

ORIGINAL RESEARCH

Simulated patient perceptions of telesimulation education

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ABSTRACT

Introduction

Perspectives of simulated participants (SPs) as stakeholders in simulation education are under-represented. With rapid increase in virtual education and anticipation of post-pandemic continuation it is important to establish best practices. This work aims to determine SP perceptions of telesimulation.

Methods

In-depth semi-structured interviews determined SP opinions of participation in telesimulation. Thematic analysis utilizing an inductive and semantic iterative coding process was performed. SPs completed a survey of their demographics, experience and prior SP training, both virtual and in-person.

Results

Data sufficiency occurred after 16 interviews (10 females/6 males; 15 White/1 Black/African American). Median age was 56 years (range 37–72). Median number of in-person simulation experiences was 100 (range 6–300) and 27 telesimulations (range 3–100). Thematic analysis identified five themes: (1) students behave differently (distracted, less professional, less prepared for 'real life', less nervous), (2) my performance – some things are easier and some harder (increased cognitive load, coming out of role more, difficulties with non-verbal aspect, more standardized performance), (3) it's harder to connect with learners (different cues, less of a personal connection), (4) safety for all in telesimulation (as psychologically safe as in-person, appreciate opportunity to continue to educate/work, personal safety), (5) future applications of telesimulation (telehealth training, better access to education for learners).

Conclusion

SP perceptions of telesimulation education revealed appreciation of the educational modality and identified potential benefit in telehealth education. SPs were concerned about learner participation, professionalism and resultant preparation for clinical practice. Incorporating SP feedback into telesimulation education may be important to ensure high quality.

What this study adds

- Simulated participants (SPs) are important stakeholders in simulation education and provide essential insight into the rapid transition to the telesimulation platform.
- SP perceptions of telesimulation education revealed appreciation of the educational modality and identified potential benefit in telehealth education.
- SPs were concerned about learner participation, professionalism and resultant preparation for clinical practice.
- SPs believe psychological safety is equivalent for them between in-person and virtual simulations and appreciate health safety the virtual platform provides.
- Incorporating SP feedback into telesimulation education may be important to ensure high-quality education continues peri- and post-pandemic.

Introduction

Telesimulation has been popularized through the COVID-19 pandemic due to the flexibility of this platform to provide experiential learning in the face of social distancing, quarantine and isolation of learners [1–3]. The virtual learning environment also protects simulated participants (SPs) and simulation educators from viral exposure, particularly important in the time before a COVID-19 vaccine was available [4]. Telesimulation has been utilized as an educational strategy over the last two decades [5], but only formally defined in the HealthCare Simulation Dictionary in 2020 [6]. ‘Telesimulation is a novel concept that uses the internet to link simulators between an instructor and a trainee in different locations’ [7]. Although employed prior to the pandemic, the rapid and widespread adoption of telesimulation has provided challenges including determining the appropriateness and efficacy of this technique for those learning objectives to which it has been applied. Additionally, the COVID-19 pandemic has necessitated simulation educators to rapidly utilize telesimulation, sometimes without extensive previous experience. In these instances, educators have created, learnt about and evaluated this methodology contemporaneously. Telesimulation therefore, although formally defined less than 2 years ago [6], has become rapidly and widely adopted amidst a background of relative paucity regarding knowledge of best practices.

Learner and educator evaluation of each other and learning events allow simulation educators to modify and optimize the learning experience; however, perspectives of SPs as stakeholders are historically under-represented. Previous qualitative analysis has demonstrated that SPs identify as specialists within the simulation experience and are committed to representing the perspectives of real patients [8]. As vital components of effective simulation education, incorporation of SP perceptions, feedback and insights within a simulation program may provide significant benefit to the efficacy of the process.

As educators anticipate post-pandemic continuation of telesimulation, it is important to establish best practices.

The aim of this work is to determine SP perceptions of telesimulation based on lived experiences to guide simulation development and faculty education.

