennial Learner and Moving an Emergency Medicine Residency Curriculum into the 21st Century. West J Emerg Med 2016 May;17(3):337-343 [FREE Full text] [doi: 10.5811/westjem.2016.3.29863] [Medline: 27330668]
15. Purdy K. How to pull off a professional video call from home. Wirecutter. URL: https://www.nytimes.com/wirecutter/blog/professional-video-call-from-home [accessed 2020-07-15]
16. Saiyad S, Virk A, Mahajan R, Singh T. Online Teaching in Medical Training: Establishing Good Online Teaching Practices from Cumulative Experience. Int J Appl Basic Med Res 2020;10(3):149-155 [FREE Full text] [doi: 10.4103/ijabmr.IJABMR_358_20] [Medline: 33088735]
17. Son C, Hegde S, Smith A, Wang X, Sasangohar F. Effects of COVID-19 on College Students' Mental Health in the United States: Interview Survey Study. J Med Internet Res 2020 Sep 03;22(9):e21279 [FREE Full text] [doi: 10.2196/21279] [Medline: 32805704]
18. Du J, Mayer G, Hummel S, Oetjen N, Gronewold N, Zafar A, et al. Mental Health Burden in Different Professions During the Final Stage of the COVID-19 Lockdown in China: Cross-sectional Survey Study. J Med Internet Res 2020 Dec 02;22(12):e24240 [FREE Full text] [doi: 10.2196/24240] [Medline: 33197231]
19. Hall AK, Nousiainen MT, Campisi P, Dagnone JD, Frank JR, Kroeker KI, et al. Training disrupted: Practical tips for supporting competency-based medical education during the COVID-19 pandemic. Med Teach 2020 Jul;42(7):756-761. [doi: 10.1080/0142159X.2020.1766669] [Medline: 32450049]
20. Rubinger L, Gazendam A, Ekhtiari S, Nucci N, Payne A, Johal H, et al. Maximizing virtual meetings and conferences: a review of best practices. Int Orthop 2020 Aug;44(8):1461-1466 [FREE Full text] [doi: 10.1007/s00264-020-04615-9] [Medline: 32445031]
21. Shaikh F, Inayat F, Awan O, Santos M, Choudhry A, Waheed A, et al. Computer-Assisted Learning Applications in Health Educational Informatics: A Review. Cureus 2017 Aug 10;9(8):e1559 [FREE Full text] [doi: 10.7759/cureus.1559] [Medline: 29021930]
22. Wray A, Bennett K, Boysen-Osborn M, Wiechmann W, Toohey S. Efficacy of an asynchronous electronic curriculum in emergency medicine education in the United States. J Educ Eval Health Prof 2017 Dec 11;14:29. [doi: 10.3352/jeehp.2017.14.29] [Medline: 29237247]
23. Hayden EM, Navedo DD, Gordon JA. Web-conferenced simulation sessions: a satisfaction survey of clinical simulation encounters via remote supervision. Telemed J E Health 2012 Sep;18(7):525-529. [doi: 10.1089/tmj.2011.0217] [Medline: 22827475]
24. Ikeyama T, Shimizu N, Ohta K. Low-cost and ready-to-go remote-facilitated simulation-based learning. Simul Healthc 2012 Mar;7(1):35-39. [doi: 10.1097/SIH.0b013e31822eacae] [Medline: 22228281]
25. Sweet L, Palazzi D. Application of Kern's Six-step approach to curriculum development by global health residents. Educ Health (Abingdon) 2015;28(2):138-141 [FREE Full text] [doi: 10.4103/1357-6283.170124] [Medline: 26609014]
26. Robertson AC, Fowler LC, Niconchuk J, Kreger M, Rickerson E, Sadovnikoff N, et al. Application of Kern's 6-Step Approach in the Development of a Novel Anesthesiology Curriculum for Perioperative Code Status and Goals of Care Discussions. J Educ Perioper Med 2019 Jan 01;21(1):E634 [FREE Full text] [Medline: 31406705]
27. Husain A, Repanshek Z, Singh M, Ankel F, Beck-Esmay J, Cabrera D, et al. Consensus Guidelines for Digital Scholarship in Academic Promotion. West J Emerg Med 2020 Jul 08;21(4):883-891 [FREE Full text] [doi: 10.5811/westjem.2020.4.46441] [Medline: 32726260]
28. Zureick AH, Burk-Rafel J, Purkiss JA, Hortsch M. The interrupted learner: How distractions during live and video lectures influence learning outcomes. Anat Sci Educ 2018 Jul;11(4):366-376. [doi: 10.1002/ase.1754] [Medline: 29178200]
29. ZOOM guides. University of California San Francisco Medical Education. URL: https://meded.ucsf.edu/ZOOM [accessed 2020-07-15]
30. Lorenz T. ‘Zoombombing’: When video conferences go wrong. The New York Times. 2020 Mar 20. URL: https://www.nytimes.com/2020/03/20/style/zoombombing-zoom-trolling.html [accessed 2020-05-21]
31. Earon S. Video communications in healthcare. Zoom for Healthcare. URL: https://zoom.us/docs/doc/Video%20Communications%20in%20Healthcare.pdf [accessed 2020-08-20]
32. Messman AM, Malik A, Ehrman R. An Asynchronous Curriculum for Teaching Practical Interpretation Skills of Clinical Images to Residents in Emergency Medicine. J Emerg Med 2020 Feb;58(2):299-304. [doi: 10.1016/j.jemermed.2019.11.046] [Medline: 32220547]
33. Westberg J, Jason H, editors. Fostering Learning in Small Groups: A Practical Guide. New York: Springer Publishing Company Inc; 1996.
34. Rajagopal A, Sudario G, Weiland D, Osborne M. Family game show-style didactic for teaching nervous system disorders during emergency medicine training. Journal of Education and Teaching in Emergency Medicine 2020 Apr;5(2):1. [doi: 10.21980/J8D357]
35. Boysen-Osborn M, Paradise S, Suchard JR. The toxiscape hunt: an escape room-scavenger hunt for toxicology education. Journal of Education and Teaching in Emergency Medicine 2018;3(1):9-19 [FREE Full text] [doi: 10.21980/J8NW58]
36. Bharamgoudar R. Gamification. Clin Teach 2018 Jun;15(3):268-269. [doi: 10.1111/tct.12787] [Medline: 29878598]

37. Bigdeli S, Kaufman D. Digital games in medical education: Key terms, concepts, and definitions. Med J Islam Repub Iran 2017 Sep 02;31:52 [FREE Full text] [doi: 10.14196/mjiri.31.52] [Medline: 29445681]
38. Akl EA, Pretorius RW, Sackett K, Erdley WS, Bhoopathi PS, Alfarah Z, et al. The effect of educational games on medical students' learning outcomes: a systematic review: BEME Guide No 14. Med Teach 2010 Jan;32(1):16-27. [doi: 10.3109/01421590903473969] [Medline: 20095770]
39. Ting DK, Boreskie P, Luckett-Gatopoulos S, Gysel L, Lanktree MB, Chan TM. Quality Appraisal and Assurance Techniques for Free Open Access Medical Education (FOAM) Resources: A Rapid Review. Semin Nephrol 2020 May;40(3):309-319. [doi: 10.1016/j.semnephrol.2020.04.011] [Medline: 32560781]
40. Burkholder T, Bellows J, King R. Free Open Access Medical Education (FOAM) in Emergency Medicine: The Global Distribution of Users in 2016. West J Emerg Med 2018 May;19(3):600-605 [FREE Full text] [doi: 10.5811/westjem.2018.3.36825] [Medline: 29760862]
41. CME for MOC Evaluation Guide. Accreditation Council for Continuing Medical Education. URL: https://accme.org/publications/cme-for-moc-evaluation-guide [accessed 2021-03-03]
42. Create a Survey. Google Surveys Help. URL: https://support.google.com/surveys/answer/2372144?hl=en [accessed 2021-02-28]
43. Learn how to create a survey online in 10 easy steps. SurveyMonkey. URL: https://www.surveymonkey.com/mp/how-to-create-surveys/ [accessed 2021-03-03]
44. Creating a project. QualtricsXM. URL: https://www.qualtrics.com/support/survey-platform/my-projects/creating-a-project/ [accessed 2021-03-03]
45. Hew KF, Lo CK. Flipped classroom improves student learning in health professions education: a meta-analysis. BMC Med Educ 2018 Mar 15;18(1):38 [FREE Full text] [doi: 10.1186/s12909-018-1144-z] [Medline: 29544495]
46. Lin M, Joshi N, Grock A, Swaminathan A, Morley E, Branzetti J, et al. Approved Instructional Resources Series: A National Initiative to Identify Quality Emergency Medicine Blog and Podcast Content for Resident Education. J Grad Med Educ 2016 May;8(2):219-225 [FREE Full text] [doi: 10.4300/JGME-D-15-00388.1] [Medline: 27168891]
47. Frequently asked questions: Emergency medicine. Accreditation Council for Graduate Medical Education. URL: https://www.acgme.org/Portals/0/PDFs/FAQ/110_emergency_medicine_FAQs_2017-07-01.pdf?ver=2017-11-03-145400-030 [accessed 2020-04-15]

Abbreviations

ACGME: Accreditation Council for Graduate Medical Education
PGY: postgraduate year

Edited by G Eysenbach; submitted 20.11.20; peer-reviewed by J Siebert, L Suppan; comments to author 03.01.21; revised version received 10.03.21; accepted 14.04.21; published 11.05.21.

Please cite as:
Rivera R, Smart J, Sakaria S, Wray A, Wiechmann W, Boysen-Osborn M, Toohey S
Planning Engaging, Remote, Synchronous Didactics in the COVID-19 Pandemic Era
JMIR Med Educ 2021;7(2):e25213
URL: https://mededu.jmir.org/2021/2/e25213
doi:10.2196/25213
PMID:33872191

Review

Social Media and Medical Education in the Context of the COVID-19 Pandemic: Scoping Review

Marc Katz[1*], MD; Neilanjan Nandi[2*], MD

[1]Division of Cardiology, Department of Medicine, St. Luke's University Hospital, Bethlehem, PA, United States

[2]Division of Gastroenterology and Hepatology, Department of Medicine, University of Pennsylvania, Philadelphia, PA, United States

[*]all authors contributed equally

Corresponding Author:
Marc Katz, MD
Division of Cardiology
Department of Medicine
St. Luke's University Hospital
801 Ostrum Street
Bethlehem, PA, 18015
United States
Phone: 1 8667858537
Email: marckatzmd@gmail.com

Abstract

Background: The COVID-19 pandemic has brought virtual web-based learning to the forefront of medical education as training programs adapt to physical distancing challenges while maintaining the rigorous standards of medical training. Social media has unique and partially untapped potential to supplement formal medical education.

Objective: The aim of this review is to provide a summary of the incentives, applications, challenges, and pitfalls of social media–based medical education for both trainees and educators.

Methods: We performed a literature review via PubMed of medical research involving social media platforms, including Facebook, Twitter, Instagram, YouTube, WhatsApp, and podcasts. Papers were reviewed for inclusion based on the integrity and power of the study.

Results: The unique characteristics of social media platforms such as Facebook, Twitter, Instagram, YouTube, WhatsApp, and podcasts endow them with unique communication capabilities that serve different educational purposes in both formal and informal education settings. However, contemporary medical education curricula lack widespread guidance on meaningful use, application, and deployment of social media in medical education.

Conclusions: Clinicians and institutions must evolve to embrace the use of social media platforms for medical education. Health care professionals can approach social media engagement in the same ethical manner that they would with patients in person; however, health care institutions ultimately must enable their health care professionals to achieve this by enacting realistic social media policies. Institutions should appoint clinicians with strong social media experience to leadership roles to spearhead these generational and cultural changes. Further studies are needed to better understand how health care professionals can most effectively use social media platforms as educational tools. Ultimately, social media is here to stay, influencing lay public knowledge and trainee knowledge. Clinicians and institutions must embrace this complementary modality of trainee education and champion social media as a novel distribution platform that can also help propagate truth in a time of misinformation, such as the COVID-19 pandemic.

(JMIR Med Educ 2021;7(2):e25892) doi:10.2196/25892

KEYWORDS

social media; medical education; COVID-19; medical student; review; doctor; communication; online learning; e-learning; online education; delivery; dissemination

Introduction

Social media has become an integral vehicle for the delivery and dissemination of health care education. Although social media use has become ubiquitous among patients, health care practitioners have shown variable enthusiasm with regard to adoption and engagement within the social media realm. The COVID-19 pandemic has brought virtual web-based learning to the forefront of medical education as training programs adapt to physical distancing challenges while maintaining the rigorous standards of medical training. Social media offers unique and partially untapped potential to supplement formal medical education. Indeed, social media has also provided clinicians who must practice social distancing for public safety with an opportunity and virtual space for educational discourse, community, camaraderie, and support. Notably, contemporary curricula on the application, deployment, and professional etiquette of social media are lacking. In this review, we provide a summary of the incentives and applications of social media–based medical education for both trainees and educators. Likewise, we highlight the challenges and pitfalls of social media–based medical education.

Methods

We performed a literature review by searching PubMed for medical research studies involving social media platforms, including Facebook, Twitter, Instagram, WhatsApp, and podcasts. Papers were reviewed for inclusion based on the integrity and power of the study.

Results

Social Media: History, Evolution, and Use Prevalence

A social media platform is characterized as a web-based application that facilitates interactive creation and sharing of information and ideas through virtual communities. Facebook, Twitter, Instagram, YouTube, WhatsApp, and various podcast-hosting applications are among the most popular and established electronic communication tools and social media platforms. Each platform has its own individual smartphone mobile app with unique user interfaces. These individual platforms have variable degrees of flexibility and limitation on how content is posted. Twitter permits a total of 280 characters in a single tweet, whereas other platforms may be far more generous; for example, Facebook permits up to 63,206 characters in a single post. Images and videos are permitted on all platforms; however, the number of images and the permitted video length may differ between these platforms. Instagram is intentionally built to share images and short videos. YouTube is strictly built for videos and does not restrict video length. WhatsApp provides secure, encrypted messaging and sharing of audiovisual material capabilities within closed groups; however, it is restricted to mobile devices and does not have a traditional desktop, web-based user interface. These platform-specific parameters enable each social media platform to be used uniquely for different types of educational learning.

Critical to the global adoption of social media platforms is the parallel and complementary development of high-speed internet and smart devices, which laid the groundwork for their creation and global adoption. The ability to capture and share high-quality audiovisual media evolved from basic email and text messaging to dissemination of such media via social networks, with social network access transitioning from a computer interface to a smartphone interface. The prevalence of smartphone technology is undoubtedly widespread in the United States, with the estimated number of Americans who owned a smartphone rising from 56% in 2013 to 77% in 2017 [1]. Similarly, smart tablet use in America rose from 3% in 2010 to 51% in 2016 [2]. Social media platforms have similarly experienced widespread multigenerational adoption. In 2014, the percentage of Americans who reported using smartphones to access social media was 55% in those aged more than 50 years, 77% in Americans aged 30-49 years, and 91% in Americans aged 18-29 years [3]. The percentage of American adults who used at least one social media platform rose from 5% in 2005 to 72% in 2019. Additionally, in 2019, an estimated 75% of Facebook users, 63% of Instagram users, and 42% of Twitter users reported accessing each social media platform, respectively, on a daily basis [3]. Hence, the critical focus on the word “media” in social media bears much weight and recognition in considering the ramifications of how social media has changed society over the last 15 years as social media applications have become a part of daily life.

Physician Engagement on Social Media Before and During the COVID-19 Pandemic

Prior generations of physicians were apprehensive about engaging on social media out of concern about patient privacy, liability, lack of time, compensation, and familiarity with the technology; however, times are changing [4,5]. In a 2011 survey of 4033 clinicians, it was found that 90% of clinicians used at least one social media site for personal use and that 65% of clinicians already used at least one social media platform for professional purposes [6]. Many physicians use social media to find and share health information, communicate with colleagues and trainees, advertise their clinical practices, engage in health advocacy, impact health policy decisions, exchange developments in their fields, and publicize their research [7-12]. Over 140 uses for Twitter alone have been reported in health care [8]. Beyond social networking, clinicians have historically used social media platforms to directly engage and educate professional peers, house staff trainees, and patients.

The advent of COVID-19 further catalyzed the adoption of social media platforms such as Twitter to more rapidly disseminate and spread information about an unknown and contagious disease directly to frontline reporters as new information unfolded. This was critical in many instances, such as providing guidance on helping health care workers to maintain safety during aerosolizing procedures like endotracheal intubation [13,14]. Infected physicians even chronicled their disease course on Twitter to educate followers in a novel way that would not have even been possible 15 years ago [14]. Similar to the global response to the Zika virus, physicians and public health organizations such as the US Centers for Disease Control and Prevention (CDC) and the World Health

Organization also used Instagram to spread information to health care professionals and the general public from verifiable sources [15-17]. This rapid and efficient dissemination of information illustrates the significant influence social media can have on the spread of medical literature and knowledge among health care professionals.

The COVID-19 pandemic also disrupted medical education. It forced medical schools and residency and fellowship training programs to adapt to how they educate their trainees. Aided by virtual platforms such as Zoom and Microsoft Teams, formal educational lectures, noon conferences, grand rounds, and even medical conferences have migrated onto the web to adapt to the "new normal" [18]. With widespread cancellation of elective procedures, more procedural-based specialty training programs faced unique challenges to ensure their trainees would acquire adequate procedure skills. Gastroenterology fellowship programs adopted innovative virtual training webinars to strengthen participants' theoretical background in endoscopy and video sessions to review common technical aspects of endoscopy; they also reinvigorated the use of simulation-based training, in which it has been shown that skills learned in virtual reality simulation-based training are transferable to real life [18-21]. Although Zoom and Microsoft Teams are the newest widely adopted virtual platforms for formal medical education, informal medical education has been present on multiple social media platforms for years. Moreover, with social distancing measures actively in place, social media platforms help provide health care professionals with opportunities to establish community and camaraderie that would otherwise not exist. Specific use case examples of educational opportunities on each social media platform are illustrated below.

Facebook

The use of Facebook by patients to access and share medical information for chronic disease management has been well studied, and these studies may provide insight into how closed Facebook groups can be harnessed for medical education [7,22-30]. In some studies, researchers have looked at relatively small and homogenous groups of individuals who participate in well-moderated, closed Facebook groups to enhance weight loss in African American women [31], improve physical activity in patients with type 2 diabetes [30], and improve exercise motivation in patients with stable coronary artery disease undergoing cardiac rehabilitation [31]. These studies may provide important context on how Facebook groups can potentially enhance the learning experience of medical students. Although Facebook groups for medical education may pose privacy and logistical concerns, medical students are already using them to share learning tips, study strategies, and material and to discuss course content [32]. Faculty who engage in and moderate discussions with medical trainees in closed Facebook groups may help them better understand common problems and challenges that students encounter and, in doing so, may enhance the student experience [33].

Twitter

The historically robust engagement of physicians with Twitter has led to several educational opportunities for medical trainees and attending physicians alike. Opportunities such as virtual case conferences, Twitter-based journal clubs, and "tweetorials" provide physicians with the ability to communicate with and learn from experts in their field whom they otherwise would not be able to access. For example, #MondayNightIBD is a weekly social media version of a multidisciplinary case conference. The weekly hashtag is used to identify discussion threads about the treatment or management of inflammatory bowel disease (IBD). It brings together clinicians from around the world to share their knowledge and research as it relates to a complex or controversial topic or situation [34]. These weekly discussions foster sharing of scientific data or guidelines when available, highlight areas where there is disagreement in data interpretation, and identify areas where more research is needed. These de facto case conferences also empower patients with IBD to help educate clinicians to better understand the patient experience and ultimately help improve patient care [35].

Twitter-based journal clubs are similar to contemporary journal clubs. They exist across various medical specialties, including but not limited to internal medicine, radiology, nephrology, urology, and echocardiography [36-40]. Typically, a chat is organized around a specific published article [37]. Participants use hashtags to follow subjects of interest and contribute to discussions [37]. Many journal clubs, such as #NephJC, involve live discussions over a specific time period that foster a conversational tone and instant communication. Other journal clubs, such as #UroJC, involve focused chats over a period of a few days to foster global discussion, which fosters participation when convenient for individual participants [36]. Twitter-based journal clubs promote global participation from individuals in different fields and institutions and provide participants with equal opportunity to participate in a timely and efficient manner [36]. Participants can engage directly with research authors, who may be able to provide nuanced insight that otherwise may not have been revealed, and simultaneously provide postpublication peer review [36-39]. Chan et al [41] outlined the steps to establish a web-based journal club, and although it is challenging to establish, promote, and maintain a Twitter-based journal club, it is comparatively easy to participate [41].

A tweetorial is a collection of threaded tweets with the goal of educating those who read them [42]. The impact of tweetorials is restricted only by the author's audience. Users on Twitter can follow any number of individuals who use tweetorials as a teaching tool. Authors can use embedded pictures, videos, polls, or GIFs in tweets within the tweetorial thread, provide links to further reading or primary sources, and foster self-directed learning and teaching for health care professionals. Similar to Twitter-based journal clubs or case conferences, tweetorials enable individuals of varying hierarchical levels to directly interact who otherwise may not have the opportunity to do so [42]. Tweetorials can be used in formal medical education lectures and are a novel tool to summarize, educate, and disseminate complex topics in bite-sized teaching points.

WhatsApp Group Chat

As the field of medicine grows, new ways also grow for health care professionals and those in training to digest educational material. In formal medical education classrooms, didactic lectures still predominate. Residency and fellowship training programs as well as continuing education for attending physicians are often at least partly driven by case-based learning through direct patient care. These important teaching points that physicians experience daily are often difficult to translate into formal lectures; however, widely available smartphones and software applications such as WhatsApp are disrupting and enhancing modern medical education.

WhatsApp is a secure, encrypted messaging software app that is restricted to mobile devices [43]. It enables physicians to securely share messages, links, documents, files, photographs, and videos in a timely manner and is an ideal smartphone app for modern medical education. It has been used to enhance and stimulate medical student education as an adjunct to formal classroom and problem-based learning [44-47]. The Duke University cardiovascular disease fellowship program successfully implemented a WhatsApp group chat to enhance the education of its fellows and continuing education of attending physician faculty [43].

Coleman and O'Connor's scoping review [44] detailed a practical and learning framework for those interested in establishing successful WhatsApp educational group chats. Many successful educational group chats implemented a faculty "champion" or leader to focus discussions and facilitate learning objectives. Some group chats implemented a prespecified curriculum, while others used a continuous learning environment seeded by real life clinical cases [43-47]. This approach may be ideal for smaller groups, such as residency or fellowship house staff. However, it can also be limited by the relatively small size of the group, as group chats are reliant on individual member engagement. Ultimately, these studies have shown that WhatsApp educational group chats, if structured well, create safe spaces on the web for peer discussion and are applicable in multiple fields and educational levels.

Instagram

The intuitive and interactive design and widespread use of Instagram create multiple teaching avenues for physician educators and learning opportunities for medical trainees. Sharing images to educate other health care professionals is not a new concept; however, the means and ease of doing so have changed. In 1992, the *New England Journal of Medicine* (*NEJM*) introduced *Images in Clinical Medicine* [48]. Today, *NEJM* continues to expose readers and Instagram followers to classic medical images and diagnoses to remind us of their clinical importance [49]. Although most users access Instagram for entertainment, a large number of physicians run medical Instagram accounts that enable users to learn in a unique and informal manner across multiple specialties, including but not limited to cardiothoracic anesthesiologist Dr Rishi Kumar (@RishiMD) [50], interventional cardiologist Dr Ali Haider (@YourHeartDoc) [51], cardiac electrophysiologist Dr Hafiza Khan (@Heart.Beat.Doctor) [52], interventional gastroenterologist Dr. Austin Chiang (@AustinChiangMD) [53], and pulmonary and critical care intensivist Dr. Cedric Rutland (@DrJRutland) [54]. Medical images and videos shared on Instagram give users access to virtual mini-case presentations that enable users to learn small pieces of information that they otherwise would not have been able to find or access.

Instagram is an ideal medium to share visually appealing teaching points, and it has been described in several specialties, including dermatology, plastic surgery, radiology, infectious disease, and cardiology [55-60]. Specialists such as interventional cardiologists can easily share a descriptive case, serial electrocardiograms, and noninvasive and invasive (catheterization) imaging studies to illustrate pearls of wisdom about the art of medicine that may not be found in formal curricula [60]. The static page of an account enables health care professionals to curate a feed of teaching points with accompanying photos, videos, and written descriptions. Instagram stories complement static posts by enabling followers to directly interact with posted text, photos, or videos in real time. This also instigates further in-depth discussion beyond a single post.