Methods**Telesimulation program**

As social distancing and isolation measures were mandated due to the COVID-19 pandemic in 2020 by the CDC, our last day of in-person simulation occurred on March 13, 2020. To continue education, virtual simulations started on April 13, 2020 for our undergraduate and postgraduate learners. The first events were interprofessional simulations of COVID-19 tracing and screening, elder care and OSCE practice for Anaesthesia residents. The telesimulation education was structured around the social constructivism paradigm. Learners were prepared for the transition to the virtual learning environment with information on technical aspects, Zoom etiquette goals, objectives and expectations through email and learning platforms (e.g. Blackboard). As our experience with telesimulation evolved, these materials were updated accordingly. SPs were prepared for the transition to virtual simulations initially in small groups via Zoom with education specific to the subject matter of the simulation. SPs also performed ‘dry runs’ of the simulations in order to gain feedback on performance and acting of physical signs in order to adapt their performance. Some signs were acted by the patient, e.g. dyspnoea but others, for example the results of system-specific physical examinations, were relayed verbally. As our simulation educators and SPs became more experienced with virtual simulations, regular small group virtual updates were conducted to provide SPs with education as policies and practices evolved. For example, the materials given to students regarding professionalism expectations and behaviours were developed after a discussion by the interprofessional educator group identified issues and developed strategies.

In the initial phases of telesimulation, we translated the established in-person cases to the virtual platform. As comfort with the modality increased and the use of

telehealth by physicians, trainees and students increased, we converted the scenarios to telehealth delivery. In the virtual brief, educators, after attending to logistic details (application for credit, Zoom etiquette, details of evaluation completion, who to contact in case of technical difficulties), used a Powerpoint™ to guide their talk. Educators established expectations (learner participation, professionalism, engagement), described and provided commitment to the fiction contract (learners provided a definition of this and examples) and to providing psychological safety within the learning environment (commitment by educators, SPs and learners to respect and protect all participants within simulation) [9,10]. Details of the simulation scenario were provided and learning objectives highlighted. Multiple learning objectives were incorporated into the telesimulation events including communication skills, history taking, critical thinking and knowledge application and interprofessional teamwork. The length of the simulation events ranged from 1 hour 30 minutes for interprofessional undergraduate simulations to 5 hours for the rising intern preparation week simulations. Facilitators of simulated interactions and trained SPs provided feedback on learner performance within the debriefing. All facilitators were trained to provide facilitation and debriefing in the virtual platform through attending education sessions and a pre-event huddle to go over any final details within the same platform.

Data collection

A qualitative study of SPs was performed at a simulation centre in a single tertiary academic institution [11]. Application for ethical approval was reviewed by the local institutional review board who considered the study an educational quality improvement study of virtual simulation services and not human subject research. The investigators comprised of a female simulation educator responsible for the recruitment, education and training of SPs locally (SJ), a female surgical educator (KJD) who has completed a simulation fellowship, a Masters in Education and who is a certified healthcare simulation educator with qualitative research experience, and a male certified simulation healthcare educator who is the Executive Director of the local simulation centre and who has a Masters in Education (TH).

Purposive sampling was utilized with a recruitment email sent by two investigators (KJD, SJ) to all SPs who had participated in one SP event or more per month at the institution. The sample of SPs was selected in order to recruit those with sufficient experience with both virtual and in-person simulation education to provide a well-rounded insight into telesimulation education. The email outlined the purpose of the work, to determine SP perceptions regarding virtual simulation education in order to improve the experience for learners and SPs at our institution. Following recruitment emails, in-depth semi-structured interviews were performed including all SPs who volunteered to take part, to determine SP opinions of telesimulation education.

The interviews were conducted via Zoom by KJD who was not involved in recruiting, training or managing SPs.

Interviews were conducted in July and August 2021 during the COVID-19 Delta wave. The SPs participated from a laptop or other electronic device from their homes and the interviewer was in her office. The interviewer had interacted with three of the SPs within educational events prior to the study but with minimal personal contact. The interviews were allocated 45-minute appointments, but were not terminated if they lasted longer. Written informed consent was obtained before each interview using a consent form and information materials that were sent to SPs at the time of recruitment email. Emphasis was placed during the consent process that participation or lack thereof would not impact SP future employment. The interviews were recorded and transcribed verbatim to enable subsequent thematic analysis. Following each interview, all SPs completed a survey detailing demographics, experience and prior SP training, both virtual and in-person. This survey was included for review with the institutional review board materials and collected so as to reduce the number of closed questions asked in interview (Appendix 1).

The interview questions were open-ended and assessed (1) the perceptions of SPs regarding telesimulation, (2) any barriers or challenges encountered during participating as an SP in telesimulation and (3) opinions regarding future utility and utilization of telesimulation for medical education (Appendix 2). The interview questions were created by the investigative team following literature review to identify current pertinent issues pertaining to effective delivery of telesimulation and to place focus on the participant's personal experiences and stories about their participation within these learning events. The questions were piloted by recruiting non-healthcare professionals from the institution as a convenience sample in order to assess the utility and appropriateness of the questions. Interviews were performed until sufficiency was reached with no new themes uncovered nor investigator understanding of the subject matter deepened.

Data analysis

Two investigators (KJD, TH) performed data analysis. TH was not involved in recruitment, interviews and reviewed de-identified transcripts of the interviews to mitigate possible influence of his working relationships with SPs. Thematic analysis as described by Braun and Clarke [12] is the theoretical framework upon which the work was based. The approach to analysis was experiential and inductive. This approach was selected due to the unique situation of educational delivery within the COVID-19 pandemic. A semantic iterative coding process using a realist approach was used to identify themes relating to SP perception of telesimulation [13,14]. Interviews were performed until data sufficiency was reached with no new themes uncovered nor investigator understanding of the subject matter deepened. Following data familiarization, two investigators independently coded transcripts and developed their own themes for these separately. The investigators met and discussed codes formed and candidate themes on multiple separate occasions until consensus was achieved on final themes. When disagreement occurred, the issues

were discussed until agreement was reached. The entire investigative team agreed on the final conceptual model.

Results

Two rounds of interviews were completed. Data sufficiency had not occurred after seven interviews; therefore, a second round of interviews was performed. The interview process was deemed complete when the preceding three interviews did not identify any new themes or codes. There was no attrition from recruitment. Data sufficiency occurred after 16 interviews. Demographic details of the SPs who volunteered to participate are shown in Table 1. Half of all SPs had been in their role 6 years or more (Table 2).

Median number of in-person simulation experiences was 100 (range 6–300) and, for telesimulations, 27 (range 3–100). The majority (9/16) of SPs participated in their first telesimulation in 2020. The most common training received in preparation to participate in telesimulations as an SP was practice sessions (Table 2).

Qualitative analysis identified five themes relating to SP perceptions of telesimulation; (1) students behave differently, (2) my performance – some things are easier and some harder, (3) it’s harder to connect with learners, (4) safety for all SPs in telesimulation and (5) future applications of telesimulation.

Students behave differently

When comparing student behaviours between in-person and virtual simulation learning events, SPs believed that students behaved differently in the virtual environment. SPs expressed concerns that learners were more distracted during telesimulations. Examples given included talking to others within the room, playing with pets, drinking, eating and engaging with cellphones. Example quotes: ‘With this simulated patient, they’re sitting back in their chair... they’re twiddling their pens and their background is all over. They’ve got their favorite soda or they are not alone, you know. So I no longer feel like I’m as serious to them as when that white coat student walks in the room...“and that person [learner] is sitting at home on their couch or wherever. And their spouse or somebody else has been in the room, and that learners eyes, get away from me, and go up to that person. That’s when they start laughing, or they start talking’ (#1). ‘And I feel like there’s a lot less respect for the entire process’ (#9).