For prospective medical students, Instagram Stories may show them a glimpse into the medical field to supplement formal shadowing opportunities. For medical students and resident physicians, Instagram can similarly supplement formal rotations to gain insight into various fields or niche specialties that they would otherwise not be exposed to in their current rotations. Moreover, learners can transcend geography, time zones, and schedules to engage and learn from educators whom they otherwise may not have had the opportunity to interact with. Importantly, this informal setting may also allow trainees to voice questions they may not otherwise feel comfortable asking. For educators, the Instagram platform can be used in parallel to complement formal didactic lectures, share unique and interesting cases, and continue to provide teaching points even after the formal lecture is complete.

YouTube

Videos are an excellent medium to illustrate highly complex medical concepts. Signaling this potential, in 2006, *NEJM* established *Videos in Clinical Medicine* to offer peer-reviewed educational videos. These videos are created for medical trainees to help them better understand complex procedures and advanced physical examination maneuvers to ultimately improve patient care [61]. In fact, supplemental patient education videos published on YouTube have been shown to improve patient understanding of dual antiplatelet therapy after drug eluting stent placement [62].

YouTube is the single largest video-sharing platform on the internet and is the leading free web-based source of videos used by students and health care workers worldwide [63]. A study of 91 second-year medical students found that 98% used YouTube as a web-based information resource. When a YouTube channel was created for these same medical students to compound their understanding of gross anatomy, 86% of the students accessed the channel, and 92% of these individuals agreed or strongly agreed that the channel helped them learn anatomy [64]. YouTube is clearly an effective medical education tool to improve trainee understanding and integration of information across a molecular and clinical level [65].

Numerous medical YouTube channels already exist. Some individual physicians use their channels to teach the general public about various health issues, such as Dr Danielle Jones, an obstetrician/gynecologist who produces content on her channel at *Momma Doctor Jones* [66], and Dr Mikhail Varshavski, a family medicine physician better known on his channel as *Doctor Mike* [67]. Organizations and medical societies also provide high-quality medical educational videos but also focus on medical knowledge for the general public. These include the CDC [68], the American Heart Association [69], and health care systems such as the Cleveland Clinic [70] and Mayo Clinic [71]. Other hospital networks, however, feature videos that are specific to graduate medical education. The Houston Methodist DeBakey CV Education channel [72] features free educational videos of didactic courses, hands-on learning, and procedures for cardiologists, cardiovascular surgeons, and vascular surgeons. Several companies also provide high-quality medical education content specifically for students at various levels of training. Companies such as *Osmosis* [73], *OnlineMedEd* [74], and *Dr. Najeeb Lectures* [75] are among the most popular channels that provide free videos with expanded levels of content with paid subscriptions.

Podcasts

Podcasts are ideal media for the delivery of medical education due to their relatively low cost, ease of access, and rapidity of distribution. Podcasts offer medical trainees the ability to learn at their own pace and can reinforce contemporary in-person lectures and can even foster more meaningful and engaging lectures. Podcasts are increasingly popular among medical trainees, with an increasingly more favorable perception over traditional books and journals [76]. The popularity of podcasts in medicine has grown alongside their success in the general public. In 2019, 139 active medical education podcasts existed across 19 different specialties; emergency medicine, internal medicine, and pediatrics were the specialties with the most active podcasts [77].

Podcasts can have varying structure and focus. One popular podcast, *The Curbsiders* [78], has over 271 individual episodes and covers a wide array of individual topics across medical specialties and subspecialties. By interviewing and discussing topics with experts from an array of medical disciplines, the *Curbsiders* podcast can provide a "deep dive" into the diagnosis, management, and treatment of various medical conditions. Therefore, listeners are able to gleam valuable insight into the minds of experts they otherwise would not have access to. Other formats include a review of recent literature publications or as a companion to formal journal publications. For example, *This Week in Cardiology* [79] is a weekly podcast that delivers a summary of noteworthy publications in the field of cardiology; meanwhile, *JACC Podcast* [80] is another free podcast recorded by Dr Valentin Fuster, the editor-in-chief of the *Journal of the American College of Cardiology*, that highlights the journal findings and provides a short summary of each manuscript.

It remains difficult to objectively assess the clinical utility of podcasts in medical education [81]. Although few studies have rigorously studied the efficacy of podcasts as teaching tools in medical education, their widespread use and adoption is evident [81,82]. In 2017, in a survey of 356 emergency medicine residents, it was found that 88.8% listened to a medical podcast at least once a month and that 72.2% reported that podcasts changed their clinical practice either "somewhat" or "very much" [82].

Discussion

Challenges and Pitfalls of Social Media Use by Health Care Professionals

First, we must acknowledge the prevalence and spread of misinformation on social media. This issue was present prior to the COVID-19 pandemic and is being exacerbated by it. Translating one's credibility in the medical community is often difficult to replicate on social media. Similarly, accounts with large followings may not have verifiable credentials to provide medical education. For instance, an analysis of dermatological hashtag use on Instagram showed that only 5% of the top dermatology-related posts were created by board-certified dermatologists [55]. This finding indicates that although many physicians and health care professionals may in fact be on Instagram and using it appropriately, the majority of the most popular posts are created by individuals giving advice who are not qualified to do so. Without widely effective medical therapies to treat COVID-19, clear communication with the general public is our most effective medical treatment to date and underpins the importance of combating misinformation on social media [83]. Although medical journals may provide open access to health care professionals, this research is not accessible to the general public, who receive most information through social media channels [84]. This topic warrants further discussion and research; however, this is outside the scope of this review.

There are several limitations in our review. Formal medical education programs adapted enthusiastically to physical distancing requirements during the ongoing pandemic; however, the effectiveness of these virtual learning modalities has not been extensively studied. It remains unclear if social media or virtual learning modalities are applicable as a true substitute when in-person learning is limited. Similarly, it remains difficult to study the effectiveness of individual components of social media in medical education due to the multifactorial nature of medical education and the individual user variation of social media. However, the utility of various aspects of social media, including Instagram Stories, tweetorials, YouTube videos, and podcasts, is evident. Future studies should focus on guiding clinical educators on how to best use these platforms effectively and appropriately for their respective specialty. Even prior to the COVID-19 pandemic, an increasing number of health care professionals began engaging across social media platforms to provide informal medical education. However, the degree to which these web-based social media platforms will continue to be wielded for meaningful medical education following the eventual recovery from the pandemic is yet to be seen. Additionally, the trend toward the permeation of medical education across social media is apparent on platforms such as Reddit, TikTok, and Clubhouse; however, due to the limited availability of studies assessing educational content on these platforms, they were not included in our review.

For health care professionals, uniform training in proper use of social media is often insufficient. Many medical and educational institutions forbid active social media engagement by their trainees or provide vague guidelines on its use. As a result, unprofessional or perceived unprofessional behavior by health care professionals remains an ongoing issue. Organizations such as the Association for Healthcare Social Media and social media campaigns such as #VerifyHealthcare are concrete steps by health care organizations and individual professionals to combat this chronic issue [85,86]. However, larger institutional culture shifts and further formal studies are needed to evaluate how best to leverage social media to positively impact medical education.

Although these challenges are not new, they do complicate the already difficult task of using social media as an educational tool. As previously detailed, WhatsApp has been successfully integrated into formal medical school classes and informal cardiovascular disease fellow training [43-47]. YouTube channels and podcast series may be some of the most effective methods for educators to supplement trainee education. However, there may be challenges to formally incorporate these media and platforms such as Instagram, Twitter, or Facebook into formal medical education curricula. Therefore, these platforms remain supplemental resources for trainees, professionals, and patients alike. Future studies should examine how to best supplement contemporary medical education with each respective social media platform.

Studies should isolate differences between educating health care professionals in various stages of training. We surmise that there will be specialty-specific variations with regard to ideal platforms as well.

Future social media studies should implement process-evaluation strategies to ascertain which specific aspects of social media have the greatest impact. A conceptual framework was developed to aid future researchers in establishing studies on social media. This framework, known as the Therapeutic Affordances of Social Media (TASoMe), is grounded by the biopsychosocial model, or the interconnection between biology, psychology, and socioenvironmental factors [87]. TASoMe has been used to study social media use in brain cancer, endometriosis, and mental health [87,88]. It can aid researchers in systematically generating evidence-based research in a stepwise fashion and can be particularly useful for future studies on Facebook groups to educate trainees on chronic disease management [87].

It also remains difficult to quantify the academic impact of physician engagement on social media. As health care professionals engage on social media, they will gradually redirect their time from other responsibilities. Unfortunately, contemporary criteria used by academic institutions to evaluate individuals for academic promotions and tenure may not fully encompass the impact of social media posts or publications [89,90]. Expanded altmetrics for each social media platform can supplement contemporary metrics that aid in academic promotion or financial reimbursement in contract negotiations.

Lastly, contemporary studies on Facebook in medical education focus on perceived digital professionalism and likely reflect generational attitudes toward social media [91,92]. For better or worse, some residency program directors routinely survey public social media profiles of potential candidates, which directly influences residency match rank lists [91]. Teaching institutions must adapt to the changing web-based landscape and integrate realistic social media best practice guidelines into formal medical school, residency, and fellowship training program curricula to ensure that current and future generations of physicians are well equipped to use social media platforms meaningfully, responsibly, and professionally.

Conclusion

Social media platforms may come and go, and their engagement patterns may fluctuate; however, their impact on modern society is incalculable. The seeds of social media were enriched by separate yet intertwined technological advances that served as the building blocks of a communication revolution and spawned these integrative and seemingly inescapable social media platforms. In a time period that requires novel communication and teaching methods, social media can put the “social” back into physical distancing and medical education. The characteristics of each social media platform endow them with unique communication capabilities that have never before been seen in telecommunication history. Their use as educational tools must be approached with accelerated caution and monitored as they are implemented. Further studies are needed to better understand how health care professionals can most effectively use social media platforms as educational tools. Health care professionals can approach social media engagement in the same ethical manner that they would with patients in real life; however, health care institutions ultimately must enable their health care professionals to do this by enacting realistic social media policies. Institutions should appoint clinicians with strong social media experience to leadership roles to spearhead these generational and cultural changes. Ultimately, social media is expected to play a permanent role in influencing lay public and trainee knowledge. Clinicians and institutions must evolve to embrace and champion these platforms to preserve educational integrity and public trust.

Conflicts of Interest

None declared.

References

1. Smith A. Smartphone ownership 2013. Pew Research Center. 2013 Jun 05. URL: http://pewinternet.org/Reports/2013/Smartphone-Ownership-2013.aspxRecord shares of Americans have smartphones, home broadband [accessed 2019-10-13]
2. Social media fact sheet. Pew Research Center. 2019. URL: https://www.pewinternet.org/fact-sheet/social-media/ [accessed 2019-10-13]
3. Beratarrechea A, Lee AG, Willner JM, Jahangir E, Ciapponi A, Rubinstein A. The impact of mobile health interventions on chronic disease outcomes in developing countries: a systematic review. Telemed J E Health 2014 Jan;20(1):75-82 [FREE Full text] [doi: 10.1089/tmj.2012.0328] [Medline: 24205809]
4. U.S. smartphone social and digital media access 2014, by age group. Statista. URL: https://www.statista.com/statistics/421257/smartphone-users-usa-social-digital-media-access-age/ [accessed 2019-04-07]
5. George DR, Rovniak LS, Kraschnewski JL. Dangers and opportunities for social media in medicine. Clin Obstet Gynecol 2013 Oct;56(3):453-462 [FREE Full text] [doi: 10.1097/GRF.0b013e318297dc38] [Medline: 23903375]
6. Over 65% of physicians have used social media to support their professional practice. Care Continuum Alliance. 2011 Sep 08. URL: http://www.carecontinuum.org/news_releases/2011/20110908_social_media_study.asp [accessed 2021-03-31]
7. Dantu R, Wang J, Mahapatra R. Social media use in physician-patient interaction - A fit perspective. 2014 Presented at: 20th Americas Conference on Information Systems; August 7-9, 2014; Savannah, GA.
8. Grajales FJ, Sheps S, Ho K, Novak-Lauscher H, Eysenbach G. Social media: a review and tutorial of applications in medicine and health care. J Med Internet Res 2014 Mar 11;16(2):e13 [FREE Full text] [doi: 10.2196/jmir.2912] [Medline: 24518354]
9. Antheunis ML, Tates K, Nieboer TE. Patients' and health professionals' use of social media in health care: motives, barriers and expectations. Patient Educ Couns 2013 Oct;92(3):426-431. [doi: 10.1016/j.pec.2013.06.020] [Medline: 23899831]
10. Chretien KC, Kind T. Social media and clinical care. Circulation 2013 Apr 02;127(13):1413-1421. [doi: 10.1161/circulationaha.112.128017]
11. Domingo MC. Managing healthcare through social networks. Computer 2010 Jul;43(7):20-25. [doi: 10.1109/mc.2010.92]
12. Ventola C. Social media and health care professionals: benefits, risks, and best practices. P T 2014 Jul;39(7):491-520 [FREE Full text] [Medline: 25083128]
13. Chan AKM, Nickson CP, Rudolph JW, Lee A, Joynt GM. Social media for rapid knowledge dissemination: early experience from the COVID-19 pandemic. Anaesthesia 2020 Dec 31;75(12):1579-1582 [FREE Full text] [doi: 10.1111/anae.15057] [Medline: 32227594]
14. Rosenberg H, Syed S, Rezaie S. The Twitter pandemic: the critical role of Twitter in the dissemination of medical information and misinformation during the COVID-19 pandemic. CJEM 2020 Jul 06;22(4):418-421 [FREE Full text] [doi: 10.1017/cem.2020.361] [Medline: 32248871]
15. Fung IC, Blankenship EB, Goff ME, Mullican LA, Chan KC, Saroha N, et al. Zika-virus-related photo sharing on Pinterest and Instagram. Disaster Med Public Health Prep 2017 Dec;11(6):656-659. [doi: 10.1017/dmp.2017.23] [Medline: 28330514]
16. Seltzer E, Horst-Martz E, Lu M, Merchant R. Public sentiment and discourse about Zika virus on Instagram. Public Health 2017 Oct;150:170-175. [doi: 10.1016/j.puhe.2017.07.015] [Medline: 28806618]
17. Dabbagh A. The role of Instagram in public health education in COVID-19 in Iran. J Clin Anesth 2020 Oct;65:109887 [FREE Full text] [doi: 10.1016/j.jclinane.2020.109887] [Medline: 32454342]
18. Barberio B, Massimi D, Dipace A, Zingone F, Farinati F, Savarino EV. Medical and gastroenterological education during the COVID-19 outbreak. Nat Rev Gastroenterol Hepatol 2020 Aug;17(8):447-449 [FREE Full text] [doi: 10.1038/s41575-020-0323-7] [Medline: 32483352]
19. Palchaudhuri S, Gabre J, Prenner S, Klapproth J. Adapting a GI fellowship to a pandemic: novel approaches to accommodating a novel virus. Dig Dis Sci 2020 Jun 30;65(6):1562-1565 [FREE Full text] [doi: 10.1007/s10620-020-06306-2] [Medline: 32356258]
20. Siau K, Hodson J, Neville P, Turner J, Beale A, Green S, et al. Impact of a simulation-based induction programme in gastroscopy on trainee outcomes and learning curves. World J Gastrointest Endosc 2020 Mar 16;12(3):98-110 [FREE Full text] [doi: 10.4253/wjge.v12.i3.98] [Medline: 32218889]
21. Grover SC, Garg A, Scaffidi MA, Yu JJ, Plener IS, Yong E, et al. Impact of a simulation training curriculum on technical and nontechnical skills in colonoscopy: a randomized trial. Gastrointest Endosc 2015 Dec;82(6):1072-1079. [doi: 10.1016/j.gie.2015.04.008] [Medline: 26007221]
22. Bender JL, Jimenez-Marroquin M, Jadad AR. Seeking support on Facebook: a content analysis of breast cancer groups. J Med Internet Res 2011 Mar 04;13(1):e16 [FREE Full text] [doi: 10.2196/jmir.1560] [Medline: 21371990]
23. Thoren EM, Metze B, Bührer C, Garten L. Online support for parents of preterm infants: a qualitative and content analysis of Facebook 'preemie' groups. Arch Dis Child Fetal Neonatal Ed 2013 Dec 12;98(6):F534-F538. [doi: 10.1136/archdischild-2012-303572] [Medline: 23759520]
24. Al Mamun M, Ibrahim HM, Turin TC. Social media in communicating health information: an analysis of Facebook groups related to hypertension. Prev Chronic Dis 2015 Jan 29;12:E11 [FREE Full text] [doi: 10.5888/pcd12.140265] [Medline: 25633486]
25. De la Torre-Díez I, Díaz-Pernas FJ, Antón-Rodríguez M. A content analysis of chronic diseases social groups on Facebook and Twitter. Telemed J E Health 2012 Jul;18(6):404-408. [doi: 10.1089/tmj.2011.0227] [Medline: 22650380]

26. Apperson A, Stellefson M, Paige S, Chaney B, Chaney J, Wang M, et al. Facebook groups on chronic obstructive pulmonary disease: social media content analysis. Int J Environ Res Public Health 2019 Oct 09;16(20):3789 [FREE Full text] [doi: 10.3390/ijerph16203789] [Medline: 31600907]
27. Stellefson M, Paige S, Apperson A, Spratt S. Social media content analysis of public diabetes Facebook groups. J Diabetes Sci Technol 2019 May 31;13(3):428-438 [FREE Full text] [doi: 10.1177/1932296819839099] [Medline: 30931593]
28. Timms C, Forton D, Poullis A. Social media use in patients with inflammatory bowel disease and chronic viral hepatitis. Clin Med (Lond) 2014 May 08;14(2):215-215 [FREE Full text] [doi: 10.7861/clinmedicine.14-2-215] [Medline: 24715144]
29. Reich J, Guo L, Groshek J, Weinberg J, Chen W, Martin C, et al. Social media use and preferences in patients with inflammatory bowel disease. Inflamm Bowel Dis 2019 Feb 21;25(3):587-591 [FREE Full text] [doi: 10.1093/ibd/izy280] [Medline: 30203036]
30. Boudreau F, Moreau M, Côté J. Effectiveness of computer tailoring versus peer support web-based interventions in promoting physical activity among insufficiently active Canadian adults with type 2 diabetes: protocol for a randomized controlled trial. JMIR Res Protoc 2016 Mar 11;5(1):e20 [FREE Full text] [doi: 10.2196/resprot.5019] [Medline: 26869015]
31. Joseph RP, Keller C, Adams MA, Ainsworth BE. Print versus a culturally-relevant Facebook and text message delivered intervention to promote physical activity in African American women: a randomized pilot trial. BMC Womens Health 2015 Mar 27;15:30 [FREE Full text] [doi: 10.1186/s12905-015-0186-1] [Medline: 25886945]
32. Siegmund LA, Ahmed HM, Crawford MT, Bena JF. Feasibility of a Facebook intervention for exercise motivation and cardiac rehabilitation adherence: study protocol. JMIR Res Protoc 2017 Aug 18;6(8):e162 [FREE Full text] [doi: 10.2196/resprot.7554] [Medline: 28821473]
33. Nicolai L, Schmidbauer M, Gradel M, Ferch S, Antón S, Hoppe B, et al. Facebook groups as a powerful and dynamic tool in medical education: mixed-method Study. J Med Internet Res 2017 Dec 22;19(12):e408 [FREE Full text] [doi: 10.2196/jmir.7990] [Medline: 29273572]
34. Sutherland S, Jalali A. Social media as an open-learning resource in medical education: current perspectives. AMEP 2017 Jun;Volume 8:369-375. [doi: 10.2147/amep.s112594]
35. Charabaty A. Monday Night IBD offers GIs, experts a new way to discuss cases. Healio. 2019 Oct 21. URL: https://www.healio.com/news/gastroenterology/20191021/monday-night-ibd-offers-gis-experts-a-new-way-to-discuss-cases [accessed 2020-02-29]
36. Roberts MJ, Perera M, Lawrentschuk N, Romanic D, Papa N, Bolton D. Globalization of continuing professional development by journal clubs via microblogging: a systematic review. J Med Internet Res 2015 May 23;17(4):e103 [FREE Full text] [doi: 10.2196/jmir.4194] [Medline: 25908092]
37. Topf JM, Sparks MA, Iannuzzella F, Lerma E, Oates T, Phelan PJ, et al. Twitter-based journal clubs: additional facts and clarifications. J Med Internet Res 2015 Oct 16;17(9):e216 [FREE Full text] [doi: 10.2196/jmir.4639] [Medline: 26376668]
38. Bolderston A, Watson J, Woznitza N, Westerink A, Di Prospero L, Currie G, et al. Twitter journal clubs and continuing professional development: An analysis of a #MedRadJClub tweet chat. Radiography (Lond) 2018 Feb;24(1):3-8. [doi: 10.1016/j.radi.2017.09.005] [Medline: 29306372]
39. Topf JM, Sparks MA, Phelan PJ, Shah N, Lerma EV, Graham-Brown MP, et al. The evolution of the journal club: from Osler to Twitter. Am J Kidney Dis 2017 Jul;69(6):827-836. [doi: 10.1053/j.ajkd.2016.12.012] [Medline: 28233653]
40. Twitter Journal Club. American Society of Echocardiography. URL: https://www.asecho.org/twitterjournalclub/ [accessed 2020-03-01]
41. Chan, Thoma B, Radecki R, Topf J, Woo HH, Kao LS, et al. Ten steps for setting up an online journal club. J Contin Educ Health Prof 2015;35(2):148-154. [doi: 10.1002/chp.21275] [Medline: 26115115]
42. Breu AC. Why is a cow? Curiosity, tweetorials, and the return to why. N Engl J Med 2019 Oct 19;381(12):1097-1098. [doi: 10.1056/NEJMp1906790] [Medline: 31532957]
43. Kochar A, Rymer J, Samad Z, Duke Cardiovascular Education Group. Disrupting fellow education through group texting: WhatsApp in fellow education? J Am Coll Cardiol 2018 Dec 25;72(25):3366-3369 [FREE Full text] [doi: 10.1016/j.jacc.2018.11.007] [Medline: 30573034]
44. Coleman E, O'Connor E. The role of WhatsApp in medical education; a scoping review and instructional design model. BMC Med Educ 2019 Jul 25;19(1):279 [FREE Full text] [doi: 10.1186/s12909-019-1706-8] [Medline: 31345202]
45. Raiman L, Antbring R, Mahmood A. WhatsApp messenger as a tool to supplement medical education for medical students on clinical attachment. BMC Med Educ 2017 Jan 06;17(1):7 [FREE Full text] [doi: 10.1186/s12909-017-0855-x] [Medline: 28061777]
46. Ranjan R, Jain A, Baghel AS. WhatsApp-assisted learning of anatomy as an adjuvant to traditional classroom learning: achievements and prospect. IJAR 2017 Mar 31;5(1.3):3659-3664. [doi: 10.16965/ijar.2017.133]
47. Dyavarishetty PV, Patil DC. An interventional study to assess the effectiveness of 'WhatsApp' as a teaching learning tool in community medicine. Int J Community Med Public Health 2017 Jun 23;4(7):2564. [doi: 10.18203/2394-6040.ijcmph20172860]
48. Kassirer JP. Images in clinical medicine. N Engl J Med 1992 Mar 19;326(12):829-830. [doi: 10.1056/nejm199203193261211]
49. New England Journal of Medecine Instagram page. URL: https://www.instagram.com/nejm [accessed 2020-03-10]
50. rishimd Instagram page. URL: https://www.instagram.com/rishimd/?hl=en [accessed 2021-03-31]

51. yourheartdoc Instagram page. URL: https://www.instagram.com/yourheartdoc/?hl=en [accessed 2021-03-31]
52. heart.beat.doctor Instagram page. URL: https://www.instagram.com/heart.beat.doctor/?hl=en [accessed 2021-03-31]
53. austinchiangmd Instagram page. URL: https://www.instagram.com/austinchiangmd/?hl=en [accessed 2021-03-31]
54. drjrutland Instagram page. URL: https://www.instagram.com/drjrutland/?hl=en [accessed 2021-03-31]
55. Park JH, Christman MP, Linos E, Rieder EA. Dermatology on Instagram: an analysis of hashtags. J Drugs Dermatol 2018 May 01;17(4):482-484 [FREE Full text] [Medline: 29601627]
56. Chandawarkar AA, Gould DJ, Stevens WG. Insta-grated plastic surgery residencies: the rise of social media use by trainees and responsible guidelines for use. Aesthet Surg J 2018 Oct 14;38(10):1145-1152. [doi: 10.1093/asj/sjy055] [Medline: 29474525]
57. Dorfman R, Vaca E, Mahmood E, Fine N, Schierle C. Plastic surgery-related hashtag utilization on Instagram: implications for education and marketing. Aesthet Surg J 2018 Mar 15;38(3):332-338. [doi: 10.1093/asj/sjx120] [Medline: 29040378]
58. Shafer S, Johnson MB, Thomas RB, Johnson PT, Fishman EK. Instagram as a vehicle for education: what radiology educators need to know. Acad Radiol 2018 Jun;25(6):819-822. [doi: 10.1016/j.acra.2018.03.017] [Medline: 29751861]
59. Gauthier TP, Spence E. Instagram and clinical infectious diseases. Clin Infect Dis 2015 Jul 01;61(1):135-136. [doi: 10.1093/cid/civ248] [Medline: 25805305]
60. Alasnag M, Mamas M, Fischman D, Brugaletta S, Safirstein J, Meier P, et al. View point on social media use in interventional cardiology. Open Heart 2019 May 22;6(1):e001031 [FREE Full text] [doi: 10.1136/openhrt-2019-001031] [Medline: 31218008]
61. McMahon G, Ingelfinger J, Campion E. Videos in clinical medicine — a new Journal feature. N Engl J Med 2006 Apr 13;354(15):1635-1635. [doi: 10.1056/NEJMe068044]
62. Katz M, Krinock M, Shah K, Shirani J. YouTube education improves patient understanding of management of bleeding on dual antiplatelet therapy. 2020 Jul 26 Presented at: 1st Annual Association for Healthcare Social Media Virtual Conference; July 26, 2020; virtual meeting.
63. Ahmad T, Sattar K, Akram A. Medical professionalism videos on YouTube: content exploration and appraisal of user engagement. Saudi J Biol Sci 2020 Oct;27(9):2287-2292 [FREE Full text] [doi: 10.1016/j.sjbs.2020.06.007] [Medline: 32884409]
64. Jaffar AA. YouTube: an emerging tool in anatomy education. Anat Sci Educ 2012;5(3):158-164. [doi: 10.1002/ase.1268] [Medline: 22383096]
65. Azer SA. Mechanisms in cardiovascular diseases: how useful are medical textbooks, eMedicine, and YouTube? Adv Physiol Educ 2014 Jul;38(2):124-134 [FREE Full text] [doi: 10.1152/advan.00149.2013] [Medline: 25039083]
66. Mama Doctor Jones YouTube page. URL: https://www.youtube.com/channel/UCrPhcbDwqWRc-3tteE2BS6g [accessed 2021-03-31]
67. Doctor Mike YouTube page. URL: https://www.youtube.com/channel/UC0QHWhjbe5fGJEPz3sVb6nw [accessed 2021-03-31]
68. Centers for Disease Control and Prevention YouTube page. URL: https://www.youtube.com/user/CDCStreamingHealth [accessed 2021-03-31]
69. American Heart Association YouTube page. URL: https://www.youtube.com/user/americanheartassoc [accessed 2021-03-31]
70. Cleveland Clinic YouTube page. URL: https://www.youtube.com/user/ClevelandClinic [accessed 2021-03-31]
71. Mayo Clinic YouTube page. URL: https://www.youtube.com/user/mayoclinic [accessed 2021-03-31]
72. Houston Methodist DeBakey CV Education YouTube page. URL: https://www.youtube.com/channel/UCb8PGmJ6SILfyOvOWJvHZIg [accessed 2021-03-31]
73. Osmosis YouTube page. URL: https://www.youtube.com/channel/UCNI0qOojpkhsUtaQ4_2NUhQ [accessed 2021-03-31]
74. OnlineMedEd YouTube page. URL: https://www.youtube.com/channel/UC05SuYpXwFiwfrT9dBjYuPg [accessed 2021-03-31]
75. Dr. Najeeb Lectures YouTube page. URL: https://www.youtube.com/user/DoctorNajeeb [accessed 2021-03-31]
76. AhnJ, InboriboonPC, BondMC. Podcasts: accessing, choosing, creating, and disseminating content. J Grad Med Educ 2016;8:6. [doi: 10.4300/jgme-d-16-00205.1]
77. Little A, Hampton Z, Gronowski T, Meyer C, Kalnow A. Podcasting in medicine: a review of the current content by specialty. Cureus 2020 Jan 21;12(1):e6726 [FREE Full text] [doi: 10.7759/cureus.6726] [Medline: 32104642]
78. Chiu C. The Curbsiders - An Internal Medicine Podcast. URL: https://thecurbsiders.com/ [accessed 2020-12-29]
79. Mandrola J. This Week in Cardiology Podcast. Medscape. 2020 Dec 18. URL: https://www.medscape.com/viewarticle/942875 [accessed 2020-12-29]
80. Fuster V. JACC Podcasts. Journal of the American College of Cardiology. URL: https://www.jacc.org/journal/jacc/podcasts [accessed 2020-12-29]
81. Cho D, Cosimini M, Espinoza J. Podcasting in medical education: a review of the literature. Korean J Med Educ 2017 Dec;29(4):229-239 [FREE Full text] [doi: 10.3946/kjme.2017.69] [Medline: 29207454]
82. Riddell J, Swaminathan A, Lee M, Mohamed A, Rogers R, Rezaie SR. A survey of emergency medicine residents' use of educational podcasts. West J Emerg Med 2017 Mar;18(2):229-234 [FREE Full text] [doi: 10.5811/westjem.2016.12.32850] [Medline: 28210357]

83. A thread: Communications in a public health crisis are as crucial as medical intervention. in fact, communications policies ARE a medical intervention. We can do much better so here goes: (1/25). @HeidiTworek. 2020 Mar 18. URL: https://twitter.com/heiditworek/status/1240340632666701824 [accessed 2020-04-16]
84. Lima D, Lopes M, Brito A. Social media: friend or foe in the COVID-19 pandemic? Clinics (Sao Paulo) 2020;75:e1953 [FREE Full text] [doi: 10.6061/clinics/2020/e1953] [Medline: 32428114]
85. Farr C. This doctor is recruiting an army of medical experts to drown out fake health news on Instagram and Twitter. CNBC. 2019 Jun 02. URL: https://www.cnbc.com/2019/05/31/doctor-recruiting-doctors-to-fight-fake-health-info-on-social-media.html [accessed 2020-03-26]
86. Association for Healthcare Social Media. URL: https://ahsm.org/ [accessed 2020-05-06]
87. Merolli M, Gray K, Martin-Sanchez F. TASoMe: validating a framework to generate evidence about health outcomes from social media use. Stud Health Technol Inform 2018;247:606-610. [Medline: 29678032]
88. Shoebotham A, Coulson NS. Therapeutic affordances of online support group use in women with endometriosis. J Med Internet Res 2016 May 09;18(5):e109 [FREE Full text] [doi: 10.2196/jmir.5548] [Medline: 27160641]
89. Maldonado G. Role of digital scholarship on promotion and tenure guidelines of LCME accredited medical schools. Thesis. University of California Irvine. 2019. URL: https://escholarship.org/uc/item/4xq4p03c [accessed 2021-03-31]
90. Priem J. Altmetrics. In: Cronin B, Sugimoto CR, editors. Beyond bibliometrics: harnessing the multidimensional indicators of scholarly impact. Cambridge, MA: MIT Press; 2014.
91. Sterling M, Leung P, Wright D, Bishop TF. The use of social media in graduate medical education: a systematic review. Acad Med 2017 Jul;92(7):1043-1056 [FREE Full text] [doi: 10.1097/ACM.0000000000001617] [Medline: 28225466]
92. Pander T, Pinilla S, Dimitriadis K, Fischer M. The use of Facebook in medical education—a literature review. GMS Z Med Ausbild 2014;31(3):Doc33 [FREE Full text] [doi: 10.3205/zma000925] [Medline: 25228935]

Abbreviations

CDC: US Centers for Disease Control and Prevention
IBD: inflammatory bowel disease
NEJM: New England Journal of Medicine
TASoMe: Therapeutic Affordances of Social Media

Edited by G Eysenbach; submitted 21.11.20; peer-reviewed by A Chiang, A Mohamed; comments to author 26.12.20; revised version received 12.01.21; accepted 19.01.21; published 12.04.21.

Please cite as:
Katz M, Nandi N
Social Media and Medical Education in the Context of the COVID-19 Pandemic: Scoping Review
JMIR Med Educ 2021;7(2):e25892
URL: https://mededu.jmir.org/2021/2/e25892
doi:10.2196/25892
PMID:33755578

Original Paper

Analysis of Cyberincivility in Posts by Health Professions Students: Descriptive Twitter Data Mining Study

Jennie C De Gagne[1*], PhD, DNP; Eunji Cho[2*], PhD; Sandra S Yamane[3*], DNP; Haesu Jin[4*], BSN; Jeehae D Nam[5*], BA; Dukyoo Jung[6*], PhD

[1]School of Nursing, Duke University, Durham, NC, United States

[2]School of Nursing, Vanderbilt University, Nashville, TN, United States

[3]Department of Nursing, Catawba College, Salisbury, NC, United States

[4]Division of Hematologic Malignancies and Cellular Therapy, Duke University Medical Center, Durham, NC, United States

[5]Global Health Institute, Duke University, Durham, NC, United States

[6]College of Nursing, Ewha Womans University, Seoul, Republic of Korea

[*]all authors contributed equally

Corresponding Author:
Dukyoo Jung, PhD
College of Nursing, Ewha Womans University
52 Ewhayeodae-gil, Seodaemun-gu,
Seoul, 03760
Republic of Korea
Phone: 82 2 3277 6693
Fax: 82 2 3277 2850
Email: dyjung@ewha.ac.kr

Abstract

Background: Health professions students use social media to communicate with other students and health professionals, discuss career plans or coursework, and share the results of research projects or new information. These platforms allow students to share thoughts and perceptions that are not disclosed in formal education settings. Twitter provides an excellent window through which health professions educators can observe students' sociocultural and learning needs. However, despite its merits, cyberincivility on Twitter among health professions students has been reported. *Cyber* means using electronic technologies, and *incivility* is a general term for bad manners. As such, *cyberincivility* refers to any act of disrespectful, insensitive, or disruptive behavior in an electronic environment.

Objective: This study aims to describe the characteristics and instances of cyberincivility posted on Twitter by self-identified health professions students. A further objective of the study is to analyze the prevalence of tweets perceived as inappropriate or potentially objectionable while describing patterns and differences in the instances of cyberincivility posted by those users.

Methods: We used a cross-sectional descriptive Twitter data mining method to collect quantitative and qualitative data from August 2019 to February 2020. The sample was taken from users who self-identified as health professions students (eg, medicine, nursing, dental, pharmacy, physician assistant, and physical therapy) in their user description. Data management and analysis were performed with a combination of SAS 9.4 for descriptive and inferential statistics, including logistic regression, and NVivo 12 for descriptive patterns of textual data.

Results: We analyzed 20 of the most recent tweets for each account (N=12,820). A total of 639 user accounts were analyzed for quantitative analysis, including 280 (43.8%) medicine students and 329 (51.5%) nursing students in 22 countries: the United States (287/639, 44.9%), the United Kingdom (197/639, 30.8%), unknown countries (104/639, 16.3%), and 19 other countries (51/639, 8.0%). Of the 639 accounts, 193 (30.2%) were coded as having instances of cyberincivility. Of these, 61.7% (119/193), 32.6% (63/193), and 5.7% (11/193) belonged to students in nursing, medicine, and other disciplines, respectively. Among 502 instances of cyberincivility identified from 641 qualitative analysis samples, the largest categories were profanity and product promotion. Several aggressive or biased comments toward other users, politicians, or certain groups of people were also found.

Conclusions: Cyberincivility is a multifaceted phenomenon that must be considered in its complexity if health professions students are to embrace a culture of mutual respect and collaboration. Students' perceptions and reports of their Twitter experiences offer insights into behavior on the web and the evolving role of cyberspace, and potentially problematic posts provide opportunities for teaching digital professionalism. Our study indicates that there is a continued need to provide students with guidance and training regarding the importance of maintaining a professional persona on the web.

(JMIR Med Educ 2021;7(2):e28805) doi:10.2196/28805

KEYWORDS

cyberincivility; digital professionalism; health professions students; social media; social networking sites; Twitter

Introduction

Background

Over the past decades, social networking services have significantly improved communication and connection for millions of people worldwide. Twitter has been a particularly popular social networking platform since its launch in 2006 and currently has more than 330 million active users per month [1]. This platform enables users to post a short message with images or videos, exchange ideas or information with other users, and customize their information streams via a unique subscribing function (ie, following) [1]. The microblogging feature of Twitter allows users to share their thoughts within a limited number of characters, thus helping them to reorganize and polish their ideas concisely [2,3]. Owing to its ubiquitous nature, simplicity, and user connectivity, Twitter is widely used for a variety of purposes.

Twitter and Health Professions

A growing body of research has identified Twitter as a useful tool for health care provider development [4,5]. Health care providers and health professions students use Twitter in various ways, including for intraprofessional and interprofessional mentoring and networking [6-8], knowledge development and discussion [9], idea and information sharing [10], teaching and learning [11,12], and contacting or communicating with patient groups [5,13,14]. Twitter is well positioned as a creative and convenient tool to help health care providers and health professions students develop skills beyond traditional boundaries [15].

Despite its advantages, previous studies on social media, including Twitter, have identified potential problems that may arise from misuse and misinterpretation. Health care professionals are among the sources of health-related information most trusted by the public [16]. Although students are not yet licensed experts, by sharing tweets while disclosing their identities as health professions students, they can earn public trust; conversely, their improper use of Twitter can have unexpected consequences. For instance, tweets perceived as misleading or lacking in sensitivity may cause the information conveyed to be perceived as inaccurate or may unintentionally offend some audiences, and such tweets can be preserved permanently [17].

Health care providers and health professions students can invade patients' privacy by disclosing their personal information on Twitter or by sharing detailed clinical scenarios that the patients or their acquaintances can easily recognize [18]. Moreover, by displaying profanity, offensive language, aggression toward other health professionals, product promotion, violence, or any violation of patient confidentiality on Twitter, they could damage their reputation or lose public confidence [19-21]. Such misuses of Twitter can undermine its potential benefits, create misconceptions about health care professionals, and affect the privacy of health care providers and their colleagues and patients.

To maximize the benefits of Twitter use by health professions students, it is essential to promote cybercivility, or behavior in an electronic environment that reflects the norms and mutual respect that characterize the professional culture to which users belong and the society in which they live, learn, and work. In contrast to cybercivility, cyberincivility is defined as "direct and indirect interpersonal violation involving disrespectful, insensitive, or disruptive behavior of an individual in an electronic environment that interferes with another person's personal, professional, or social well-being, as well as one's learning" [22]. An understanding of the prevalence and properties of cyberincivility among health professions students can provide the foundational knowledge needed to develop instructional strategies and administrative guidelines regarding the use of social networking services to promote and maintain cybercivility in health professions education.

Research Aim

This study aims to describe the characteristics and instances of cyberincivility posted on Twitter by self-identified health professions students. The specific objectives were to (1) analyze the prevalence of tweets that could be perceived as inappropriate or potentially objectionable for a health professions student and (2) describe the patterns and differences in instances of cyberincivility posted by those users.

Methods

Design and Sample

We used a cross-sectional Twitter data mining method to collect quantitative and qualitative data from August 2019 to February 2020. The sample was taken from health professions students in various disciplines, including medicine, nursing, dental, pharmacy, physician assistant, and physical therapy. We included only tweets written in English by users who self-identified as health professions students on their user description, but we did not limit the geographic location. cross-sectional Twitter data mining method

Ethical Considerations

This study was reviewed and declared exempt by the institutional review board of Duke University (Pro00106123). To protect users' privacy and their digital rights, we deidentified all identifiable personal information (eg, name, user identification, location, and affiliation) after data analysis. We also paraphrased all quotes presented as examples to prevent backtracking while maintaining their original meanings. Only data relevant to the purpose of this study were collected, and a secure, shared drive was used to store and manage all research data.

Data Collection: Eligible Twitter Account List Development

Initially, we identified potential user accounts by searching for 50 hashtags (Textbox 1) through the desktop version of BirdIQ v1.6 [23], a cross-platform data extraction program tailored to Twitter queries using preselected hashtags. The search results were returned in a multitabbed Microsoft Excel [24] workbook that included tweeting accounts.

The search terms (Textbox 1) allowed us to compile original tweets that were written in English and contained a designated hashtag over a given period (ie, August 28, 2019, to September 25, 2019). We set the time interval to 1 week and ran the BirdIQ program once a week on the same day of the week and at the same time. As a result of this process, 12,360 tweets containing one or more of the 50 hashtags were collected over 5 weeks. After removing duplicates, the remaining 10,267 tweets were linked to 5671 accounts. We removed 1556 duplicates and excluded accounts based on the inclusion and exclusion criteria summarized in Textbox 2.

Textbox 1. Hashtag list.

Medical students:

- #medicalstudent; #medschool; #medicalschool; #usmleprep; #usmlepreparation; #usmlexam; #usml; #futuredoctor; #medicalcollege; #medschoolthings; #medstudenttwitter; #premed; #medstudentlife; #medstudentblog; #lifeofamedstudent; #medical_student

Nursing students:

- #studentnurse; #nursingstudentproblems; #nursingschool; #nclexrnexam; #adnstudent; #bsnstudent; #msnstudent; #dnpstudent; #futurebsnrn; #futurern; #futurenurse; #futurenp; #futurenursepractitioner

Students in other disciplines (dental, pharmacy, physician assistant, and physical therapy):

- #dentalschool; #dentalstudent; #nbde; #futuredentist; #physicianassistantstudent; #PAschool; #futurePA; #PANCE; #pharmacystudent; #futurepharmacist; #pharmacyschool; #NAPLEX; #futurehealthcareprovider; #futurehealthprofessional; #healthstudent; #health_student; #futurephysicaltherapist; #futurePT; #PTstudent

A search string example:

- #nursingstudent -filter:retweets lang:en since:2019-9-17 until:2019-9-23.

Textbox 2. Account inclusion and exclusion criteria.

Account inclusion criteria:

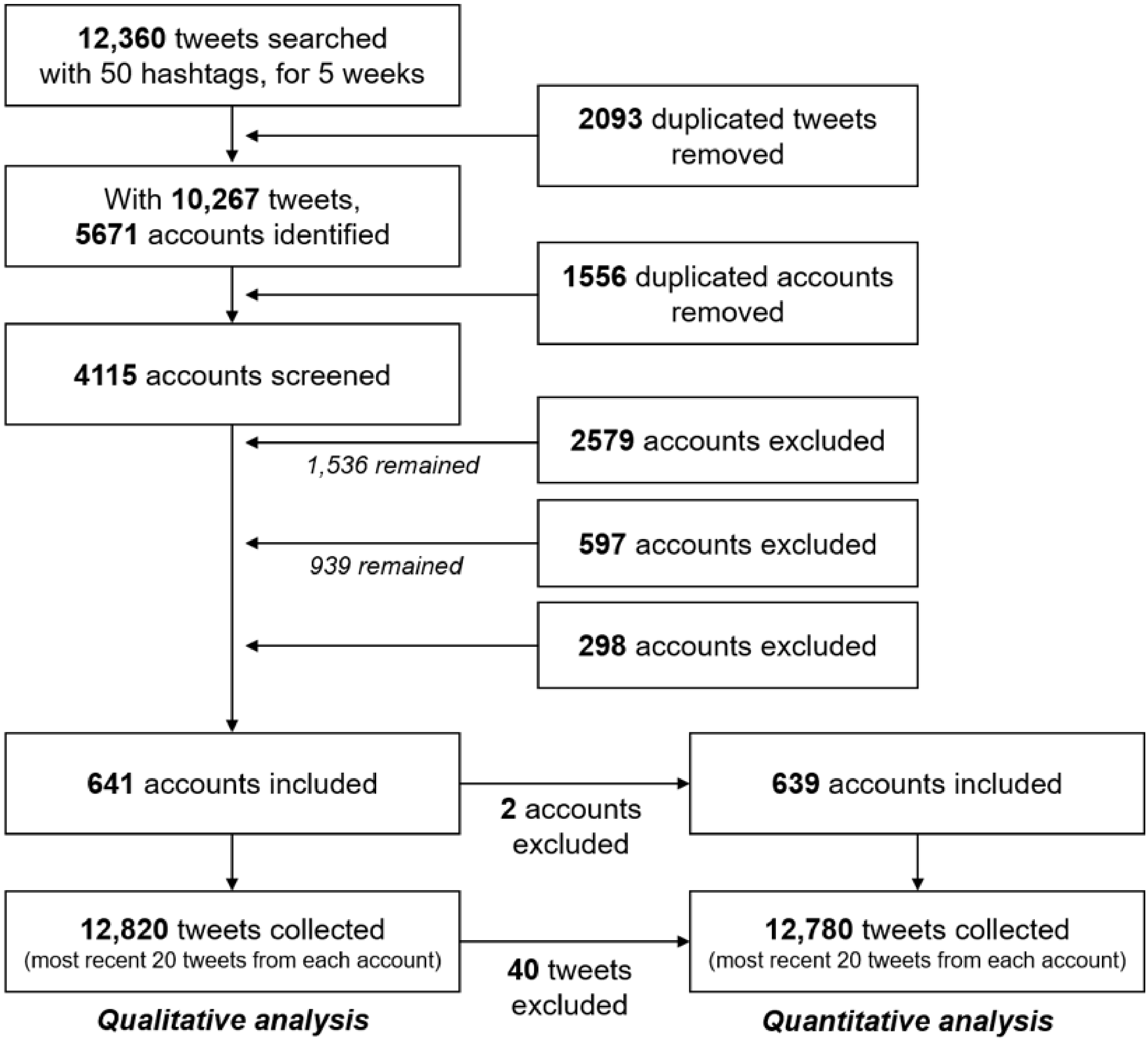
- Belongs to a student identified as a current health professions student (ie, medicine, nursing, dental, physician assistant, and physical therapy) on the user description
- Is written primarily in English
- Has more than 100 followers at the time of data collection
- Has more than 50 tweets written at the time of data collection
- Is open to public

Account exclusion criteria:

- Belongs to a postlicensure professional in clinical clerkship
- Belongs to a student not self-identified as such on the user description
- Belongs to a premed, prenursing, or research-only PhD student
- Suspended or locked over the course of data collection
- Is institutional, with an aim to provide information, education, or commercial advertisements to health professions students
- Has over 70% of tweets not written in English

Owing to the floating nature of Twitter [5], the users made changes to their accounts during the data collection period. It was difficult to exclude all ineligible accounts with one screening, so 2 researchers (EC and HJ) independently reviewed each account's profile and content 3 times. We held regular team meetings, discussed the eligibility of accounts based on the criteria, cross-checked the results, and agreed to create additional cut-off criteria (ie, the number of overall tweets and followers) for the final screening (Figure 1). After multiple screenings of ineligible accounts (eg, deleted, banned, locked, or user graduated during the screening; Textbox 3), we ended with a total of 641 health professions student accounts for qualitative analysis and 639 for quantitative analysis (Figure 2).

Figure 1. A flow diagram to depict data mining and sampling procedures. PA: physician assistant; PT: physical therapy.



Textbox 3. Account exclusion criteria for multiple screening.