SPs were also worried that learners were less professional in the virtual environment. SPs related learner distraction to lack of ‘buy-in’ to the fiction contract, an important element of the simulation learning experience that allows immersion of learners within the case [15]. An example quote ‘If [it] is on

Table 1: Demographic details of SPs

Characteristic	
Gender	Female 10 Male 6
Race	Black/African American 1 White 15
Age, years (median, range)	56 (37–72)

Table 2: Experience of SPs

Variable	
Number of years as an SP	0–5 8 6–10 4 11–15 3 >15 1
Number of in-person simulations as an SP, median	100 (range 6–300)
Number of telesimulations as an SP, median	27 (range 3–100)
Training received for in-person SP performance (all that apply)	Didactics 13 Practice sessions 13 Reading materials 7 Shadowing 6 Other – watching recorded cases 6, YouTube 1
Training received for telesimulation SP performance (all that apply)	Didactics 11 Practice sessions 15 Reading materials 8 Shadowing 6 Practicing onsite (dry run) 3

Zoom... Yeah. It is not real. Yeah. This is like them watching a movie or something. The seriousness of the issue is lost. It’s difficult to translate it virtually’ (#6). Most SPs reported that the telesimulation events, although useful, raised concern in them that the students were less prepared for ‘real life’. Explanations provided included the lack of simulating an in-person consultation environment.

SPs also perceived students to be less nervous in the telesimulation learning events compared to in-person. The SPs described that they did not wish to see the students afraid, more that they felt a certain level of ‘nerves’ and stress would be helpful for them in the learning environment. Example quotes: ‘They’re, they’re almost scared now. I don’t really want them to be scared and the longer they’re in practice with us the less scared, they are, but the students who are seeing on video today, it’s like they’re sitting in front of a game and they have no fear whatsoever’ (#5). ‘I don’t think they’re quite as nervous because they’re not actually in person and they are comfortable sitting in their home or dorm room or wherever’ (#8). They were concerned that the telesimulation education facilitated students being too laid back. SPs described concerns about the stress levels of the students in the future if the students don’t get to practice an in-person encounter before they engage with patients in real life. An example quote: ‘There’s a difference between knocking on the door and waiting until your patient says come in and just storming in and virtually you can’t replicate that’ (#4). Specifically, the lack of ability to practice physical examination was identified as a major limitation for student preparation. Learning ‘how to touch’ patients was described by one participant as a skill they were worried is lost for the current cohort of students. An example quote: ‘Probably the biggest obstacles are cases where there’s a scenario or a case in which there has to be a physical touching.. That’s

when face to face is superior.....the learner is not able to examine or touch the patient, you know, which they're going to have to touch patients a lot and so they're not getting that practice' (#8).

My performance – some things are easier and some are harder

When reflecting upon their performance, SPs described how the virtual environment facilitated some aspects of their performance and provided challenges in other areas. Making their performance harder, SPs universally reported an increased cognitive load with telesimulation. The increase related to a number of factors, both technological and personal. Example quotes: 'I feel like I have to focus more' (#4). 'it [telesimulation] adds an extra step of complexity for us as standardized patients because not only do we need to focus on our character and remembering our history and having that split focus that we try to develop in theater training to pay attention to what you're doing. But also pay attention to what they're doing [and the technology] so that you can provide feedback' (#9). Technology issues included those with connectivity, dealing with the technical aspects of zoom and addressing learner technology problems, and all distracted them from their performance. One participant expressed frustration with distraction by all the noises made by the technical devices in use or in the environment in general. An example quote: 'Interruptions ding, you know, ding ding, in the virtual setting that do not occur in the face-to-face settings' (#12). Personal issues described included those related to visual and non-verbal cues being diluted in the virtual environment. 'The thing that is hard to sometimes get across as the patient to the of learner is nonverbal stuff' (#1). 'and you don't get that face-to-face interaction, you don't get the body language you know, the real feel of it because of the communication method' (#8). SPs described having to focus on exaggerating the physical sign of the symptom they were supposed to be experiencing, examples being dramatic clutching of the abdomen or exhibiting extremely laboured breathing. 'So I have to be more focused on Zoom to get you.....if I'm panting or if I'm holding my side, I don't know how much of this screen you can see' (#5). They also expressed concern that certain emotions, most particularly anger, were not communicated as well virtually. One participant described that in person she can get up close to the learner to non-verbally reinforce her anger as the SP, whereas the computer screen acted as a dampener of emotion during the virtual encounters. '[when you are in the role of an angry patient].... like you can't get in the physical space. It's not threatening. Like if you start yelling now....you're still on the computer....It's different kind of feeling I guess for the learner...I don't know if we can ever really emulate that over a computer' (#14). 'and so I get angry at these learners. And that exposes these students to an angry person that they have to learn to deescalate. You can't really do that virtually, you know' (#1). SPs were also concerned that they were required to come out of role more during telesimulations, predominantly due to technical issues experienced by the SP or the learner and the process required to address them. One participant reported