Account exclusion criteria for first screening (n=2579):

- Not a health professions student account (eg, school, institution, administrator, organization, commercial, business, research only, and not relevant); uses language other than English; user not in nursing, medicine, physician assistant, physical therapy, dental, and pharmacy fields; and not open to public

Account exclusion criteria for second screening (n=597):

- User currently working as a health care professional; unclear user identity; and not open to public

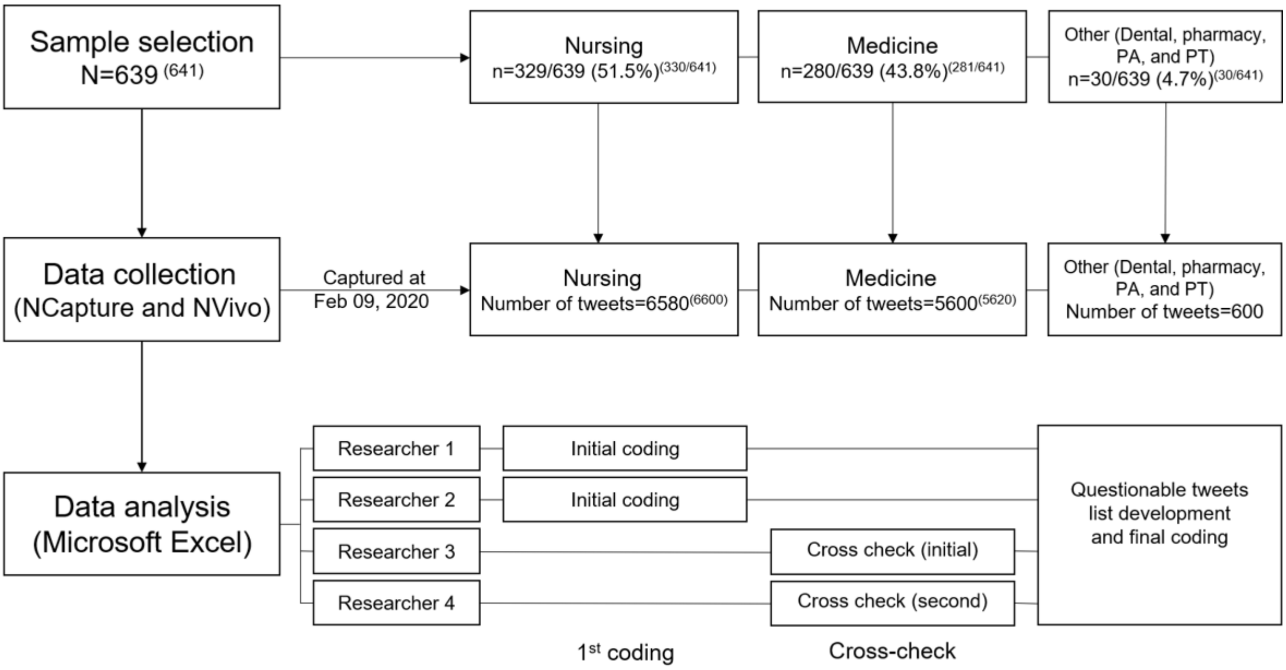
Account exclusion criteria for third screening (n=298):

- Less than 100 followers; less than overall 50 tweets; uses language other than English; not a current student account; and not open to public

Account exclusion criteria for fourth screening (n=2; 40 tweets):

- Deleted and unable to check profile images

Figure 2. User account selection and data analysis process. PA: physician assistant; PT: physical therapy. Number of data used for analysis is provided within parenthesis in superscript.



Data Collection

All tweets from 641 accounts were collected through NCapture [25], a free web browser extension tool that allows users to capture the content of web pages, Twitter, and Facebook to import into NVivo (QSR International Pty Ltd). Owing to the uncontrollably large number of total tweets (n=3,415,798), each account's 20 most recent tweets were purposefully selected and analyzed (N=12,820).

The definition of tweets characterized by incivility (ie, "those written in [an] ill-mannered, disrespectful [way], or containing annoying, derogatory, disruptive, or aggressive remarks") and various types of a priori codes and their definitions were adopted from the study by De Gagne et al [19] on cyberincivility in Twitter accounts of nurses and nursing students (Table 1). Initially, 2 researchers (EC and HJ) independently examined all 12,820 tweets and identified instances of incivility based on the given definitions. Any unclear tweets were marked as *not sure*. After the initial coding, 2 coders (EC and HJ) had a team meeting and cross-checked the results. Then, a third and fourth coder (SSY and JCD) reviewed all tweets containing inappropriate or potentially objectionable content (cyberincivility) and the tweets marked as *not sure* and provided reasons for their views. When all 4 coders were familiar with the tweets, the team held a meeting to finalize the data set of tweets containing cyberincivility. When the research team identified tweets that fell into gray areas, they considered whether they would post such tweets themselves if they were health professions students and whether they would post them to their Twitter accounts while disclosing their identity; when team members determined that they would not, we categorized those tweets as instances of cyberincivility.

Table 1. Codebook used in the study.

Type of incivility	Definition
Profanity[a]	The use of abusive, vulgar, or irreverent words, images, symbols, or acronyms, including wtf, lmfao, or lmao
Product promotion[a]	The promotion to prospective buyers of commercial health or medical products unsupported by evidence through referral to promotional sites or dissemination of information about the product line, brand, or company
Sexually explicit or suggestive[a]	The depiction, description, or suggestion of nudity or sexual content to belittle, degrade, intimidate, humiliate, or harm
Demeaning to patients[a]	Remarks or attitudes toward patients, including body donors, that lack dignity and respect
Name-calling	The use of abusive names to belittle, degrade, intimidate, humiliate, or harm
Rude comments	Comments lacking the respect considered normal in society or conveying contempt with a design to offend, humiliate, or harm
Interprofessional aggression[a]	Expressions of direct/indirect, hostile/subtle, derogatory, or negative attitudes across the health professions
Alcohol and drugs[a]	Depictions of or remarks about health issues such as intoxication that denigrate, condemn, or humiliate a community or its members rather than contributing to safety or education
Violation of privacy and anonymity[b]	Remarks about or images of patients that reveal confidential information or that could be used to identify a patient
Bias and stereotyping references[b]	Prejudicial, discriminatory, or negative remarks or expressions about a culture or a person's racial, ethnic, religious, gender, or sexual orientation
Intraprofessional aggression[a]	Remarks or expressions of direct/indirect, hostile/subtle, derogatory, or negative attitudes within a given health profession community
Violence[a]	Graphic images or descriptions that glorify violence, suffering, or humiliation or encourage participation
Risky behaviors[a]	Content that encourages, glorifies, or celebrates reckless or unhealthy behaviors, such as speeding, unprotected sex, or hazing that carry a risk of negative results or could lead to loss or harm

[a]Revised definition from the study by De Gagne et al [19].

[b]Revised code from the study by De Gagne et al [19].

Data Analysis and Rigor

The quantitative data (n=639) were analyzed using SAS version 9.4 (SAS Institute Inc). Descriptive statistics were used to summarize user and account characteristics, including gender; country; type of health discipline; presence of profile images or user descriptions that could be perceived as inappropriate or potentially objectionable; and the number of total tweets, followers, and instances of cyberincivility. We calculated the univariate odds of the presence of cyberincivility for the user and the account characteristics mentioned above with logistic regression.

The qualitative content of tweets containing incivility was analyzed using Microsoft Excel. We performed consensus coding to classify each tweet that could be perceived as inappropriate or potentially objectionable [26]. While using the a priori codes in the findings by De Gagne et al [19], the coding team discussed whether we needed to expand or modify the definition of certain codes or add a new code that could emerge in this study. The team collaborated to create a final set of codes and definitions and consulted a professional editor who provided the team with constructive comments and revisions (Table 1). Then, the coding team independently coded the instances of cyberincivility, cross-checked them, and discussed any discrepancies or disagreements arising among coders to ensure reliability [26]. To ensure the rigor of the qualitative data analysis, all coding team members held regular team meetings during the entire analysis process.

Results

Sample Characteristics and Instances of Cyberincivility

A total of 639 accounts were analyzed for quantitative analysis. Of the total 639 accounts, users included 280 (43.8%) medical students, 329 (51.5%) nursing students, and 30 (4.7%) others in 22 countries: 287 (44.9%) from the United States, 197 (30.8%) from the United Kingdom, 104 (16.3%) from unknown countries, and 51 (8.0%) from other 19 countries. The sample comprised primarily female users (489/639, 76.5%) along with 20.8% (133/639) male users and 2.7% (17/639) gender-unknown users. The mean number of followers for each account and the mean number of tweets were 2361.28 (SD 43,443.8) and 5343.50 (SD 10,168.8), respectively. Among the 639 users analyzed for quantitative analysis, 193 (30.20%) tweeted instances of cyberincivility at least once over the 5-week period and had 2.71 instances on average (SD 2.60), with a maximum of 18 and a median of 4. Of the 193 users, 61.66% (119), 32.64% (63), and 5.7% (11) were students in nursing, medicine, and other disciplines, respectively (Table 2).

Table 2. Sample characteristics of users (N=639).

Characteristics	Value
Discipline, n (%)	
Medicine	280 (43.8)
Nursing	329 (51.5)
Others	30 (4.7)
Gender, n (%)	
Female	489 (76.5)
Male	133 (20.8)
Unknown	17 (2.7)
Country, n (%)	
United States	287 (44.9)
United Kingdom	197 (30.8)
Others	51 (8.0)
Unknown	104 (16.3)
Number of followers	
Mean (SD)	2361.28 (43443.80)
Median	323.0
Number of tweets	
Mean (SD)	5343.50 (10168.81)
Median	1463.0
Instances of cyberincivility[a], n (%)	
Absence	446 (69.8)
Presence	193[a] (30.2)
Cyberincivility by disciplines (n=193)[a]; n (%)	
Medicine	63[a] (32.6)
Nursing	119 (61.7)
Others	11 (5.7)

[a]One medical student account was excluded from the quantitative analysis, as some information could not be verified because of account deletion.

The characteristics of accounts with instances of cyberincivility are presented in Table 3, with odds ratios (ORs). Findings from the logistic regression analysis revealed that gender-unknown users were more likely to exhibit instances of cyberincivility than female users (OR 4.9194, 95% CI 1.6086-15.8640). Twitter users with profile pictures that could be perceived as inappropriate or potentially objectionable were more likely to display instances of cyberincivility (OR 3.3484, 95% CI 1.2389-10.0217). Twitter users in nursing were more likely to exhibit instances of cyberincivility than users in medicine (OR 2.1100, 95% CI 1.3009-3.4504). Twitter users from the United States were more likely to display instances of cyberincivility than users from the United Kingdom (OR 3.2172, 95% CI 1.8678-5.6490). Twitter users with fewer followers were more likely to post tweets categorized as instances of cyberincivility (OR 0.5477, 95% CI 0.3033-0.9493). In addition, when they tweeted more often, they were more likely to post cyberincivility (OR 4.6938, 95% CI 3.2626-6.8807). When the number of tweets was equal to 100, if the number of tweets increased by 10%, the odds of the probability of instances of cyberincivility increased to 4.6938 (Table 3).

Table 3. Association of Twitter account characteristics with presence of cyberincivility through logistic regression fit.

Characteristics	Estimated coefficient	OR[a] (95% CI)	*P* value
Gender (reference: female)			
Male	0.02876	0.9716 (0.5572-1.6702)	.92
Unknown	1.59319	4.9194 (1.6086-15.8640)	.005
Picture profile (reference: appropriate)			
Inappropriate or potentially objectionable	1.20850	3.3484 (1.2389-10.0217)	.02
Discipline (reference: medicine)			
Nursing	0.74669	2.1100 (1.3009-3.4504)	.002
Others	0.40821	1.5041 (0.6000-3.6218)	.37
Country (reference: United Kingdom)			
United States	1.16851	3.2172 (1.8678-5.6490)	<.001
Other	0.87034	2.3877 (0.9871-5.6001)	.048
Unknown	1.15787	3.1831 (1.7089-5.9744)	<.001
Number of followers this account has	-0.60209	0.5477 (0.3033-0.9493)	.04
Number of tweets issued by the user	1.54624	4.6938 (3.2626-6.8807)	<.001

[a]OR: odds ratio.

Patterns of Cyberincivility

Over the 5-week period, 3.92% (502/12,820) tweets categorized as instances of cyberincivility were generated by 193 users, comprising 119 nursing (323/502, 64.3%), 64 medicine (155/502, 30.9%), and 10 other health professions students (24/502, 4.8%). Most tweets were collected from the United States (300/502, 59.8%), the United Kingdom (53/502, 10.6%), and Australia (12/502, 2.4%); in addition, 21.5% (108/502) of tweets were collected from unknown locations. A total of 5.8% (29/502) of tweets were collected from 8 other countries that did not have a considerable number of tweets (range 1-10). Of the 502 tweets identified as instances of cyberincivility, 15.5% (78/502) were related to the user's health profession or school life, and 84.5% (424/502) were related to their personal life. The major categories of the personal life domain were profanity (218/502, 43.4%), product promotion (53/502, 10.6%), and rude comments (42/502, 8.4%). Profanity (37/502, 7.4%) was the most frequent category in the school life domain. The tweets were original posts, responses to other users' posts, or posts quoted. The frequencies of each code in the personal life and school life domains are shown in Multimedia Appendix 1.

Personal tweets covered a wide range of topics, including entertainment, everyday thoughts and events, relationships, sports, product promotion, service evaluation, and politics. Inappropriate or potentially objectionable tweets in the school life domain were not as prevalent as those in the personal life domain. Tweets in the school life domain that could be perceived as inappropriate or potentially objectionable often expressed students' frustration or stress with their school (eg, coursework, assignments, grades, exams, and tuition) or aggressively referred to interactions in health care settings or during clinical practice. Some users expressed dissatisfaction with their school's financial aid office's expectations or described the stressful nature of the nursing school. A minor number of tweets in the school life domain contained aggressive criticism regarding community health issues or public health policies. One user tweeted about laws that pertained to miscarriage and self-inflicted abortion in what might be interpreted as an opinionated and offensive manner. In tweets categorized as the school life domain, a few users applied school-related hashtags (eg, #medstudenttwitter; #medstudents).

Of the 502 tweets identified as instances of cyberincivility, profanity (255/502, 50.8%) was found most frequently in both the personal life domain (218/502, 43.4%) and the school life domain (37/502, 7.4%). Although the context in which it was used varied, the profanity was generally pointed and direct (eg, expressing frustration with a patient interaction). In some cases, profanity was used to emphasize casual feelings and thoughts. For example, many students used "f**k," "bit**," "sh*t," or the acronym "Lmfao" ("Laughing my f***ing ass off"). Students expressed high levels of dissatisfaction with their elected leaders' decisions, yet few tweeted profanities at the politicians. Some users tweeted profanity about sports performances or shared and referenced music among other accounts that used profanity. One student tweeted that their progress in school was an "absolute sh*t show." Sometimes, users used some profanity but censored it with asterisks (ie, F**K). We found 5 accounts that contained profane gestures or words in their profile or header images. Furthermore, there were product promotion-related tweets (60/502, 12.0%) that advertised commercial products, places, websites, or accounts. One tweet referenced traveling around the city and promoted a code for free rides. Some students directly tagged a commercial Twitter account running a money-drawing event and asked for money to pay for their student loan. Some tweets often promoted free show or movie tickets or mobile apps, and a few students shared their customer codes for an extra discount for specific products.

Among 502 tweets coded as instances of cyberincivility, 7.4% (37/502) were of a sexually explicit or suggestive nature, which occurred most frequently in the personal life domain (35/37, 94.6%). In addition, 3.1% (20/639) of users' profile pictures or images were coded as potentially objectionable because of their sexually suggestive nature to readers or viewers. A few tweets were sexually explicit, including one user's naked selfies along with an invitation to their personal paid websites (eg, OnlyFans account). Another tweet searched for people with specific sexual fetishes. Most of the sexually explicit and suggestive tweets seemed to have a humorous yet sarcastic or cynical intent. Some tweets portrayed or described excessive alcohol drinking or drug abuse, violent or risky behaviors, or unlawful acts or displayed an image of a weapon. A few users tweeted about biased or stereotyped references to a specific gender, race/ethnicity, culture, or zodiac sign (eg, "Aquarius people are always so rude"). Name-calling (33/502, 6.6%) or tweets meant to belittle, degrade, or humiliate others often occurred between accounts as users argued and expressed disagreement (eg, "idiots") in response to tweets about current political events or as commentary; these tweets often included derogatory language and were mostly aggressive. For instance, one user referred to a political party in a dismissive manner, and one tweet contained name-calling that expressed opposition to a politician by referring to them as a "toddler" and "a disgrace." Children and older adults were the targets of 3 tweets that referred to them as disrespectful, stupid, and nasty. Furthermore, 1.4% (7/502) of tweets were coded as demeaning to patients, including tweets about drug seekers observed in the emergency department or tweets that used a mocking tone to describe patients (eg, "they look like the dead"). One user described how they had played with a cadaver's muscles in an anatomy laboratory.

A proportion of 1.6% of tweets identified as instances of cyberincivility (8/502) exhibited interprofessional (7/502, 1.4%) or intraprofessional (1/502, 0.2%) aggression. Some users tweeted within their own profession (ie, alluded to their work or school) using minor profanity (eg, "Lmao"). Tweets by medical students were dismissive of naturopathic medicine and nurse practitioners: they were mocked in one tweet, and in another tweet, they were deemed not to be a professional. We found 0.8% of those tweets (4/502) that violated privacy and anonymity by providing details of situations and dialogs concerning patients during clinical practice. Although these tweets did not include person-identifiable information, the descriptions provided were sufficiently detailed to allow possible identification by the patients or people involved. Multimedia Appendix 2 summarizes the examples of tweets from each code. All examples have been paraphrased to prevent backtracking and protect privacy while maintaining the original meaning.

Discussion

Principal Findings

The purpose of this study is to analyze Twitter content related to cyberincivility among health professions students. Our study sample consisted of a diverse group of students from 22 different countries. Unlike previous studies where a single discipline was included [19,20,27-29], this study explored cyberincivility using a global and multidisciplinary approach.

In our study, 30.2% (193/639) of the sample population engaged in cyberincivility on Twitter at least once over a period of 5 weeks, with an average of 2.71 instances of cyberincivility per user, ranging from 1 to 18 during this period. Regarding a specific discipline, 36.2% (119/329) of nursing students, 22.5% (63/280) of medical students, and 36.7% (11/30) of other health professions students were involved in cyberincivility. In a previous study by De Gagne et al [19], 36.8% of nurses and nursing students posted tweets that could have been perceived as inappropriate or potentially objectionable, which is similar to the findings of this study. The prevalence of cyberincivility among medical students was consistent with a study conducted in the United States [30] in which 21% of medical students self-reported that they had posted profanity, a depiction of intoxication, or sexually suggestive materials on social media. Peer reporting of such content was significantly more frequent than self-reporting [30], which suggests that there may be differing perceptions and opinions of propriety pertaining to social media use. The boundaries of professionalism in cyberspace are likely to be an ongoing topic of discussion among health professionals.

Our study revealed several interesting areas for future research. Gender-unknown users were more likely to engage in cyberincivility compared with users who identified as male or female. A lack of information exists on the relationship between gender identity and cyberincivility; however, gender-unknown users may not be restricted by gender identity [31]. Another interesting finding was that Twitter users with a profile picture that could be perceived as inappropriate were more likely to post potentially objectionable tweets. It has been suggested that as a means of asserting self-presence, a profile picture may provide an emotional statement and a facial image [32]; this is another area that could benefit from further study. It has been noted that social media profiles of medical doctors significantly affect potential patients' impressions of those doctors' professionalism [33]; thus, it could be worthwhile to evaluate the potential benefits of profile pictures for building provider-patient relationships and maintaining meaningful connections with the public.

Our findings showed that users from the United Kingdom were more likely to post tweets deemed appropriate than users from the United States and other countries. There have been a few studies on cyberincivility that involved international comparisons. For example, a study of German and Japanese students' communication on mobile messaging indicated that German students tended to use a direct communication style compared with Japanese students [34]. In our previous study that examined differences in cybercivility among nursing students using cross-country comparisons, we discovered that students from Hong Kong reported lower knowledge of cybercivility compared with respondents from South Korea and the United States [35]. In a study by Kim et al [35], US nursing students reported a lower frequency of cyberincivility experiences compared with students from Hong Kong and South Korea. Although it is difficult to compare our results directly with those from previous studies, they provide further evidence that cultural and societal differences may affect social media communications, thus supporting the development and implementation of proper web-based communication training from a global perspective.

Our findings revealed that Twitter users were more likely to issue potentially problematic content if they had fewer followers. These results may indicate that respondents with many followers may think more about the influence of their tweets and exercise more caution when they post messages. A small number of followers could indicate that followers are closely related to the owner of the account and are therefore not perceived as likely to be influenced or as having dissimilar opinions or social habits. We also noted that Twitter users were more likely to engage in cyberincivility if they posted tweets relatively often. These results are congruent with those of a previous study [19], showing that users who have used Twitter for a longer period may feel more comfortable with the technology and with expressing their opinions freely on even sensitive issues compared with those who have been Twitter users for a shorter period [36].

We found that the largest categories of cyberincivility were profanity and product promotion, which is consistent with the findings of a previous study [19]. Furthermore, we noticed several aggressive or biased comments toward other users, politicians, or specific groups of people. Profanity was reported to be the second most frequent unprofessional content in a study by Kitsis et al [30], which analyzed medical students' and faculty members' perceptions of unprofessional content posted on their social networking platforms. Our study showed that students often added minor profane abbreviations (eg, f**k and Lmao) to create an intimate and informal atmosphere to the content of their tweets; however, some students used profanities to show their aggression and offensive opinions toward other users, which could result in fostering similar hostility or rude behavior in their followers. According to negative behavioral contagion models, rudeness is like a cold, and this behavior can be easily activated in social networking and spread easily by any user [37]. In a study by Ryan et al [38] that examined public perspectives on digital professionalism in nursing, participants perceived profanities used generally or against individuals or groups as unacceptable and unprofessional. Such tweets have been reported as rude, disrespectful, and unprofessional in other studies of cybercivility by health professionals and students [19,39].

Although we found relatively few instances of cyberincivility in school-related tweets, their content is worth discussing. We found tweets that included demeaning comments toward specific patient groups or vulnerable populations, including children and older adults, or interprofessional or intraprofessional aggression, such as content that degraded other health professionals. For example, one medical student posted that patients should be treated by physicians rather than by advanced practice registered nurses. In a study by Kitsis et al [30], medical students and faculty perceived social media content as unprofessional if it contained derogatory remarks toward certain patient groups (ie, Medicaid patients) or negative comments about work stress, colleagues, and patients. Similarly, Kim et al [40] studied Korean clinical nurses' experiences of cyberincivility, including a lack of respect and morality within health professions. They suggested that interprofessional or intraprofessional aggression in online spaces could occur when health care professionals lacked an understanding of the roles of workers in other occupations or when users were tired from work and lost control of their emotions [40]. Researchers have also highlighted that experiences of interprofessional or intraprofessional aggression in cyberspace can increase the workload and stress of health professionals by generating mistrust and reducing teamwork [30,40]. The content of health professions students' tweets in our study reflects their perceptions, beliefs, and values, and it is possible that their communication with colleagues may indicate a lack of respect and understanding of other occupations. These findings reinforce the need to teach digital professionalism to cultivate respect from students for their peers, colleagues, and patients. The structure of social norms in digital professionalism is complex and evolves based on changing social and individual norms, values, attitudes, beliefs, and context [38]; therefore, instructional materials should include socially and culturally appropriate content and input by individuals from diverse backgrounds.

Although our data did not show many cases of cyberincivility related to privacy violation, several studies have reported social media content that could expose patients' personal information and invade their privacy [18]. Student disclosure of information about themselves and others (eg, patients or other health care providers) can lead to unexpected consequences. Ahmed et al [18] analyzed 754 tweets issued by doctors, nurses, and other professionals with a hashtag #ShareAStoryInOneTweet containing disclosures about others (eg, patients and colleagues). The content of those tweets included patients' age, name, specific time frames, clinical images, information about vulnerable groups of patients, and descriptions of direct patient care. Only 2 tweets (0.3%) included the patients' consent to share the story or information. The authors reported that a considerable number of the tweets are likely to be identifiable by patients or their acquaintances. Their study indicates that sharing clinical stories on the web, including fragmented information, is highly problematic as it can lead to recognition and identification [18] and that health professions students have a clear need for guidelines for safe and professional use of social networking sites [41].

The ubiquitous nature and advanced algorithms of social media allow fast and easy connection with others [42], but this characteristic can blur the line between health professionals (including students) and the public as well as between health care providers' private and professional lives [42-45]. There is a growing concern about the line between health care providers' privacy and professionalism. Users' personal information can be easily found through various sources in social networking platforms, including their profile images, everyday narratives, photos taken at work or home, and accounts that they follow or interest groups to which they belong [21,46,47]. Digital footprints, traces that users leave behind on the internet, are archived and can be rediscovered through a simple search [18]. For example, the recent *medbikini* controversy has provoked heated discussion of the standards of digital professionalism after authors of a now-retracted article published in the *Journal of Vascular Surgery* [48] created fake accounts on Facebook, Twitter, and Instagram to analyze the personal posts of graduating vascular surgery trainees for *potentially unprofessional* content, such as pictures of users wearing bikinis or drinking alcohol while off duty.

Researchers, educators, and regulators in health professions have been concerned that posts on the web that are perceived as unprofessional could potentially cost public trust and the professional image of health professions [21,47]. Several studies have recommended that health professionals keep their presence on the web safe and secure by separating professional and private accounts or by using the privacy options of their social media accounts [38,47,49]. Kouri et al [49] argued that health professionals cannot be *general users* of social networking platforms because their identity makes any information or content they post appear reliable and trustworthy, an argument disputed by the professional backlash to the retracted *medbikini* article [48]. Health professions are organized around specialized knowledge in addition to an ethos of duty and service. Historically, these professions have secured autonomy and prominence in the society by adopting codes of ethics and, ultimately, codes of behavior [50]. As social media will most likely continue to provide an important forum for health professions education and social discourse, the growing diversity of thoughts and perspectives about social responsibility and professional ethics should inform cybercivility training for all health professions students.

Limitations

This study is not without its limitations. First, our study was retrospective and observational and included a sample of accounts during the study period. We analyzed only 20 most recent tweets from each account, which may have skewed the findings. As a logistical challenge, Twitter users frequently change their accounts (eg, lock, ban, delete, or change user IDs) or delete their tweets, so several potential user accounts and tweets were excluded during the data collection phases. We were also solely dependent on the users' self-reported identification on their user descriptions. If they profiled themselves as health professions students and yet did not appear to be students, our ability to validate their student status was limited. Another possibility of sampling bias relates to our sample primarily consisting of nursing and medical students, with less than 5% of other health professions students (ie, dentistry, pharmacy, physical assistant, and physical therapy) being included. Future studies may explore ways to capture more diverse health professions students.

Second, our study was constrained by time limitations. The content of tweets may vary according to the time frame of the postings. In our case, we completed data collection in February 2020 when the global COVID-19 pandemic was not yet widespread, the Black Lives Matter social justice movement in the United States that followed the death of George Floyd had not commenced, and the August 2020 publication that inspired the *medbikini* issue in the medical profession had not occurred. As social networks respond rapidly to sociocultural and political contexts, these global events and social arguments might have had a significant impact on our results had the data been collected several months later.

Finally, and perhaps most importantly, we are not exempt from researchers' confirmation bias and cultural bias. Cyberincivility is an emotionally charged social issue that can lead researchers to make interpretations or seek evidence to confirm or support their preconceptions. To minimize such biases, we implemented multiple team meetings during the course of the study, as we identified and analyzed instances of cyberincivility and engaged in open discussions as to why those tweets were potentially problematic. This process was both difficult and beneficial because our team members were of diverse backgrounds and generations, and professional standards are affected by individual experience, culture, generation, life history, and social ambiance. Although it was challenging to measure interrater reliability, the rigor of the study was maintained through deep and insightful team discussions, immersion in data, and a dedicated commitment to limit conflicts arising from cultural or implicit biases [51].

Future Implications

Work environments that practice professional behavior are safer, more productive, and healthier [52]. Unprofessional behavior has been linked to burnout, absenteeism [53,54], communication breakdowns, increased errors, and decreased performance [54,55]. However, there is still no universal definition of professional behavior. The onset of social media in the last 10 years or more has made it difficult to expand the narrower frameworks of historic codes of ethics [22]. Most major health care professional organizations have published guidelines for the use of social media, and many schools of higher education have them in place as well.

Definitions and rules of professionalism are changeable and have served many functions over time [50]. The relationship between professionals and the public is tenuous, complex, and ever changing; therefore, policies regarding professional codes of behavior, social contracts, and free speech are continuously negotiated. The current and past court cases illustrate the importance of an institution's ability to define inappropriate off-campus speech. For example, in Keefe vs Adams, the eighth US Circuit Court of Appeals ruled that a nursing student could be expelled for Facebook posts that showed a lack of professionalism [56]. To prevent risks to students and institutions, educators should provide comprehensive and practical guidelines using effective and creative methods (eg, vignettes or simulations) [57,58]. Academic institutions should provide clear policies for students' social media activities and a safe forum in which all members of the community can constructively discuss controversial issues.

Conclusions

Cyberincivility is a complex social phenomenon that has an important influence on health professions education. Using the Twitter data mining approach, we analyzed the nature of incivility among health professions students to better understand this concept. Our study supports the existing evidence that cyberincivility is still observed on social media. Twitter is likely to remain a ubiquitous, simple, and convenient tool for communication and education; however, the benefits of using Twitter in health professions education can be maximized only within a culture dedicated to maintaining safe and healthy online communities. Our study shows that there is a continued need to provide students with guidance and training about their online persona and digital professionalism. Our findings have implications for designing evidence-based, intentional, and multidisciplinary cybercivility education rooted in social courtesy, professional ethics, and profound respect for others.

Acknowledgments

This research was funded by a 2019-2021 Duke University School of Nursing, Institute for Education Excellence's Educational Research Grant awarded to JCD. The authors would like to thank the Duke University Compact for Open Access Publishing Equity (COPE) program for supporting the open access publication of this manuscript. The authors also appreciate Dr Donnalee Frega for editing and proofreading the manuscript and for sharing her insights.

Authors' Contributions

JCD and EC designed the study and drafted the introduction. EC and HJ collected, screened, and cleaned the Twitter data set. JCD and EC drafted the context of the study and data collection sections. JCD and SSY developed a priori codes and their definitions. DJ analyzed the quantitative data. EC, HJ, SSY, and JCD analyzed the qualitative data iteratively. Data analysis and the results were drafted by DJ, EC, and JDN, and JCD, EC, DJ, and SSY interpreted the results and drafted the discussions. All the authors drafted the conclusions. All authors have read and approved the final manuscript.

Conflicts of Interest

None declared.

Multimedia Appendix 1
Paraphrased examples of tweets.
[PDF File (Adobe PDF File), 176 KB - mededu_v7i2e28805_app1.pdf]

Multimedia Appendix 2
Frequencies of each code in the personal and school life domains (n=502).
[PDF File (Adobe PDF File), 289 KB - mededu_v7i2e28805_app2.pdf]

References

1. Kozinets RV. Netnography: The Essential Guide to Qualitative Social Media Research 3rd Edition. Thousand Oaks, CA: SAGE Publications; 2019:1-472.
2. Gazza EA. Using Twitter to engage online RN-to-BSN students in health care policy. J Nurs Educ 2019 Feb 01;58(2):107-109. [doi: 10.3928/01484834-20190122-08] [Medline: 30721311]
3. Neier S, Zayer LT. Students' perceptions and experiences of social media in higher education. J Mark Educ 2015 Apr 29;37(3):133-143. [doi: 10.1177/0273475315583748]
4. Bolderston A, Watson J, Woznitza N, Westerink A, Di Prospero L, Currie G, et al. Twitter journal clubs and continuing professional development: an analysis of a #MedRadJClub tweet chat. Radiography (Lond) 2018 Feb;24(1):3-8. [doi: 10.1016/j.radi.2017.09.005] [Medline: 29306372]
5. Chretien KC, Tuck MG, Simon M, Singh LO, Kind T. A digital ethnography of medical students who use Twitter for professional development. J Gen Intern Med 2015 Nov;30(11):1673-1680 [FREE Full text] [doi: 10.1007/s11606-015-3345-z] [Medline: 25952652]
6. Lewis JD, Fane KE, Ingraham AM, Khan A, Mills AM, Pitt SC, et al. Expanding opportunities for professional development: utilization of Twitter by early career women in academic medicine and science. JMIR Med Educ 2018 Jul 23;4(2):e11140 [FREE Full text] [doi: 10.2196/11140] [Medline: 30037788]
7. Patel SS, Hawkins CM, Rawson JV, Hoang JK. Professional social networking in radiology: who is there and what are they doing? Acad Radiol 2017 May;24(5):574-579. [doi: 10.1016/j.acra.2016.09.026] [Medline: 28153576]
8. Rashid MA, McKechnie D, Gill D. What advice is given to newly qualified doctors on Twitter? An analysis of #TipsForNewDocs tweets. Med Educ 2018 Jul 15;52(7):747-756. [doi: 10.1111/medu.13589] [Medline: 29766550]
9. Pemmaraju N, Mesa RA, Majhail NS, Thompson MA. The use and impact of Twitter at medical conferences: best practices and Twitter etiquette. Semin Hematol 2017 Oct;54(4):184-188. [doi: 10.1053/j.seminhematol.2017.08.003] [Medline: 29153078]
10. Pace K. Student life - Twitter - a great medium for learning and debate. Nurs Stand 2016 Aug 03;30(49):33. [doi: 10.7748/ns.30.49.33.s43] [Medline: 27484561]

11. Lopez V, Cleary M. Using social media in nursing education: an emerging teaching tool. Issues Ment Health Nurs 2018 Jul;39(7):616-619. [doi: 10.1080/01612840.2018.1494990] [Medline: 30142004]
12. Smith S, Buchanan H. Integrating social media into an online academic program. Nurs Educ Perspect 2019;40(6):379-380. [doi: 10.1097/01.NEP.0000000000000387] [Medline: 30095732]
13. Chudleigh M, Jones R. How to set up and use a Twitter account professionally. Nurs Stand 2016 Nov 02;31(10):40-43. [doi: 10.7748/ns.2016.e10560] [Medline: 27861058]
14. Schumacher KR, Stringer KA, Donohue JE, Yu S, Shaver A, Caruthers RL, et al. Social media methods for studying rare diseases. Pediatrics 2014 May;133(5):1345-1353 [FREE Full text] [doi: 10.1542/peds.2013-2966] [Medline: 24733869]
15. Hart M, Stetten NE, Islam S, Pizarro K. Twitter and public health (Part 1): how individual public health professionals use Twitter for professional development. JMIR Public Health Surveill 2017 Sep 20;3(3):e60 [FREE Full text] [doi: 10.2196/publichealth.6795] [Medline: 28931499]
16. Platt J, Raj M, Kardia SL. The public's trust and information brokers in health care, public health and research. J Health Organ Manag 2019 Nov 07;33(7/8):929-948. [doi: 10.1108/jhom-11-2018-0332]
17. Langenfeld SJ, Vargo DJ, Schenarts PJ. Balancing privacy and professionalism: a survey of general surgery program directors on social media and surgical education. J Surg Educ 2016;73(6):28-32. [doi: 10.1016/j.jsurg.2016.07.010] [Medline: 27524278]
18. Ahmed W, Jagsi R, Gutheil TG, Katz MS. Public disclosure on social media of identifiable patient information by health professionals: content analysis of Twitter data. J Med Internet Res 2020 Sep 01;22(9):e19746 [FREE Full text] [doi: 10.2196/19746] [Medline: 32870160]
19. De Gagne JC, Hall K, Conklin JL, Yamane SS, Roth NW, Chang J, et al. Uncovering cyberincivility among nurses and nursing students on Twitter: a data mining study. Int J Nurs Stud 2019 Jan;89:24-31. [doi: 10.1016/j.ijnurstu.2018.09.009] [Medline: 30321747]
20. Jones S, Chudleigh M, Baines R, Jones RB. Did introducing Twitter and digital professionalism as an assessed element of the nursing curriculum impact social media related incidence of 'Fitness to Practise': 12-year case review. Nurse Educ Pract 2021 Jan;50:102950. [doi: 10.1016/j.nepr.2020.102950] [Medline: 33310508]
21. Koo K, Ficko Z, Gormley EA. Unprofessional content on Facebook accounts of US urology residency graduates. BJU Int 2017 Jun;119(6):955-960 [FREE Full text] [doi: 10.1111/bju.13846] [Medline: 28393475]
22. De Gagne JC, Choi M, Ledbetter L, Kang HS, Clark CM. An integrative review of cybercivility in health professions education. Nurse Educ 2016;41(5):239-245. [doi: 10.1097/NNE.0000000000000264] [Medline: 27022683]
23. Birdiq. URL: https://birdiq.net/twitter-search [accessed 2021-05-05]
24. Microsoft. URL: http://www.microsoft.com [accessed 2021-05-05]
25. NCapture. Google Chrome. URL: https://chrome.google.com/webstore/detail/ncapture/lgomjifbpjfhpodjhihemafahhmegbek [accessed 2021-05-05]
26. Hays DG, Singh AA. The basics of qualitative data management and analysis. In: Qualitative Inquiry in Clinical and Educational Settings 1st Edition. New York, NY: Guilford Publications; 2011:292-336.
27. Chretien KC, Azar J, Kind T. Physicians on Twitter. J Am Med Assoc 2011 Feb 9;305(6):566-568. [doi: 10.1001/jama.2011.68] [Medline: 21304081]
28. Kung YM, Oh S. Characteristics of nurses who use social media. Comput Inform Nurs 2014 Feb;32(2):64-72; quiz 73. [doi: 10.1097/CIN.0000000000000033] [Medline: 24419089]
29. Piscotty R, Martindell E, Karim M. Nurses' self-reported use of social media and mobile devices in the work setting. Online J Nurs Inform. 2016. URL: https://tinyurl.com/dz5pp3a8 [accessed 2021-04-20]
30. Kitsis EA, Milan FB, Cohen HW, Myers D, Herron P, McEvoy M, et al. Who's misbehaving? Perceptions of unprofessional social media use by medical students and faculty. BMC Med Educ 2016 Feb 18;16:67 [FREE Full text] [doi: 10.1186/s12909-016-0572-x] [Medline: 26887561]
31. Khoshsabk N, Southcott J. Gender identity and Facebook: social conservatism and saving face. Qual Rep 2019 Apr 1;24:632-647 [FREE Full text] [doi: 10.46743/2160-3715/2019.3526]
32. Zhang Y, Benayoun M. The emotional statement: profile photo and self-branding in the art world. Int J Arts Technol (IJART) 2020;12(2):174-196. [doi: 10.1504/ijart.2020.108629]
33. Clyde JW, Domenech RM, Geiser C. Medical professionalism: an experimental look at physicians' Facebook profiles. Med Educ Online 2014;19:23149 [FREE Full text] [Medline: 24947922]
34. Lim TS, Urakami J. Cross-cultural comparison of German and Japanese mobile messenger communication. In: Advances in Human Factors, Business Management and Society. Switzerland: Springer; 2018:626-635.
35. Kim SS, Lee JJ, De Gagne JC. Exploration of cybercivility in nursing education using cross-country comparisons. Int J Environ Res Public Health 2020 Oct 02;17(19) [FREE Full text] [doi: 10.3390/ijerph17197209] [Medline: 33023095]
36. Oz M, Zheng P, Chen G. Twitter versus Facebook: comparing incivility, impoliteness, and deliberative attributes. New Media Soc 2017 Dec 31;20(9):3400-3419. [doi: 10.1177/1461444817749516]
37. Foulk T, Woolum A, Erez A. Catching rudeness is like catching a cold: the contagion effects of low-intensity negative behaviors. J Appl Psychol 2016 Jan;101(1):50-67. [doi: 10.1037/apl0000037] [Medline: 26121091]

38. Ryan G, Jackson J, Cornock M. Exploring public perspectives of e-professionalism in nursing. Nurs Manag (Harrow) 2019 Dec 02;26(6):29-35. [doi: 10.7748/nm.2019.e1870] [Medline: 31686468]
39. Koo K, Bowman MS, Ficko Z, Gormley EA. Older and wiser? Changes in unprofessional content on urologists' social media after transition from residency to practice. BJU Int 2018 Aug;122(2):337-343 [FREE Full text] [doi: 10.1111/bju.14363] [Medline: 29694713]
40. Kim SS, Song HJ, Lee JJ. Cyberincivility experience of Korean clinical nurses in the workplace: a qualitative content analysis. Int J Environ Res Public Health 2020 Dec 04;17(23):9052 [FREE Full text] [doi: 10.3390/ijerph17239052] [Medline: 33291696]
41. Henning MA, Hawken S, MacDonald J, McKimm J, Brown M, Moriarty H, et al. Exploring educational interventions to facilitate health professional students' professionally safe online presence. Med Teach 2017 Sep;39(9):959-966. [doi: 10.1080/0142159X.2017.1332363] [Medline: 28562145]
42. Sandlin JK, Hinmon D. Beyond baby steps: today's use of social networking sites and the nursing profession. J Perinat Neonatal Nurs 2016;30(3):204-208. [doi: 10.1097/JPN.0000000000000189] [Medline: 27465450]
43. Osman A, Wardle A, Caesar R. Online professionalism and Facebook-falling through the generation gap. Med Teach 2012;34(8):549-556. [doi: 10.3109/0142159X.2012.668624] [Medline: 22494078]
44. Ross S, Lai K, Walton JM, Kirwan P, White JS. "I have the right to a private life": medical students' views about professionalism in a digital world. Med Teach 2013 Oct;35(10):826-831. [doi: 10.3109/0142159X.2013.802301] [Medline: 23826730]
45. Westrick SJ. Nursing students’ use of electronic and social media: law, ethics, and e-professionalism. Nurs Educ Perspect 2016:16-22. [doi: 10.5480/14-1358]
46. MacDonald J, Sohn S, Ellis P. Privacy, professionalism and Facebook: a dilemma for young doctors. Med Educ 2010 Aug;44(8):805-813. [doi: 10.1111/j.1365-2923.2010.03720.x] [Medline: 20633220]
47. Nason KN, Byrne H, Nason GJ, O'Connell B. An assessment of professionalism on students' Facebook profiles. Eur J Dent Educ 2018 Feb;22(1):30-33 [FREE Full text] [doi: 10.1111/eje.12240] [Medline: 27735108]
48. Hardouin S, Cheng TW, Mitchell EL, Raulli SJ, Jones DW, Siracuse JJ, et al. Retracted: prevalence of unprofessional social media content among young vascular surgeons. J Vasc Surg 2020 Aug;72(2):667-671. [doi: 10.1016/j.jvs.2019.10.069] [Medline: 31882313]
49. Kouri P, Rissanen ML, Weber P, Park HA. Competences in social media use in the area of health and healthcare. Stud Health Technol Inform 2017;232:183-193. [doi: 10.3233/978-1-61499-738-2-183]
50. Sullivan WM. Work and Integrity: The Crisis and Promise of Professionalism in America, 2nd Edition. San Francisco, CA: Jossey-Bass; 2004:1-352.
51. Maher C, Hadfield M, Hutchings M, de Eyto A. Ensuring rigor in qualitative data analysis. Int J Qual Methods 2018 Jul 10;17(1). [doi: 10.1177/1609406918786362]
52. Brennan MD, Monson V. Professionalism: good for patients and health care organizations. Mayo Clin Proc 2014 May;89(5):644-652. [doi: 10.1016/j.mayocp.2014.01.011] [Medline: 24797645]
53. Laschinger HK. Impact of workplace mistreatment on patient safety risk and nurse-assessed patient outcomes. J Nurs Adm 2014 May;44(5):284-290. [doi: 10.1097/NNA.0000000000000068] [Medline: 24759201]
54. Wilson JL. An exploration of bullying behaviours in nursing: a review of the literature. Br J Nurs 2016;25(6):303-306. [doi: 10.12968/bjon.2016.25.6.303] [Medline: 27019166]
55. Wilson BL, Phelps C. Horizontal hostility: a threat to patient safety. JONAS Healthc Law Ethics Regul 2013;15(1):51-7; quiz 58. [doi: 10.1097/NHL.0b013e3182861503] [Medline: 23429651]
56. Hudson Jr DL. Keefe v. Adams (8th Cir.) (2016). The First Amendment Encyclopedia. 2016. URL: https://www.mtsu.edu/first-amendment/article/1565/keefe-v-adams-8th-cir [accessed 2021-04-20]
57. Bernabeo EC, Holmboe ES, Ross K, Chesluk B, Ginsburg S. The utility of vignettes to stimulate reflection on professionalism: theory and practice. Adv in Health Sci Educ 2012 Jun 21;18(3):463-484. [doi: 10.1007/s10459-012-9384-x]
58. John NJ, Shelton PG, Lang MC, Ingersoll J. Training psychiatry residents in professionalism in the digital world. Psychiatr Q 2017 Jun;88(2):263-270. [doi: 10.1007/s11126-016-9473-8] [Medline: 27796921]

Abbreviations

OR: odds ratio

Edited by G Eysenbach; submitted 17.03.21; peer-reviewed by S Pesälä; comments to author 10.04.21; revised version received 13.04.21; accepted 13.04.21; published 13.05.21.

Please cite as:
De Gagne JC, Cho E, Yamane SS, Jin H, Nam JD, Jung D
Analysis of Cyberincivility in Posts by Health Professions Students: Descriptive Twitter Data Mining Study
JMIR Med Educ 2021;7(2):e28805
URL: https://mededu.jmir.org/2021/2/e28805
doi:10.2196/28805
PMID:33983129

Viewpoint

Medical Students Learning on the COVID-19 Front Line

Ioanna Zimianiti[1*], BSc; Vyshnavi Thanaraaj[1*], BSc; Francesca Watson[1*], BSc; Oluwapelumi Osibona[1*], BSc

Imperial College London, School of Medicine, London, United Kingdom

[*]all authors contributed equally

Corresponding Author:
Ioanna Zimianiti, BSc
Imperial College London, School of Medicine
Level 2, Faculty Building South Kensington Campus
London, SW7 2AZ
United Kingdom
Phone: 44 (0)20 7589 5111
Email: ioanna.zimianiti16@imperial.ac.uk

Abstract

In this viewpoint, we share our perspectives, as medical students at Imperial College London, on our experiences during our Infectious Diseases placement at Northwick Park Hospital, touching upon other students' experiences at other sites as well. We highlight some of the main drivers of and barriers to medical students seeing patients with COVID-19.

(JMIR Med Educ 2021;7(2):e28264) doi:10.2196/28264

KEYWORDS

medical education; COVID-19; frontline workers; medical student; viewpoint; perspective; infectious disease; experience; barrier; motivation

Northwick Park Hospital, situated in North West London, was one of the most affected hospitals when the first COVID-19 lockdown began in the United Kingdom in March 2020 [1]. Its surrounding boroughs of Harrow and Brent have seen high infection rates from as early as March 2020. The site has both a tertiary infectious disease center and a large accident and emergency department and it was therefore designated as an additional high-consequence infectious disease intensive care unit (ICU) [2]. The end of 2020 and the beginning of 2021 were marked by a surge in COVID-19 admissions, which put an unprecedented strain on the health care system [3]. While much research regarding the disease and pandemic has been published, there is a lack of information about the impact of the pandemic on medical students' learning and assistance on COVID-19 wards. This opinion piece reflects on our personal experiences during our Infectious Diseases placement at Northwick Park Hospital during this time and compares them to those of our peers at other sites.

During the first lockdown from March to July 2020, the COVID-19 pandemic was at one of its worst stages and the global picture was unclear. As Imperial College medical students, along with many others across the country, we were sent home and our clinical placements were suspended to reduce the risk of exposure to COVID-19 during this time. All classes were moved online, with lectures delivered over Zoom and Microsoft Teams [4]. However, from July 2020 onwards, more sustainable and effective plans for medical education were identified, which led to medical students being classified as key workers, allowing us to continue with clinical placements.

One of these placements is Infectious Diseases, which occurs as part of a 3-week block including aspects of genitourinary medicine and HIV. Conditions typically seen on these wards largely comprise tropical diseases such as typhoid and malaria. However, due to the increase in COVID-19 cases and subsequent travel restrictions, the incidence of such diseases, which are not endemic in Europe, has decreased [5].

Prior to our Infectious Diseases placement at Northwick Park Hospital, our exposure to patients with COVID-19 had been limited. However, with this placement coinciding with the second wave of the pandemic and with multiple suspected and confirmed cases on the Infectious Diseases ward, we were strongly encouraged to engage with such patients. This ranged from relaying necessary observations in the ward rounds to taking histories in order to help understand the various clinical manifestations of COVID-19, thus supporting our learning.

A key factor driving our motivation to engage with patients with COVID-19 was that our contact hours at previous placements had been reduced as part of social distancing measures; thus, we were more determined to maximize our learning experience. Furthermore, infection with COVID-19 can be an isolating experience for patients, as they are often not allowed visits from friends and family. As students, having more time than the busy medical team, we were able to spend more time with patients, which was greatly appreciated by patients and highly rewarding for us.