struggling with the scenario when learners were having technical difficulties describing how she felt she would 'put them off' in the encounter if she began talking as herself, yet felt compelled to do so to help the learner. 'you have to explain a little bit more if there is a technical difficulty... kind of your job has been expanded' (#3). 'Because actually if it gets real severe [connection issues] I would, I would say something. But I don't want to throw the learner off by throwing them a curve that your internet connection is terrible' (#8).

SPs described the benefits telesimulation as being able to deliver a more standardized performance. They discussed specifically the fact that case materials could be easily accessed during telesimulations, for example on a white board, notice board, table or electronic device next to them, and believed their ability to do this gave the learners a more reproducible learning experience. Example quotes: 'I have a bulletin board and if there's something that I absolutely need to remember, while I'm telling my story, they [the learners] can't see it. So I can just put it up on my bulletin board behind....it makes it more standardized...you can't very well do that in person' (#14). 'a virtual encounter to me almost makes it more standardized because the SPs are sitting in front of their computer and they probably have their case laid out in front of them and so they can actually read the case' (#1).

It's harder to connect with learners

All SPs reported that they experienced a lesser personal connection with learners in telesimulation events, compared to those they have experienced in-person. An example quote: 'not in the room with someone and being not fully present. It's difficult for me... Not really able to get the feedback and the emotional connection and things that, you know you get in person' (#14). The majority struggled to connect due to different cues in the virtual environment. An example quote: '...in a room, I can feel your personality. Whereas in Zoom, sometimes there's no emotion shown or it's difficult sometimes. There's no affirmation shown, you know. They're just staring at the zoom' (#5). During the interviews, multiple SPs demonstrated to the interviewer how the virtual encounter is changed by the learner's gaze focusing directly on the camera rather than looking at the zoom screen. They felt the effect of virtual platform on eye contact was a crucial contributor to decreased connectivity. An example quote: 'you can't really judge eye contact because people have different cameras in different places' (#3). SPs reported being unable to feel the learners' 'energy' and that this affected not only their interpersonal connection, but also impacted their own performance as they would usually feed a learner's energy into their character's response during in-person scenarios. 'It's really missing the element of personal energy' (#9).

Safety for all SPs within telesimulation

When considering the psychological safety of telesimulations, all SPs felt that this was equivalent to in-person simulation educational events. An example quote: 'I feel as safe and as comfortable....I feel as comfortable

giving honest feedback virtually as in person' (#9). 'Happy giving feedback to anybody over zoom - it is probably a little easier because I have my notes' (#5). The SPs all appreciated the opportunity to continue to educate learners and to stay employed during the COVID-19 pandemic to continue to earn money. 'I was happy to be working' (#13). The majority of SPs also detailed their appreciation for the opportunity to protect their personal safety by participating in telesimulations. One participant explained how she was concerned to attend events again in person (interviews were performed at the time of emergence of the Delta strain) and she felt in-person was unnecessary because virtual simulations provided a way for her to stay safe and to provide education. 'I don't have to worry about exposing myself to a viral disease' (#7).

Future applications of telesimulation

All SPs identified that they felt telesimulation would be crucial in the education of healthcare professionals to provide effective patient-centred telehealth in the future. Example quotes: '[I tell the students] get used to this [telesimulation and telehealth] because I guarantee this is going to be part of your career...This is not going away. So you need to learn how to do this well' (#7). 'I think the benefits for the learner are that we are going down this avenue for them that will probably be relevant in the future...I can see where telemedicine, Telehealth...it is going to have its place in...treatment of patients in the future' (#2). They also expressed belief that the COVID-19 pandemic had changed delivery of healthcare to emphasize the contribution of telehealth, which they believed would persist beyond the pandemic. Example quotes: '[telesimulation] it's something that can be helpful to teach for a new modality that we're now doing because of the pandemic - virtual medicine, which people have not really been taught historically. Because quite frankly, there wasn't really a need for it' (#3). 'Telehealth is really a thing that I think is here to stay and maybe taking an even more prominent role in medical care in years to come. And there's certainly a lot to for youngsters you know, medical professionals to learn about the best way to conduct a telemedicine encounter' (#9). One participant emphasized that she felt telehealth 'was here to stay' and that the virtual platform was most effective for training; 'how else can you train students for [telehealth] except online?' 'Teaching people to interact with patients virtually as well, which is like a whole other skill' (#1). The majority of SPs described a benefit of telesimulation that they felt would be important in the future as the ability to provide better access to education for learners, across both geographical distances and also in the diversity of the educator pool that telesimulation enables, 'the benefit is the student gets some training and can attend something if they are not in the same location' (#5).

Discussion

The aim of this work was to determine SP perceptions of telesimulation and qualitative analysis determined five themes (1) students behave differently, (2) my performance - some things are easier and some harder,

(3) it's harder to connect with learners, (4) safety for all SPs in telesimulation and (5) future applications of telesimulation. SPs are key stakeholders in the educational process and provide important insight into the assessment and development of newer educational approaches. As telesimulation has been popularized during the COVID-19 pandemic, analysis of SP insights is crucial to ensuring high-quality simulation education. We have identified concern in the SP population regarding their perceptions of learner participation and professionalism when engaging in the virtual platform, and the ability of telesimulation to adequately prepare learners for in-person clinical practice. The SPs described that a certain level of 'nerves' and stress would be helpful for them in the learning environment, aligned with the work of Vogel and Schwabe [16]. SPs appreciated the benefits of telesimulation in terms of the fidelity of the modality to prepare learners to effectively engage in telehealth consultations, and to increase the accessibility of events and educators to learners by bridging geographical issues.

Little is known of the perceptions of key stakeholders with regard to telesimulation. Studies evaluating efficacy of telesimulation have largely focused on learners and involve quantitative assessment of educational events [17–21]. Gutierrez-Barreto and colleagues performed a mixed methods analysis of professors, SPs and students in order to delineate a taxonomy of implementation barriers to telesimulation [20]. The results are important and of utility to simulation educators in efforts to create effective telesimulation events, but do not solely focus on SP experiences, nor identify wider SP perceptions of telesimulation. The qualitative analysis gathered through questionnaire is also limited in capacity to explore perceptions in as granular detail as with semi-structured interview-based methodology.

To assess learner experience with telesimulation, Ray et al. describe evaluation of a medical student telesimulation elective, utilized to continue experiential learning for the students during the COVID-19 pandemic [3]. The authors delineate the process for design and implementation of the telesimulation and identify limitations and issues faced during the process. Although no assessment or evaluation data are presented, the importance of collection of qualitative data from learners during the next phase of the author's project is emphasized. Whilst important to collect data from learners and faculty to evaluate the efficacy for learning that telesimulation provides, SPs have a wealth of experience in simulation and provide important insight. For example, half of the SPs in the current work have been in their role for 6 years or more, with participation in up to 300 in-person simulation events and up to 100 telesimulation events. SP input enables unique comparison of educational modalities and thoughtful reflection of the limitations, benefits and strategies to improve current telesimulation efforts. The wealth of simulation experience possessed by SPs is not afforded to learners and faculty by nature of their professional roles. Incorporation of SP perceptions into continuing telesimulation curriculum renewal may be essential to optimize student learning. Current literature

examines perceptions of adolescent SPs power and the role of the SP in simulation [8,22].