The national shortage of personal protective equipment (PPE) was something we were highly aware of due to comprehensive coverage by the news, especially at the start of the pandemic. On starting our placements, we were provided with gloves, surgical masks, and aprons (standard PPE) to see patients; nevertheless, our views were mixed on whether this was enough. This was largely due to experience in previous placements; some of us had previously been in ICUs where more significant PPE (eg, eyewear and scrub caps) was readily available, despite not being directly exposed to patients with COVID-19. However, some aerosol-generating procedures, including intubation and mechanical ventilation, were performed in the ICU area, which accounted for this heightened level of PPE. These worries were relieved for us through the team's consensus that this was adequate protection, and clear posters on the wards that reinforced this message.

Speaking with our colleagues on Infectious Diseases placements at different hospitals in North West London, including St Mary's, Hammersmith, Ealing, Charing Cross, and Chelsea and Westminster, we discovered their experiences and level of engagement with patients with COVID-19 varied. To understand this further, we disseminated a small survey, completed by 28 students, to assess their experiences.

Student experiences varied across the different sites, ranging from being encouraged to see patients with COVID-19 regularly, to being discouraged or choosing to opt out due to concerns about putting themselves or their loved ones at risk. Some students decided against contact because they felt it was an unnecessary risk as they were not contributing to patient care directly, and the experience was not aiding their learning. On the other hand, we found this to be an insightful learning experience, as we were greatly encouraged to play an active role during ward rounds. In addition, the Infectious Diseases team at Northwick Park Hospital generally encouraged engagement and followed up our encounters on the ward with case-based discussions, multidisciplinary team meetings, and X-ray meetings.

The students that were exposed to patients with COVID-19 largely felt they had adequate PPE, stating that "consultants assured us it was okay," "the whole team was wearing the same PPE," and emphasizing that maintaining physical distance and practicing good hand hygiene contributed to their comfort. However, other students felt the standard PPE was inadequate as, similar to our experience, they had received more significant PPE while on prior placements. This highlights that there is room for further, detailed communication and discussions with students regarding the levels of PPE required in different areas of the hospital, as this may encourage participation.

Students felt their comfort levels improved with exposure to patients over the course of the placement, but they felt it did not have a significant impact on their fifth year learning experience. The former is something we can relate to ourselves, as we felt that seeing patients with COVID-19 reduced our fear of being around these patients during the pandemic, as long as we were wearing adequate PPE.

In terms of education, the COVID-19 pandemic resulted in many clinical and nonclinical tutors being redirected to their health care roles and there was a subsequent reduction of teaching on the wards. Since this placement was our first contact with patients with COVID-19, the support of the medical team was crucial in guiding and encouraging our decisions to engage in the management of patients with COVID-19, as well as in alleviating any underlying worries. As we have become more involved in the "frontline" experience, we have found we can still get the necessary clinical exposure, alleviating uncertainty and equipping us with the required skills to manage similar situations when we qualify as doctors. Overall, we can all agree that our experiences made this placement—which at first appeared daunting and concerning in light of the current pandemic—an extremely interesting and enjoyable one.

Acknowledgments

We would like to thank Dr John Laurence for his support during our infectious disease placement.

Conflicts of Interest

None declared.

References

1. Mag Uidhir F, Bathula R, Sivagnanaratnam A, Abdul-Saheb M, Devine J, Cohen DL. Impact of COVID-19 on Stroke Caseload in a Major Hyperacute Stroke Unit. J Stroke Cerebrovasc Dis 2020 Dec;29(12):105383 [FREE Full text] [doi: 10.1016/j.jstrokecerebrovasdis.2020.105383] [Medline: 33099122]
2. Martin D, Platt S, Hampshire P, Meadows C. COVID-19: An update from England's high consequence infectious diseases intensive care unit leads. J Intensive Care Soc 2020 May 05;21(2):99-101 [FREE Full text] [doi: 10.1177/1751143720918517] [Medline: 32489403]
3. COVID-19 Hospital Activity. NHS England. URL: https://www.england.nhs.uk/statistics/statistical-work-areas/covid-19-hospital-activity [accessed 2021-02-26]
4. MedEd Collaborative. Reforming medical education: student experience during the covid-19 pandemic. BMJ 2021 Jan 07;372:n31 [FREE Full text] [doi: 10.1136/bmj.n31] [Medline: 33414182]

5. Steffen R, Lautenschlager S, Fehr J. Travel restrictions and lockdown during the COVID-19 pandemic-impact on notified infectious diseases in Switzerland. J Travel Med 2020 Dec 23;27(8):1 [FREE Full text] [doi: 10.1093/jtm/taaa180] [Medline: 33152761]

Abbreviations

ICU: intensive care unit
PPE: personal protective equipment

Edited by G Eysenbach; submitted 26.02.21; peer-reviewed by A Arbabisarjou, P Kanzow; comments to author 30.04.21; revised version received 03.05.21; accepted 17.05.21; published 01.06.21.

Please cite as:
Zimianiti I, Thanaraaj V, Watson F, Osibona O
Medical Students Learning on the COVID-19 Front Line
JMIR Med Educ 2021;7(2):e28264
URL: https://mededu.jmir.org/2021/2/e28264
doi:10.2196/28264
PMID:34038377

Viewpoint

Adapting Medical Education Initiatives Through Team-Based e-Learning, Telemedicine Objective Structured Clinical Exams, and Student-Led Community Outreach During the COVID-19 Pandemic

Julia H Miao[1,2], BA

[1]Department of Biological Sciences, Cornell University, Ithaca, NY, United States

[2]Department of Medicine, Renaissance School of Medicine at Stony Brook University, Stony Brook, NY, United States

Corresponding Author:
Julia H Miao, BA
Department of Medicine
Renaissance School of Medicine at Stony Brook University
100 Nicolls Rd
Stony Brook, NY, 11794
United States
Phone: 1 4083987805
Email: jhm344@cornell.edu

Abstract

Although the COVID-19 pandemic has quickly prompted medical schools and students around the world to transition from their traditional classrooms to web-based learning, the global crisis has inspired the development of innovative e-learning solutions that use existing technology and other web-based tools to continue nurturing the education of medical students while ensuring the public health and safety of both students and faculty members alike. Through the perspective of medical students, we share how the COVID-19 pandemic has impacted and transformed small team–based learning in medical education; changed objective structured clinical exam evaluations and the practice of clinical skills through telemedicine; and nurtured nationwide, web-based, student-led initiatives for community outreach, telehealth, and medical services.

(JMIR Med Educ 2021;7(2):e26797) doi:10.2196/26797

KEYWORDS

medical education; COVID-19; medical student; community service; telemedicine; telehealth; community outreach; peer teaching; student-led initiative; clinical assessment; adaptability; team-based learning

Introduction

In today's day and age of innovative technology, the urgency and necessity of social distancing during the COVID-19 pandemic has paved the way for the rapid reimagination and flexible restructuring of medical school education. As medical students across the country trickled out from their traditional lecture halls and classrooms to transition to web-based learning, the global crisis prompted the development of innovative e-learning solutions. These solutions used existing technology and other web-based tools to continue nurturing the education of medical students while ensuring the public health and safety of both students and faculty members alike. In this paper, we highlight the challenges that arose during the pandemic and the solutions that were embraced to address them. These solutions served as important methods that were implemented on web-based platforms during the pandemic for medical students and faculty members in medical school curricula, and they will play essential roles in medical education during and after the pandemic in the future. There is no doubt that in-person medical education and face-to-face clinical interactions are invaluable to medical students' learning. Although the pandemic has disrupted traditional, in-person medical education, new pedagogical approaches that integrate technology and embrace flexibility among students and professors have helped to empower and connect students during a time of social distancing. The transition to web-based platforms does not replace traditional, in-person medical education but rather transforms, adapts, and enriches the best learning practices during these challenging pandemic times. Through the perspective of medical students, we share how the COVID-19 pandemic impacted and transformed small team–based learning in medical education; changed objective structured clinical exam (OSCE) evaluations and the practice of clinical skills through telemedicine; and nurtured nationwide, web-based, student-led initiatives for community outreach, telehealth, and medical services. These insights highlight how students have continued to engage in collaborative learning and increasing their resilience in medical school during times of crisis. They also offer new, enriching perspectives on maximizing the uses of advancing technology for organizing and delivering effective medical content.

Challenges and Solutions: Small Team–Based e-Learning and Teaching During the COVID-19 Pandemic

Many recent research articles focus on the transition from medical school lectures in the classroom to web-based learning [1,2]. Certainly, the transition to web-based medical school education has its own challenges and solutions. The advent of more flexible technologies, including Zoom (Zoom Technologies Incorporated) and Microsoft Teams recordings, that not only offer live lectures for students but also supplement recordings with annotated captions and helpful time stamps for students anywhere and anytime allow students to return to, rewind, and replay lectures at their own individual paces. These technology functionalities as well as other features, such as real-time global cloud quiz polling and breakout rooms for small-group learning, have helped ease the transition to web-based medical school education [3]. In this section, we provide a unique perspective on small team–based learning in medical school education during the COVID-19 pandemic.

The pandemic has raised important questions about how we can reconcile the loss of small, in-person, team-based learning, such as working together on patient cases or discussing medical topics as a group of students. Here, we highlight adaptable technologies that have assisted in medical education through small group–based learning. One of the key functions of Zoom is breakout rooms, wherein students are preassigned to small groups or randomly assigned to one of these smaller rooms with other randomly assigned students to discuss a health care–related topic or complete an assignment. After students conduct discussions together in their mini breakout rooms like a small team, the rooms reconvene with the larger lecture hall or the main Zoom screen, with all participants shown in gallery view, to provide their insights to the whole class via the elected team student representative.

The adaptive uses of these technologies demonstrate that small team–based learning in web-based medical schools can also be facilitated; nevertheless, the feasibility of using breakout rooms to facilitate small team–based learning did not come without its initial challenges. When it came to large classes of over 100 students requiring assignment to certain breakout rooms, faculty professors often needed several minutes in early sessions to preassign students to individual groups of ≤8 people. This function was not feasible for Zoom features, as only the assigned hosts were able to designate certain students to certain breakout rooms. Of course, random assignment to breakout rooms was feasible with an easy click of the button, but the preassigned grouping of large amounts of students proved to be more challenging. Alternate video-based classrooms with breakout rooms include Cisco Webex and Google Meet, which work similarly to Zoom. The Cisco Webex breakout room feature allows students to assign themselves individually to their designated breakout room without needing a single host or professor to assign hundreds of eager students. Although this has its advantages, students can easily enter other rooms at any time, leading to potential chaos, especially during preassigned group medical quizzes. Google Meet also has a web feature for breakout rooms yet only provides the moderator or the professor with the ability to control who gets assigned to which breakout room. Nonetheless, the successes of breakout room technology will help us to continue to integrate and adapt small team–based learning and teaching; they will also help with identifying areas for technology improvement that can further enhance and assist medical education applications in the near future.

Other web-based tools that medical students found incredibly helpful during preclinical, team-based learning were Google Docs and Microsoft Teams' Word, which allow students to simultaneously contribute to, add, and revise team assignments. Comments can be added easily throughout a page; they pop up as bubbles in the margin column. In this column, classmates and teammates can teach each other and learn together by addressing each other's questions or comments in order to complete assignments or reports on medical cases.

Web-based, peer-to-peer teaching and e-learning during the COVID-19 pandemic have also resulted in a collegial environment between classes that was built through web-based medical education [4]. For preclinical students, web-based social events that integrate peer-to-peer teaching and medical education included Medical Jeopardy and therapeutic art classes that nurtured creative cognition and enhanced visual observation skills that are integral to performing clinical diagnostics and addressing patients' health. Medical student–led organizations and interest groups also showcased medical movie documentaries through Zoom sessions and led discussions. These were both informative and fun and provided a unique medical perspective on various social determinants of health. These socially distanced yet social events not only helped to unite medical classmates in a web-based and fun e-learning environment but also helped to foster interpersonal connections and offered places to destress and learn together.

Challenges and Solutions: Adapting Medical OSCEs Through Telemedicine

Obtaining clinical skills through practice and assessment is integral to building the clinical foundations of medical students, who are often assessed through OSCEs. These learning opportunities, in which students take a patient history, perform a physical exam, create a differential diagnosis, and counsel standardized patients, are often video recorded and replayed by students to evaluate and improve clinical, lifelong learning skills. OSCEs are formal, objective evaluations that are continuously conducted throughout medical school training to develop and assess the clinical learning and skills of medical students. During the pandemic, these skills were put to the test through a flexible and web-based adaptation of prepandemic OSCE patient encounters via telemedicine and telehealth OSCEs [5,6].

In the beginning of the OSCE, to ensure patient privacy and confidentiality before beginning each patient encounter, we medical students assessed for an appropriate video background on Zoom in order to ensure that no person (or pet) enters the room and interrupts the session, much like they do for a physical patient care room where physicians and patients interact. The confirmation of medical student identity by physically showing our IDs to the camera and the confirmation of patient identity on web-based platforms are essential.

During the interactions, evaluations in telemedicine OSCEs ensured that we maintained adequate eye contact and established human connection and rapport, just as we would in a regular in-person OSCE. For many of us medical students, the web-based OSCE, which was conducted during the COVID-19 pandemic, was one of our first encounters with telemedicine. Balancing note-taking and eye contact via the new technology functionalities at first was tricky, but with practice, we were able to navigate potential technological glitches while flexibly managing volume controls and visibility. For example, in one of our OSCEs, we interviewed a geriatric patient who was hard of hearing and his family member and learned to balance eye contact with both participants on separate screens while also maintaining patience and empathy through patient-centered care and medical counseling. We have continued to recognize the limitations of meeting patients on a web-based platform and miss the physical handshakes and compassionate touches that occur during a physical exam. Thus, we compensated and practiced appropriate facial expressions, strong verbal communication, and maintaining our awareness of body language through a web-based medium. The telehealth OSCE provides us with the opportunity to continue to create a cohesive, fluid conversation between medical students and patients and further strengthen the bond of a physician-patient relationship through clinical practice and reflection [7].

Telemedicine is likely to be a vital part of future patient care. Physical exams and the development of hands-on skills during the pandemic and distance learning for medical students were certainly a challenge. Medical schools have stepped up and created safe learning environments for the development of physical exam skills that allow for social distancing. Students learn and practice physical exam skills during the nonclinical years of school prior to in-person clerkships on mannequins, standardized patients, and student pairs with full personal protective equipment (PPE), including masks. Simulating the pandemic world with social distancing and OSCEs played a vital role in the development of physical exam skills for both medical students and patients.

As the number of patient cases of COVID-19 began to rise nationally during the fall of 2020, we continued to implement OSCEs through telemedicine. During a web-based clinical medicine bootcamp, we medical students worked in pairs and observed our partners interviewing a patient while obtaining a focused medical history, recording chief complaints, and providing differential diagnoses. Feedback from student pairs became essential for continued improvement and learning. Furthermore, we concluded each patient exam with a write-up of a patient note, during which fourth year medical studies helped with mentoring the preclinical second-year students and provided them with OSCE-related advice.

As always, just like with any other OSCE, demonstrating the qualities of genuine concern, compassion, respect, and support validated our patients' feelings and perspectives through empathy. Developing these important soft skills while also practicing objective clinical skills gained from medical content and knowledge is critical for the development of a physician in training [8]. These valuable learning opportunities have become an alternative to cancelled in-person OSCEs during the pandemic and have helped provide medical students and health professional trainees with an insightful clinical experience while telehealth rises in critical importance [9,10]. We obtained real-time feedback from supportive classmates in a supervised environment as well as feedback from both upperclassmen and faculty mentors. These live, interactive scenarios; the practice of medical counseling; and medical history taking have enhanced medical education.

Challenges and Solutions: Web-Based, Student-Led Initiatives in Community Outreach and Patient Care During the COVID-19 Pandemic

Sidelined from the front lines of the pandemic but passionate about contributing to the efforts in any way they can, medical students across the nation have helped initiate and have engaged in patient care–related community service initiatives during the COVID-19 pandemic. Such services have included engaging in video calls with nursing home residents to keep them company and to keep them connected during isolation periods and volunteering for the discharge counseling of recovering patients with COVID-19 via telehealth [11]. These community service projects, in conjunction with medical education, have become a vital part of our growth as medical students and clinical service learning during the COVID-19 pandemic.

Through a symphony of teamwork, medical students with diverse backgrounds, interests, and skills channel their energy to integrate their passions to elevate local and global community health in any way they can. Gathered together, medical students mirror an orchestra as various communities with their unique individual skills come together to collaborate, share, aid those in need [12]. Many medical student–led initiatives have included medical outreach for those who are underserved and socioeconomically disadvantaged [13-15]. For example, one student-led initiative involved weekly check-ups, phone calls, or video calls with older adults at local, underserved nursing homes to not only provide social support during their isolation but also enhance their physical and mental health through medical counseling [14]. Other groups of collaborating medical students from multiple medical institutions nationwide have fostered teamwork to create a contactless service and apply their multidisciplinary skills in linguistics, graphic design, and verbal and written communication [11,15]. They created and translated public health pamphlets in multiple languages for diverse community members across the country. Other students who were passionate about technology and hands-on projects initiated the 3D printing of face masks to address the nationwide shortage of PPE and masks and provide PPE to both health care workers and communities [11]. They used technology to help with the 3D printing and physical assembly of face masks for frontline health care workers. Although these student-led initiatives and extracurriculars may not directly stem from a medical school's standard curriculum, these student initiatives leverage web-based resources and are vital to medical students' education as they serve their communities and deliver compassion.

Conclusion

Despite social distancing and web-based challenges, both medical students and medical education faculty members have stepped up and risen to the challenge as they learn and grow together to navigate a digitally transformed curriculum during the COVID-19 pandemic. Technology has helped to pave the way for flexibility in medical education via web-based adaptation during this global pandemic. Such technologies have also provided medical students with the necessary resources for continual learning in their medical education, social connection, and service to their greater communities. There is no doubt that this pandemic has created a challenging time for many people, including medical students, medical professors and faculty members, families, friends, loved ones, and communities. Ranging from the various implemented technologies such as small, web-based breakout rooms to technologies that allow for the adaptable integration of telemedicine into OSCEs and clinical practice, e-learning tools have helped us to navigate these challenges together with resilience and flexibility. These technical innovations and learning chances are valuable and should be continued during and after the pandemic because they minimize travel time and increase the flexibility of learning, thereby allowing learning to occur anywhere and anytime among medical students and faculty members. For example, the advent of these technological tools, which have been integrated into our web-based medical education, also helped pave the way for innovative modalities in medical education. These modalities include web-based, team-based learning and the enhanced practice of telemedicine with patients, which has increasingly grown in importance during the 21st century and times such as the COVID-19 pandemic. With optimism and hope, we—strengthened in unity and resilience—look forward to continuing to embrace the innovative initiatives of our current web-based medical education as future physicians of tomorrow.

Conflicts of Interest

None declared.

References

1. Rose S. Medical student education in the time of COVID-19. JAMA 2020 Jun 02;323(21):2131-2132. [doi: 10.1001/jama.2020.5227] [Medline: 32232420]
2. Alsoufi A, Alsuyihili A, Msherghi A, Elhadi A, Atiyah H, Ashini A, et al. Impact of the COVID-19 pandemic on medical education: Medical students' knowledge, attitudes, and practices regarding electronic learning. PLoS One 2020 Nov 25;15(11):e0242905. [doi: 10.1371/journal.pone.0242905] [Medline: 33237962]
3. Kan JYL, Zhu L, Fong NJM, Ruan X, Ong AML, Lee G, et al. Conducting of web-based workshops for final year medical students preparing to enter the workforce during the COVID-19 pandemic. Med Sci Educ 2020 Oct 27:1-5 [FREE Full text] [doi: 10.1007/s40670-020-01125-6] [Medline: 33133758]
4. Roberts V, Malone K, Moore P, Russell-Webster T, Caulfield R. Peer teaching medical students during a pandemic. Med Educ Online 2020 Jan 01;25(1):1772014 [FREE Full text] [doi: 10.1080/10872981.2020.1772014] [Medline: 32493174]
5. Khan FA, Williams M, Napolitano CA. Resident education during Covid-19, virtual mock OSCE's via zoom: A pilot program. J Clin Anesth 2021 May;69:110107 [FREE Full text] [doi: 10.1016/j.jclinane.2020.110107] [Medline: 33248355]
6. Boyle JG, Colquhoun I, Noonan Z, McDowall S, Walters MR, Leach JP. Viva la VOSCE? BMC Med Educ 2020 Dec 18;20(1):514 [FREE Full text] [doi: 10.1186/s12909-020-02444-3] [Medline: 33334327]
7. Miao JH, Miao KH. Bench reflections on healing and patient care. AMA J Ethics 2020 Nov 01;22(11):E976-E978 [FREE Full text] [doi: 10.1001/amajethics.2020.976] [Medline: 33274711]
8. Paul N, Kohara S, Khera GK, Gunawardena R. Integration of technology in medical education on primary care during the COVID-19 pandemic: Students' viewpoint. JMIR Med Educ 2020 Nov 18;6(2):e22926 [FREE Full text] [doi: 10.2196/22926] [Medline: 33112760]
9. Lara S, Foster CW, Hawks M, Montgomery M. Remote assessment of clinical skills during COVID-19: A virtual, high-stakes, summative pediatric objective structured clinical examination. Acad Pediatr 2020 Aug;20(6):760-761 [FREE Full text] [doi: 10.1016/j.acap.2020.05.029] [Medline: 32505690]
10. Silverman JA, Foulds JL. Development and use of a virtual objective structured clinical examination. Can Med Educ J 2020 Dec 07;11(6):e206-e207 [FREE Full text] [doi: 10.36834/cmej.70398] [Medline: 33349786]
11. Collaborative student volunteer and service projects. Association of American Medical Colleges. URL: https://icollaborative.aamc.org/collection/covid-19-student-service-projects/ [accessed 2021-06-07]

12. Miao JH, Miao KH. Symphony of healthcare: Teamwork in medicine. Can Med Educ J 2020 Dec 07;11(6):e208 [FREE Full text] [doi: 10.36834/cmej.71178] [Medline: 33349787]
13. Carson S, Peraza LR, Pucci M, Huynh J. Student hotline improves remote clinical skills and access to rural care. PRiMER 2020 Sep 21;4:22 [FREE Full text] [doi: 10.22454/PRiMER.2020.581719] [Medline: 33111049]
14. van Dyck LI, Wilkins KM, Ouellet J, Ouellet GM, Conroy ML. Combating heightened social isolation of nursing home elders: The telephone outreach in the COVID-19 outbreak program. Am J Geriatr Psychiatry 2020 Sep;28(9):989-992 [FREE Full text] [doi: 10.1016/j.jagp.2020.05.026] [Medline: 32593495]
15. Soled D, Goel S, Barry D, Erfani P, Joseph N, Kochis M, et al. Medical student mobilization during a crisis: Lessons from a COVID-19 medical student response team. Acad Med 2020 Sep;95(9):1384-1387 [FREE Full text] [doi: 10.1097/ACM.0000000000003401] [Medline: 32282373]

Abbreviations

OSCE: objective structured clinical exam
PPE: personal protective equipment

Edited by G Eysenbach; submitted 27.12.20; peer-reviewed by M Singh, B Wood; comments to author 05.02.21; revised version received 03.05.21; accepted 31.05.21; published 14.06.21.

Please cite as:
Miao JH
Adapting Medical Education Initiatives Through Team-Based e-Learning, Telemedicine Objective Structured Clinical Exams, and Student-Led Community Outreach During the COVID-19 Pandemic
JMIR Med Educ 2021;7(2):e26797
URL: https://mededu.jmir.org/2021/2/e26797
doi:10.2196/26797
PMID:34061763

Original Paper

Remote Teaching in a Preclinical Phantom Course in Operative Dentistry During the COVID-19 Pandemic: Observational Case Study

Philipp Kanzow[1], MSc, Dr rer medic, PD Dr med dent; Christiane Krantz-Schäfers[1], MSc, Dr med dent; Michael Hülsmann[1], Prof Dr med dent

Department of Preventive Dentistry, Periodontology and Cariology, University Medical Center Göttingen, Göttingen, Germany

Corresponding Author:
Philipp Kanzow, MSc, Dr rer medic, PD Dr med dent
Department of Preventive Dentistry, Periodontology and Cariology
University Medical Center Göttingen
Robert-Koch-Str 40
Göttingen, 37075
Germany
Phone: 49 551 3922877
Email: philipp.kanzow@med.uni-goettingen.de

Abstract

Background: During the acute COVID-19 pandemic, physical access to the University Medical Center Göttingen was restricted for students. For the first time at our dental school, theoretical knowledge was imparted to students via asynchronous online screencasts and discussed via synchronous video meetings only.

Objective: We aimed to assess the acceptance and effectiveness of distance education as a new teaching format for theoretical knowledge within the preclinical course in Operative Dentistry (sixth semester of the undergraduate dental curriculum in Germany).

Methods: The phantom course comprised distance education (first phase, 11 weeks) and subsequent on-site practical demonstrations and training (second phase, 10 weeks). All theoretical knowledge was taught via online screencasts during distance education (except for the first week, 3 screencasts were uploaded per week resulting in a total of 30 screencasts). Until the end of the term, all students (N=33) were able to view the screencasts for an unlimited number of times. Theoretical knowledge was assessed in a summative examination after practical on-site teaching. Acceptance and effectiveness of the new curriculum and distance education were also measured based on an evaluation survey and students' self-perceived learning outcome, which was compared to the outcome from the two pre–COVID-19 terms.

Results: Each screencast was viewed by a mean of 24 (SD 3.3) students and accessed a mean of 5.6 (SD 1.2) times per user (ie, by students who accessed the respective screencast at least once). During distance education, the number of accesses showed a linear trend over time. During the practical training phase, screencast views declined and increased again prior to the examination. Screencasts covering topics in Cariology, Restorative Dentistry, and Preventive Dentistry were viewed by more students than screencasts covering topics in Endodontology or Periodontology (both P=.047). Examination items in Periodontology showed inferior results compared to the other topics (P<.001). Within the different topics, students' self-perceived learning outcome did not differ from that during the pre–COVID-19 terms. Although most students agreed that the presented screencasts contributed to their learning outcome, pre–COVID-19 term students more strongly felt that lectures significantly contributed to their learning outcome (P=.03).

Conclusions: Screencasts showed high acceptance and effectiveness among the students but were not used as a learning tool by all students. However, students who viewed the screencasts accessed each screencast more frequently than they could have attended a conventional lecture. Screencast views were mostly due to intrinsic motivation.

(JMIR Med Educ 2021;7(2):e25506) doi:10.2196/25506

KEYWORDS

acceptance; COVID-19; dental education; distance learning; effectiveness; e-learning; medical education; medical student; observational; screencasts; preclinical education; remote teaching

Introduction

In many disciplines, including medical education, virtual learning objects (eg, video podcasts, screencasts) are frequently and successfully used to facilitate knowledge acquisition [1,2]. As opposed to medical education, education of undergraduate dental students includes both teaching of theoretical knowledge and training of physical skills. Traditionally, during the preclinical semesters, theoretical knowledge is taught in lectures utilizing a large-group setup (ie, synchronous learning) and physical skills training is provided on-site by using dental simulators or phantom heads. The need for physical skills training renders conventional distance education (DE) within undergraduate dental education difficult. As a consequence, videoconferencing and streamed video lectures were only used by a minority of undergraduate dental schools in the past [3]. However, significant advancements in technology (eg, internet bandwidth, video conferencing hardware) have occurred in recent years. Based on a recent systematic review, the use of virtual learning objects and DE in dentistry has only been assessed in a small number of studies [4]. Most studies focusing on teaching preclinical and clinical dentistry used either virtual learning objects designed for single learning objectives [5-8], video demonstrations of practical procedures, or static PowerPoint presentations [9-11]. However, DE utilizing screen-captured lectures and video demonstrations was only reported in a single course in Prosthodontics [12]. Within the evaluation survey of this promising approach, students rated screen-captured lectures as highly useful for their self-perceived learning outcome.

During the COVID-19 pandemic, medical education required several adaptations and DE was frequently utilized [13-15]. Physical distancing measures prohibited on-site teaching activities. Moreover, dental students around the world were often unable to physically access their dental schools and dental simulators or phantom heads during the acute phase of the pandemic [16-18]. As a result, new and innovative teaching concepts, especially those focusing on theoretical knowledge, within the field of DE in dentistry rapidly emerged [19-24]. Although these teaching innovations seem promising, detailed data regarding students' acceptance and effectiveness are often missing.

At the beginning of the COVID-19 pandemic, educators at the University Medical Center Göttingen also faced a number of challenges, as physical access to the dental school was restricted for students and on-site teaching activities were suspended. Therefore, a new curriculum featuring both DE (theoretical knowledge) and postponed on-site education (physical skills) was developed. Lectures were recorded as screencasts and distributed as online asynchronous material. For the first time, theoretical knowledge was imparted to students by using asynchronous screencasts and discussed via synchronous video meetings only. Both educators and students had no prior experience with DE. Students' acceptance and effectiveness of DE was also unknown.

Therefore, we aimed to retrospectively analyze the acceptance and effectiveness of screencasts as a new teaching format within the preclinical phantom course in Operative Dentistry (within the sixth semester of the undergraduate dental curriculum in Germany). Further objectives of the study were to assess the use of screencasts over time, link usage data with the results of the final summative examination, and assess students' self-perceived learning outcome and compare the results to those from the two previous pre–COVID-19 terms.

Methods

Study Design and Participants

During the summer-term of 2020, asynchronous screencasts and synchronous video meetings were used as means of teaching theoretical knowledge within the preclinical phantom course in Operative Dentistry at the University Medical Center Göttingen. No study-related interventions were performed. Owing to the retrospective and anonymous design of this report, no formal approval was required as stated by the ethics committee of the University Medical Center Göttingen (no. 25/12/20).

A total of 33 students were enrolled in the phantom course. Due to restricted physical access to the dental school, the course started with a phase of DE (first 11 weeks). Subsequently, on-site practical demonstrations and training of physical skills were possible (10 weeks). Thus, the summer-term 2020 was extended from 14 weeks (regular length) to 21 weeks.

DE: Theoretical Knowledge

All theoretical knowledge was taught via asynchronous screencasts (ie, screen-captured PowerPoint presentations with narrated audio). Starting from the second week, three screencasts were uploaded weekly, resulting in a total of 30 screencasts (Table 1). Screencasts covered three different topics: Cariology, Restorative Dentistry, and Preventive Dentistry; Endodontology; and Periodontology. Of note, the provided screencasts did not equally cover the topics. The number of screencasts per topic differed according to the relative importance of that topic and equaled the number of lectures from the pre–COVID-19 terms. Screencasts were made available to students via Stud.IP, an open-source learning management system [25], by using a MediaCast plugin (Figure 1). Anonymous data on students' accesses to the screencasts were recorded in log files of the learning management system. Until the end of the term, students were able to view the screencasts on-demand and off-campus for an unlimited number of times. Additionally, PowerPoint presentations were available for download in PDF.

Furthermore, live and interactive video meetings (ie, Zoom videoconferencing) were offered weekly (every Thursday at 3 PM) to discuss the topics covered within the screencasts (ie, synchronous learning). Students were also able to contact their lecturers via chat (Stud.IP Blubber plugin) or forum (Stud.IP). Neither viewing of screencasts nor participation within the video meetings was mandatory.

At the end of the term, anonymous usage data were extracted from the log files to evaluate students' accesses to the screencasts and their participation in video meetings.

Table 1. Characteristics of screencasts uploaded for each topic.

Characteristic	All topics	Cariology, Restorative Dentistry, and Preventive Dentistry	Endodontology	Periodontology	*P* value
Total, n (%) (N=29)[a]	29 (100)	16 (55)	9 (31)	4 (14)	N/A[b]
Duration (minutes), mean (SD)	22.9 (7.7)	18.9 (7.7)[c]	27.1 (6.0)[c]	29.8 (8.3)[c]	.02
Students who viewed screencasts, mean (SD)	24.0 (3.3)	25.5 (3.1)[c]	22.2 (2.8)[d]	21.8 (1.7)[d]	.01
Screencast accesses per user[e], mean (SD)	5.6 (1.2)	5.6 (1.2)[c]	5.5 (1.1)[c]	5.7 (1.3)[c]	.98

[a]One mandatory screencast containing safety instructions only is not included in the presented data.

[b]N/A: not applicable.

[c,d]Different lowercase letters in a row indicate significant difference between topics after multiple-comparison posthoc correction.

[e]Students who accessed a screencast at least once were regarded as a “user” of the respective screencast.

Figure 1. Web-based learning management system with access to screencasts. The upper panel shows the library of screencasts within the online course. Each screencast was made available via a MediaCast plugin and could be viewed using a browser-embedded media player (lower panel) or mobile devices.

On-site Training of Physical Skills

In the second phase of the term, physical skills were taught on-site by using phantom heads with natural tooth models (AG-3 Frasaco) and extracted teeth embedded in resin. During this phase, physical presence of students and educators was mandatory. The students were divided into two groups to allow for sufficient physical distancing between them. Teaching hours were from 8 AM to 12:15 PM or from 12:45 PM to 5 PM on each workday (Monday through Friday). To be admitted to the final examination, students had to perform a predefined number of treatments (ie, placement of direct composite restorations and root canal treatments) with sufficient quality. Students' work was continuously assessed by educators (experienced dentists from the Department of Preventive Dentistry, Periodontology and Cariology) present during the on-site physical skills training. For each step, students received immediate feedback.

Electronic Examination of Theoretical Knowledge

At the end of the course, a summative electronic examination using the CAMPUS examination software (Umbrella Consortium for Assessment Networks [26]) was set. The examination consisted of 30 equally weighted items (Table 2). Single-choice items with five answer options (Type-A), multiple-select items with five or six statements (Multiple-True-False), and open-ended items were used. Single-choice and open-ended items were scored dichotomously (0 or 1 credit point per item). Multiple-True-False items were scored according to the method described by Vorkauf [27]: if all statements were marked correctly as either true or false, examinees received full credit (1 credit point). If only one statement was marked incorrectly, examinees received half-credit (0.5 credit point). Otherwise, examinees received no credit (0 credit points) [28]. A fixed pass-mark of 60% (ie, 18 credit points) was used. Again, the number of items was not equally distributed across the three topics and resembled the distribution of screencasts per topic.

Table 2. Characteristics of multiple-choice examination items and credit awarded to examinees for each topic.

Characteristic	All topics	Cariology, Restorative Dentistry, and Preventive Dentistry	Endodontology	Periodontology
Items, n (%)	30 (100)	18 (60)	8 (27)	4 (13)
Single-choice	2 (7)	1 (50)	0 (0)	1 (50)
Multiple-select	27 (90)	16 (59)	8 (30)	3 (11)
Open-ended	1 (3)	1 (100)	0 (0)	0 (0)
Received credit (%), mean (SD)	74.5 (34.6)	75.8 (34.5)[a]	79.2 (31.2)[a]	58.9 (37.2)[b]

[a,b]Different lowercase letters in a row indicate significant difference between topics after multiple-comparison posthoc correction.

Students' Self-Assessment of Learning Outcome

Immediately after the electronic examination, a standardized evaluation survey was electronically administered to all students using the EvaSys software (version 8.0; evasys). The questionnaire comprised a number of closed items and utilized a 6-point Likert scale with the following response options: 1="totally agree," 2="agree," 3="mostly agree," 4="mostly disagree," 5="disagree," and 6="totally disagree." Although the focus was primarily on organizational aspects, some items assessed students' self-perceived learning outcome (ie, "I estimate my learning outcome in Preventive Dentistry/Restorative Dentistry/Endodontology/Periodontology as high" and "The lectures/practical training/practical demonstrations in this course significantly contributed to my learning outcome"). Students were able to provide additional information and further suggestions in a final open-ended question. For analysis of the open-ended responses, a qualitative content analysis with inductive categories regarding aspects related to DE was performed.

Statistical Analysis

All data were first reported descriptively as absolute numbers (categorial variables) or using mean and SD values (continuous variables). Subsequently, usage data and examination results were compared between the three topics (Cariology, Restorative Dentistry, and Preventive Dentistry; Endodontology; and Periodontology) by using Kruskal-Wallis rank sum tests followed by Dunn posthoc tests. In addition, students' self-perceived learning outcome was compared to evaluation surveys from two previous terms involving conventional lectures instead of screencasts by using Kruskal-Wallis rank sum tests followed by Dunn posthoc tests.

All statistical evaluations were performed using R software (version 4.0.3; The R Foundation for Statistical Computing) and the packages "PMCMR" (version 4.3) and "irr" (version 0.84.1). The level of significance was set at $P<.05$. Multiple-comparison posthoc correction was performed using Hochberg method.

Results

DE: Theoretical Knowledge

Theoretical knowledge was taught by using a total of 29 screencasts, with a mean length of 22.9 (SD 7.7) minutes. Each screencast was viewed by a mean of 24 (SD 3.3) students (range: 17-29 students). Users (ie, students who accessed the respective screencast at least once) accessed each screencast a mean of 5.6 (SD 1.2) times. Detailed results for each topic are presented in Table 1. Screencasts in Cariology, Restorative Dentistry, and Preventive Dentistry were viewed by more students (mean 25.5, SD 3.1) than screencasts in Endodontology (mean 22.2, SD 2.8) or Periodontology (mean 21.8, SD 1.7; both P=.047). The average number of screencast accesses per user did not differ between the topics (Cariology, Restorative Dentistry, and Preventive Dentistry: mean 5.6, SD 1.2; Endodontology: mean 5.5, SD 1.1; Periodontology: mean 5.7, SD 1.3; P=.98).

During the phase of DE, the number of screencast accesses showed a linear trend over time. The number of screencast views also declined during the subsequent practical training but increased again prior to the final examination (Figure 2). Mostly, screencasts were accessed in the morning and afternoon hours. Screencasts were also viewed in the evening hours. Around noon, fewer numbers of accesses were observed (Figure 3).

The mean number of students who participated at the live and interactive video meetings was 21.2 (SD 6.7). Weekly video meetings were held to answer students' questions and discuss the content of screencasts (duration: mean 13.1, SD 6.3 minutes).

Figure 2. Number of screencasts views over time. Time spans of distance education (theoretical knowledge) and on-site education of physical skills are marked by different colors. All screencasts were uploaded during the distance-education phase. The final examination and evaluation were set after the on-site education phase. MC: multiple-choice.

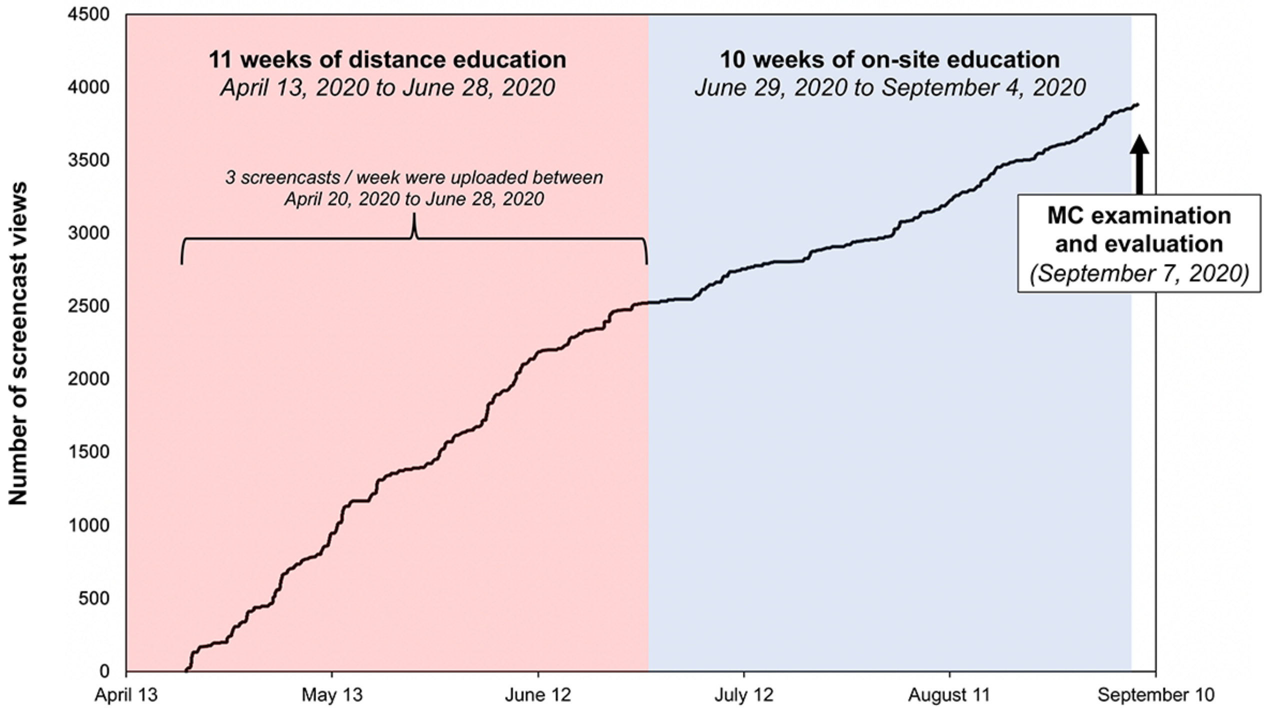
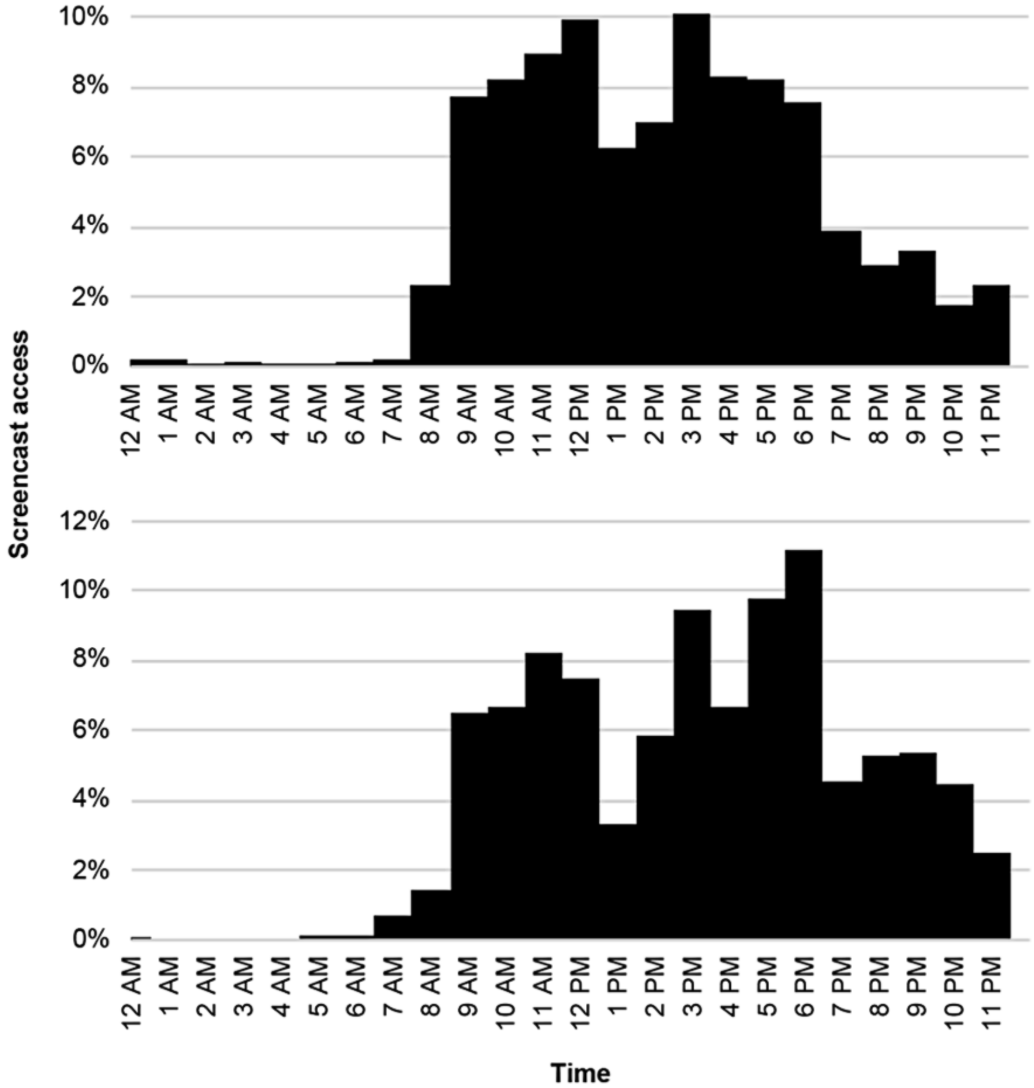


Figure 3. Histograms showing the distribution of screencast access times over the course of the day. The upper panel shows the access times during the distance education phase. The lower panel shows access times during the on-site phase of physical skills training. During on-site teaching, physical presence at the dental school was mandatory on weekdays (either between 8 AM to 12:15 PM or between 12:45 PM to 5 PM).



Electronic Examination of Theoretical Knowledge

Only 31 students met the course requirements during physical skills training and were eligible for taking the final examination. Overall examination difficulty (ie, the mean score per item in the given situation) amounted to 0.74. Items in Periodontology showed inferior results compared to the other topics (58.9% vs 75.8% for Cariology, Restorative Dentistry, and Preventive Dentistry and 58.9% vs 79.2% for Endodontology; both *P*<.001).

Students' Self-Assessment of Learning Outcome

Students' self-perceived learning outcome within the assessed topics did not differ from the evaluations performed during the pre–COVID-19 terms (Restorative Dentistry: *P*≥.21, Preventive Dentistry: *P*=.84, Endodontology: *P*≥.48, and Periodontology: *P*=.36; Table 3). Regarding DE, most students agreed that the presented screencasts significantly contributed to their learning outcome (median score: 2="agree"). However, students from the pre–COVID-19 terms rated more strongly that lectures significantly contributed to their learning outcome within the preclinical course in Operative Dentistry (*P*=.03). Evaluation of practical training during on-site teaching did not significantly differ from that during the pre–COVID-19 terms (*P*≥.69). The contribution of practical demonstrations showed comparable results to the previous phantom course during the pre–COVID-19 winter-term 2019/20 (*P*=.27) but was judged as less supportive than that during the summer-term 2019 (*P*=.03).

In response to the final open-ended question, some students gave additional insights regarding their perception of DE: students criticized the screencasts as being superficial (n=4), shorter than conventional lectures (n=2), and an inappropriate learning tool for the final examination (n=2). Some students (n=2) also criticized the need for additional self-study.

Table 3. Students' self-assessment of learning outcome during summer-term 2020 and the pre–COVID-19 terms.

Survey item[a]	Summer-term 2020 (n=31, response rate: 94%) Median (IQR; range)	Winter-term 2019/20 (pre–COVID-19) (n=33, response rate: 97%) Median (IQR; range)	Summer-term 2019 (pre–COVID-19) (n=29, response rate: 78%) Median (IQR; range)
"I estimate my learning outcome in Preventive Dentistry as high."	2 (1-2; 1-4)[b]	2 (1.25-2; 1-4)[b]	2 (1-2; 1-4)[b]
"I estimate my learning outcome in Restorative Dentistry as high."	2 (1-2; 1-3)[b]	2 (1-2; 1-4)[b]	1 (1-2; 1-3)[b]
"I estimate my learning outcome in Endodontology as high."	1 (1-2; 1-3)[b]	1 (1-2; 1-3)[b]	1 (1-2; 1-3)[b]
"I estimate my learning outcome in Periodontology as high."	3.5 (3-4; 1-6)[b]	3 (2.25-3.75; 1-6)[b]	3 (2-4; 1-6)[b]
"Lectures significantly contributed to my learning outcome."	2 (2-3; 1-5)[b]	2 (2-2; 1-4)[c]	2 (1-2.25; 1-5)[c]
"Practical training significantly contributed to my learning outcome."	2 (1-2; 1-4)[b]	2 (1-2; 1-3)[b]	2 (1-2; 1-3)[b]
"Practical demonstrations significantly contributed to my learning outcome."	2 (2-3; 1-3)[b]	2 (1-3; 1-5)[b,c]	1.5 (1-2; 1-3)[c]

[a]Students' responses on a 6-point Likert scale with the following response options: 1="totally agree," 2="agree," 3="mostly agree," 4="mostly disagree," 5="disagree," and 6="totally disagree."

[b,c]For each item, different lowercase letters in a row indicate significant difference between the terms after multiple-comparison posthoc correction.

Discussion

Principal Findings

This study reports the experience of a German dental school with DE in a preclinical phantom course in Operative Dentistry. Due to the COVID-19 pandemic, the current curriculum had to be adapted. As further development of the pandemic was unknown, a high degree of planning uncertainty was present throughout the term. During the initial phase, feasibility of the new curriculum was still unknown. Moreover, both educators and students were not used to DE, and students' acceptance of screencasts as a new teaching format was unknown.

Acceptance of DE

Students' attention in conventional lectures is known to start decreasing after only 10 minutes [29]. Regarding videos in massive open online courses, video lengths of varying durations between 6 and 20 minutes are recommended in the literature [30]. Therefore, produced screencasts were kept shorter (duration: mean 22.9, SD 7.7 minutes) than conventional lectures from the pre–COVID-19 terms (duration: 45 minutes). In addition, screencasts included references to selected articles and book chapters for further reading. Students were encouraged to review the presented topics during self-study. Weekly live and interactive video meetings were offered to discuss any questions. The number of students participating in the video meetings was slightly lower than the number of screencast users (mean 21.1, SD 6.7 vs 24.0, SD 3.3).

The term could be performed as initially planned. At the end, data on screencast usage over time were assessed and linked to examination results. Screencasts were not used by all students as a learning tool. Up to 4 students refrained from viewing at least a single screencast. However, students using the screencasts accessed each screencast more frequently than they could have visited a conventional lecture. Screencast viewing was mostly due to intrinsic motivation as screencast accesses showed a linear trend already at the beginning of the term. However, the final examination triggered an extrinsic increase in screencast accesses immediately prior to the examination date. This increase prior to the examination is in accordance with the observed access patterns in a growth and development curriculum: web-based learning modules were more frequently accessed by dental students as course examinations approached [31].

Interestingly, most screencasts were accessed during the daytime and evening hours, indicating that students seem to have maintained their daily routine during DE without any mandatory courses, as only an absolute minority of screencasts views were noted after midnight. In addition, access rates dropped around 1 PM, suggesting students took a lunch break around noontime. The pattern of access times only slightly shifted between both phases: during on-site teaching, screencasts were more frequently accessed in the evening hours. As always, only half of the cohort was present in the dental school for on-site teaching, and the other half was able to access the screencasts also in the morning or afternoon hours.

Effectiveness of DE

This study reports on the effectiveness of DE in an undergraduate dental curriculum. Students' acceptance and the effectiveness of DE were assessed based on the number of screencast views, students' summative examination results, and students' self-perceived learning outcome.

As physical attendance of lectures was not mandatory during the pre–COVID-19 terms, no comparison between the number of users and students attending conventional lectures was possible. Results of the final examination are comparable to those from the pre–COVID-19: within the phantom course, examination difficulty ranged between 0.64 and 0.82 over the past terms. However, this comparison should be interpreted with caution as examination items differed.

Some students criticized that the presented screencasts were very superficial and/or very short. However, screencasts were intentionally kept shorter than conventional lectures in the pre–COVID-19 terms for didactic reasons. Although the students' self-perceived learning outcome did not differ from the past terms and most students agreed that the presented screencasts significantly contributed to their learning outcome, pre–COVID-19 term students rated more strongly that lectures significantly contributed to their learning outcome. Again, this comparison with students of the previous terms should be interpreted with caution, as evaluations were performed at different time points. For instance, although the evaluations of previous terms were performed near the end of the practical training, the current evaluation was performed immediately after the final examination. Therefore, the examination might have affected the students' judgement, leading to biased evaluation results.

Overall, the acceptance of DE can be regarded as high, and most students agreed that screencasts significantly contributed to their learning outcome. The presented data show the promising use of DE in an undergraduate dental curriculum. Our results are in line with those of a previous study that found that screen-captured lectures and video demonstrations were rated as highly useful by students regarding their self-perceived learning outcome in a course in Prosthodontics [12].

Limitations

The major limitation of this study is the anonymous data structure used. Therefore, no demographic data or other student-related factors concerning the use of the screencasts were available. In addition, no correlation of screencast viewing, examination results, or evaluation survey responses was possible at the individual student level. No data regarding the technical devices used and how students accessed the screencasts were available. Therefore, potential restrictions (eg, no device or internet access, not enough time to view screencasts) preventing some students from accessing the screencasts could not be identified. Moreover, the possibility that screencasts were jointly viewed by multiple students per access cannot be excluded.

A standardized questionnaire was used for the final evaluation survey. The evaluation survey was not modified according to the COVID-19 situation and the modified curriculum in effect (ie, DE and extended term duration). More detailed results could have been obtained by using a more differentiated questionnaire.

Further research regarding DE within the field of dentistry is required. These studies should allow for a direct comparison between screencast usage and examination results at the individual student level, assess students' self-estimated learning outcome using more detailed questionnaire tools, and include a control group.

Conclusions

Within the abovementioned limitations of the study, the results show that DE using online screencasts is a viable way of imparting theoretical knowledge in undergraduate dentistry programs. Screencast usage seems to be linked to examination results, and screencasts should be made available to students in addition to conventional lectures when the regular curriculum can be resumed. As suggested by some students, the length and content of screencasts could also be extended.

Acknowledgments

The authors would like to thank the team of the Digital Learning and Teaching services at University of Göttingen for their assistance with data extraction on screencast usage. The authors acknowledge support by the Open Access Publication Funds of Göttingen University. The funder had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Conflicts of Interest

None declared.

References

1. White J, Sharma N. Podcasting: a technology, not a toy. Adv Health Sci Educ Theory Pract 2012 Oct;17(4):601-603. [doi: 10.1007/s10459-012-9361-4] [Medline: 22426544]
2. Raupach T, Grefe C, Brown J, Meyer K, Schuelper N, Anders S. Moving knowledge acquisition from the lecture hall to the student home: a prospective intervention study. J Med Internet Res 2015 Sep 28;17(9):e223 [FREE Full text] [doi: 10.2196/jmir.3814] [Medline: 26416467]
3. Andrews KG, Demps EL. Distance education in the U.S. and Canadian undergraduate dental curriculum. J Dent Educ 2003 Apr;67(4):427-438. [Medline: 12749572]
4. Zitzmann NU, Matthisson L, Ohla H, Joda T. Digital undergraduate education in dentistry: a systematic review. Int J Environ Res Public Health 2020 May 07;17(9):3269 [FREE Full text] [doi: 10.3390/ijerph17093269] [Medline: 32392877]
5. Weaver JM, Lu M, McCloskey KL, Herndon ES, Tanaka W. Digital multimedia instruction enhances teaching oral and maxillofacial suturing. J Calif Dent Assoc 2009 Dec;37(12):859-862. [Medline: 20066873]

6. Bains M, Reynolds PA, McDonald F, Sherriff M. Effectiveness and acceptability of face-to-face, blended and e-learning: a randomised trial of orthodontic undergraduates. Eur J Dent Educ 2011 May;15(2):110-117. [doi: 10.1111/j.1600-0579.2010.00651.x] [Medline: 21492347]
7. Alves LS, de Oliveira RS, Nora Â, Cuozzo Lemos LF, Rodrigues JA, Zenkner JEA. Dental students' performance in detecting in vitro occlusal carious lesions using ICDAS with e-learning and digital learning strategies. J Dent Educ 2018 Oct;82(10):1077-1083. [doi: 10.21815/JDE.018.100] [Medline: 30275142]
8. Luz PB, Stringhini CH, Otto BR, Port ALF, Zaleski V, Oliveira RS, et al. Performance of undergraduate dental students on ICDAS clinical caries detection after different learning strategies. Eur J Dent Educ 2015 Nov;19(4):235-241. [doi: 10.1111/eje.12131] [Medline: 25495379]
9. Reissmann DR, Sierwald I, Berger F, Heydecke G. A model of blended learning in a preclinical course in prosthetic dentistry. J Dent Educ 2015 Feb;79(2):157-165. [Medline: 25640620]
10. Schultze-Mosgau S, Zielinski T, Lochner J. Web-based, virtual course units as a didactic concept for medical teaching. Med Teach 2004 Jun;26(4):336-342. [doi: 10.1080/01421590410001679028] [Medline: 15203847]
11. Smith W, Rafeek R, Marchan S, Paryag A. The use of video-clips as a teaching aide. Eur J Dent Educ 2012 May;16(2):91-96. [doi: 10.1111/j.1600-0579.2011.00724.x] [Medline: 22494307]
12. Botelho MG. Evaluation of student use of videos to support learning in a simulation laboratory course: a perception and analytics approach. J Investig Clin Dent 2019 Nov;10(4):e12453. [doi: 10.1111/jicd.12453] [Medline: 31560416]
13. Remtulla R. The present and future applications of technology in adapting medical education amidst the COVID-19 pandemic. JMIR Med Educ 2020 Jul 17;6(2):e20190 [FREE Full text] [doi: 10.2196/20190] [Medline: 32634107]
14. Haridy R, Abdalla MA, Kaisarly D, Gezawi ME. A cross-sectional multicenter survey on the future of dental education in the era of COVID-19: alternatives and implications. J Dent Educ 2021 Apr;85(4):483-493 [FREE Full text] [doi: 10.1002/jdd.12498] [Medline: 33263205]
15. Wilcha R. Effectiveness of virtual medical teaching during the COVID-19 crisis: systematic review. JMIR Med Educ 2020 Nov 18;6(2):e20963 [FREE Full text] [doi: 10.2196/20963] [Medline: 33106227]
16. Wu DT, Wu KY, Nguyen TT, Tran SD. The impact of COVID-19 on dental education in North America - Where do we go next? Eur J Dent Educ 2020 Nov;24(4):825-827 [FREE Full text] [doi: 10.1111/eje.12561] [Medline: 32654328]
17. Quinn B, Field J, Gorter R, Akota I, Manzanares M, Paganelli C, et al. COVID-19: the immediate response of european academic dental institutions and future implications for dental education. Eur J Dent Educ 2020 Nov;24(4):811-814 [FREE Full text] [doi: 10.1111/eje.12542] [Medline: 32394605]
18. Machado RA, Bonan PRF, Perez DEDC, Martelli Júnior H. COVID-19 pandemic and the impact on dental education: discussing current and future perspectives. Braz Oral Res 2020;34:e083 [FREE Full text] [doi: 10.1590/1807-3107bor-2020.vol34.0083] [Medline: 32609144]
19. Liu X, Zhou J, Chen L, Yang Y, Tan J. Impact of COVID-19 epidemic on live online dental continuing education. Eur J Dent Educ 2020 Nov;24(4):786-789 [FREE Full text] [doi: 10.1111/eje.12569] [Medline: 32648989]
20. Silva PGDB, de Oliveira CAL, Borges MMF, Moreira DM, Alencar PNB, Avelar RL, et al. Distance learning during social seclusion by COVID-19: improving the quality of life of undergraduate dentistry students. Eur J Dent Educ 2021 Feb;25(1):124-134 [FREE Full text] [doi: 10.1111/eje.12583] [Medline: 32780535]
21. Silva MM, Caraballo MGD, Soto AP, Delgado AJ. Spanish in dentistry online classroom: a new teaching strategy in challenging times. J Dent Educ. Epub ahead of print posted online on August 12, 2020 2021. [doi: 10.1002/jdd.12380] [Medline: 32786010]
22. Karpenko AE, Sterlitz SJ, Garcia-Hammaker SS. Virtual online learning communities reducing dental student stress and anxiety. J Dent Educ. Epub ahead of print posted online on September 15, 2020 2021. [doi: 10.1002/jdd.12430] [Medline: 32935361]
23. Hu J, Zou H, Dai Y, Feng Z. How to keep students engaged in oral health education during the COVID-19 pandemic. J Dent Educ. Epub ahead of print posted online on September 9, 2020 2021. [doi: 10.1002/jdd.12420] [Medline: 32901927]
24. Aguilar-Gálvez D, Noal FC, de Araujo FB, Arriola-Guillén LE. Virtual learning object: an asynchronous solution for virtual learning in dentistry post COVID-19. J Dent Educ. Epub ahead of print posted online on September 16, 2020 2021. [doi: 10.1002/jdd.12439] [Medline: 32936459]
25. Stud.IP-Portal. Göttingen, Germany: Stud.IP URL: https://www.studip.de/ [accessed 2021-05-06]
26. CAMPUS. Umbrella Consortium for Assessment Networks. URL: https://www.ucan-assess.org/campus/?lang=en [accessed 2021-05-06]
27. Kanzow P, Schuelper N, Witt D, Wassmann T, Sennhenn-Kirchner S, Wiegand A, et al. Effect of different scoring approaches upon credit assignment when using Multiple True-False items in dental undergraduate examinations. Eur J Dent Educ 2018 Nov;22(4):e669-e678. [doi: 10.1111/eje.12372] [Medline: 29934980]
28. Vorkauf H. Teilpunktbewertung bei K'-Items. Jahresbericht 1986 der Gruppe Medizinalprüfungen und der Gruppe Statistik und EDV. Bern, Switzerland: Institut für Ausbildungs- und Examensforschung, Medizinische Fakultät der Universität Bern; 1987:44-48.
29. Hartley J, Cameron A. Some observations on the efficiency of lecturing. Educ Rev 1967 Nov;20(1):30-37. [doi: 10.1080/0013191670200103]

30. Tolks D, Schäfer C, Raupach T, Kruse L, Sarikas A, Gerhardt-Szép S, et al. An introduction to the inverted/flipped classroom model in education and advanced training in medicine and in the healthcare professions. GMS J Med Educ 2016;33(3):Doc46 [FREE Full text] [doi: 10.3205/zma001045] [Medline: 27275511]
31. Jackson TH, Zhong J, Phillips C, Koroluk LD. Self-directed digital learning: when do dental students study? J Dent Educ 2018 Apr;82(4):373-378. [doi: 10.21815/JDE.018.040] [Medline: 29606654]

Abbreviations

DE: distance education

Edited by G Eysenbach; submitted 05.11.20; peer-reviewed by M Hama, F Noal, R Mallick; comments to author 02.12.20; revised version received 28.12.20; accepted 03.05.21; published 14.05.21.

Please cite as:
Kanzow P, Krantz-Schäfers C, Hülsmann M
Remote Teaching in a Preclinical Phantom Course in Operative Dentistry During the COVID-19 Pandemic: Observational Case Study
JMIR Med Educ 2021;7(2):e25506
URL: https://mededu.jmir.org/2021/2/e25506
doi:10.2196/25506
PMID:33941512

Letter to the Editor

Virtual vs Online: Insight From Medical Students. Comment on “Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review”

Shahil Kaini[1*], iBSc; Lucinda Zahrah Motie[1*], BSc

University College London, London, United Kingdom

*all authors contributed equally

Corresponding Author:
Shahil Kaini, iBSc
University College London
Gower St, Bloomsbury
London, WC1E 6BT
United Kingdom
Phone: 44 020 7679 2000
Email: shahilkaini@live.co.uk

Related Articles:

Comment on: https://mededu.jmir.org/2020/2/e20963/

Comment in: https://mededu.jmir.org/2021/2/e29335/

(JMIR Med Educ 2021;7(2):e27020) doi:10.2196/27020

KEYWORDS

virtual teaching; medical student; medical education; COVID-19; review; search term; virus; pandemic; quarantine

We read with great interest the review by Wilcha [1], which discussed current literature on the effectiveness of virtual medical teaching during COVID-19. The conclusion suggested that despite various disadvantages, virtual teaching effectively enabled medical education to continue during the peak of the COVID-19 pandemic. As fifth-year medical students currently studying at University College London, we have first-hand experience in virtual teaching and recognize its importance within medical education in the future.

We commend Wilcha for undertaking a systematic review in a newly emerging area of medical education. Virtual teaching appears likely to remain a part of medical education going forward; therefore, we welcome any attempts to review existing research to outline advantages, disadvantages, and recommendations. As acknowledged by Wilcha, researching an emerging area means the literature available is restricted. However, we would like to question the literature search conducted. Wilcha used the key term “virtual,” when searching PubMed and Google Scholar, but we believe this limited the search. The search could have been expanded by using “online,” a term synonymous with “virtual.” We repeated the original search, replacing the term “virtual” with “online.” This yielded 108 articles on PubMed compared to the 92 as originally reported. We then put these articles through the inclusion and exclusion criteria outlined in the *Methods* section of the review. This left us with 7 articles, all of which were published in a peer-reviewed scientific journal, relevant to the objectives of the study, and conducted between February and June 2020.

Some of these missed articles raise interesting points. For example, Wilcha discusses how technological difficulties are a major disadvantage of virtual teaching. However, Nik-Ahmad-Ziki et al [2] raise excellent points regarding this topic that were not discussed in the review. They outline the psychological impact technological difficulties can have on students, leaving them discouraged from joining sessions and demotivated. Interestingly, technological difficulties were rare for clinical teachers, who still had to go to the hospital during the day and so had access to excellent facilities and internet coverage.

Research on virtual teaching has become very important due to the recent changes enforced by the COVD-19 pandemic. We commend Wilcha for conducting this systematic review, but we believe the initial literature search was too limited. Adjusting the search terms would have provided more literature to review and more points to discuss. Furthermore, it would have helped address certain limitations. Many of the studies discussed by Wilcha had small sample sizes, which decreases the reliability of the findings. Had “online” been used as a key term, the study by Singh et al [3] would have been included. This study had a large sample size of 208 students and presented interesting findings as many students thought physical classes were better than virtual classes. Going forward, repeating this systematic review would be useful as a considerable amount of research has occurred on this topic since this review was originally conducted.

Conflicts of Interest

None declared.

References

1. Wilcha RJ. Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review. JMIR Med Educ 2020 Nov 18;6(2):e20963 [FREE Full text] [doi: 10.2196/20963] [Medline: 33106227]
2. Nik-Ahmad-Zuky NL, Baharuddin KA, Abdul Rahim AF. Online Clinical Teaching and Learning for Medical Undergraduates during the COVID-19 Pandemic: The Universiti Sains Malaysia (USM) Experience. EIMJ 2020 Jun 30;12(2):75-80. [doi: 10.21315/eimj2020.12.2.8]
3. Singh K, Srivastav S, Bhardwaj A, Dixit A, Misra S. Medical Education During the COVID-19 Pandemic: A Single Institution Experience. Indian Pediatr 2020 May 4;57(7):678-679. [doi: 10.1007/s13312-020-1899-2]

Edited by T Derrick; submitted 07.01.21; this is a non–peer-reviewed article;accepted 14.04.21; published 14.05.21.

Please cite as:
Kaini S, Motie LZ
Virtual vs Online: Insight From Medical Students. Comment on “Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review”
JMIR Med Educ 2021;7(2):e27020
URL: https://mededu.jmir.org/2021/2/e27020
doi:10.2196/27020
PMID:33988518

Letter to the Editor

Author's Reply to: Virtual vs Online: Insight From Medical Students. Comment on "Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review"

Robyn-Jenia Wilcha[1]

[1]Faculty of Biology, Medicine and Health, University of Manchester, Manchester, United Kingdom

Corresponding Author:
Robyn-Jenia Wilcha
Faculty of Biology, Medicine and Health
University of Manchester
Oxford Road
Manchester, M13 9PL
United Kingdom
Phone: 44 (0)161 306 0211
Email: robynwilcha05@gmail.com

Related Articles:

Comment on: https://mededu.jmir.org/2021/2/e27020/

Comment on: https://mededu.jmir.org/2020/2/e20963/

(JMIR Med Educ 2021;7(2):e29335) doi:10.2196/29335

KEYWORDS

virtual teaching; medical student; medical education; COVID-19; review; search term; virus; pandemic; quarantine

I am grateful for the opportunity to respond to the issues raised in the letter by Kaini and Motie [1] and to clarify aspects of my methodology in relation to these concerns. I would also like to thank these fifth-year medical students at University College London (UCL) for their interest in my paper [2] and for taking the time to express their considerations.

Potential concerns were raised in regard to limitations of the original review [2]. Foremost, I appreciate that my colleagues at UCL understand the novel nature of the study and the emerging essence of literature at the time of writing. I agree that the paper written by Nik-Ahmad-Ziki et al [3] raises further excellent points reviewing the psychological impacts of technical triumphs and difficulties on both clinicians and students, and likewise, the paper by Singh et al [4] reflects important disadvantages to virtual medical education. As acknowledged by my colleagues, studies with small sample sizes were included in my original review; this was noted in the *Discussion* section of my paper as a limitation secondary to the developing nature of the COVID-19 pandemic.

However, the primary objective of this study [2] was to provide a brief review of the effectiveness of virtual medical education at the time of an evolving global pandemic, and I believe that the concerns raised by Kaini and Motie [1] had minimal impact in accomplishing this objective. Considered by my colleagues is the impact of student mental health in line with virtual teaching; the views of 7 further authors were outlined in my paper, documenting findings similar to Nik-Ahmad-Ziki's study [3] of decreased motivation, engagement, and lack of support [5]. As a result, I believe it is unlikely that the loss of Nik-Ahmad-Ziki's study [3] would have had any deleterious effects in addressing the primary purpose of my study. Moreover, the timeframe of articles to meet my inclusion criteria was between the dates of February to June 2020. The paper by Singh et al [4] was published in completed format in July 2020, which falls outside these dates [3]. However, the paper by Kaur et al [6], included in my review, has a large sample size of 983 students and concluded similar findings to Singh et al [4], stating that students found virtual teaching unsatisfactory in comparison to face-to-face teaching due to difficulties in supporting individual learning needs, interaction levels, convenience, and balancing practical/theoretical knowledge [5].

It is apparent that we share similar interests in the development of medical education, especially due to our shared first-hand experience. It is likely that advancements in virtual medical education will revolutionize the field of medical sciences, and the COVID-19 pandemic presents a unique opportunity to explore new and innovative teaching techniques to shape the nature of medical education. Ultimately, I agree with my colleagues at UCL that more research is needed to fully understand the short- and long-term impacts of virtual teaching on future doctors.

Conflicts of Interest

None declared.

References

1. Kaini S, Motie LZ. Virtual vs Online: Insight From Medical Students. Comment on "Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review". JMIR Med Educ 2021 May 14;7(2):e27020 [FREE Full text] [doi: 10.2196/27020]
2. Wilcha RJ. Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review. JMIR Med Educ 2020 Nov 18;6(2):e20963 [FREE Full text] [doi: 10.2196/20963] [Medline: 33106227]
3. Nik-Ahmad-Zuky NL, Baharuddin KA, Abdul Rahim AF. Online Clinical Teaching and Learning for Medical Undergraduates during the COVID-19 Pandemic: The Universiti Sains Malaysia (USM) Experience. EIMJ 2020 Jun 30;12(2):75-80. [doi: 10.21315/eimj2020.12.2.8]
4. Singh K, Srivastav S, Bhardwaj A, Dixit A, Misra S. Medical Education During the COVID-19 Pandemic: A Single Institution Experience. Indian Pediatr 2020 May 4;57(7):678-679. [doi: 10.1007/s13312-020-1899-2]
5. Longhurst GJ, Stone DM, Dulohery K, Scully D, Campbell T, Smith CF. Strength, Weakness, Opportunity, Threat (SWOT) Analysis of the Adaptations to Anatomical Education in the United Kingdom and Republic of Ireland in Response to the Covid-19 Pandemic. Anat Sci Educ 2020 May;13(3):301-311 [FREE Full text] [doi: 10.1002/ase.1967] [Medline: 32306550]
6. Kaur N, Dwivedi D, Arora J, Gandhi A. Study of the effectiveness of e-learning to conventional teaching in medical undergraduates amid COVID-19 pandemic. Natl J Physiol Pharm Pharmacol 2020;10(7):563-567 [FREE Full text] [doi: 10.5455/njppp.2020.10.04096202028042020]

Abbreviations

UCL: University College London

Edited by T Derrick; submitted 02.04.21; this is a non–peer-reviewed article;accepted 14.04.21; published 14.05.21.

Please cite as:
Wilcha RJ
Author's Reply to: Virtual vs Online: Insight From Medical Students. Comment on "Effectiveness of Virtual Medical Teaching During the COVID-19 Crisis: Systematic Review"
JMIR Med Educ 2021;7(2):e29335
URL: https://mededu.jmir.org/2021/2/e29335
doi:10.2196/29335
PMID:33852412

Publisher:
JMIR Publications
130 Queens Quay East.
Toronto, ON, M5A 3Y5
Phone: (+1) 416-583-2040
Email: support@jmir.org