A predominant SP concern related to student behaviours within telesimulation events was the perceived lack of professionalism, realism and student buy-in to the fiction contract [14]. As Zoom conferencing has become more utilized during the current pandemic, it is important for students and faculty to delineate between those behaviours acceptable in the professional compared to personal virtual environment. The distinction is important not just for telesimulation events, but also as these students go on to provide telehealth services for patients. It is essential to set expectations and a culture of professional behaviour in the virtual environment, as much as within the clinical setting. Resources exist to teach students professionalism utilizing virtual patients, and students provide positive feedback regarding efficacy of these resources [23,24]. The Association of SP Educators (ASPE) also provides webinars on this topic. Within the telesimulation experience the SP opinion of the learner's professionalism is integral to their assessment. Whilst the SP opinion is not the only contributor to assessment of learner professionalism (faculty facilitators also assess this), in their role as the patient they provide important insight, particularly relevant to telehealth encounters and development of learner skills regarding etiquette of these encounters.

SPs also perceived that telesimulation was not preparing students to interact with patients in real life, examples including not being able to touch SPs, appreciate non-verbal cues nor experience a face-to-face interaction in professional attire with an SP in the clinical setting. Whilst the telesimulation environment can be very effective for communication skills, development of tactile-based clinical skills is challenging. Verbalization of clinical examination findings by the SP can move the scenario along to allow students to develop critical thinking processes, but reduces the potential for students to practice clinical examination. A potential solution is hybrid simulations (as COVID-19 restrictions permit), enabling a combination of telesimulation and in-person simulation strategies, with the modality tailored to the learning objectives of each encounter. Even with the best intentions, it is challenging to simulate the feeling of walking into a consultation room to meet a patient, or having a patient cry or become angry in front of you and within arm's reach. The SPs perceived that their personal connection with learners was affected by a lack of proximity. A combination of approaches are likely the best strategy to teach effectively.

A benefit of telesimulation identified by SPs was better standardization of SP performance in the virtual environment as SP reference materials were available. Standardization is important when considering the need to provide every student with equivalent educational opportunities. Additionally, SPs universally perceived that telesimulation would be important in the future to teach students telehealth. All SPs believed that a different skill set is required to effectively interact with a patient in a telehealth scenario compared to an in-person

consultation. Telehealth has become and will remain crucial in the maintenance of patients' health when social distancing and healthcare restrictions are in place. Effective telehealth encounters are key to the diagnosis and appropriate management of disease, including disease prevention strategies with effective education being central.

Defining SP perceptions of telesimulation education is important to ensure best practices of simulation education. Our findings from this study align with the ASPE standards of best practice. The importance of telesimulation in telehealth education can inform case development. Incorporation of learner professionalism training for SPs has been an important adaptation to local simulation education practices since this study was performed. SPs perceive that telesimulation is safer for them at times of infective risk and will be important for provision of a safe work environment in future global pandemics or continuation of the COVID-19 pandemic. In the future, professional development activities locally will focus on teaching and how to develop professional behaviours for learners within telehealth encounters.

Our work has limitations. We were committed in our attempt to recruit as diverse an SP population as possible and sent recruitment materials to all SPs at our institution. It is possible that the SPs who participated in this work do not represent our current SP population, and we may not have captured national variations in SP perceptions of telesimulation. The latter may be related to local experiences, protocols and procedures, which we recognize differ. However, we did achieve sufficiency during the interview process and it is unlikely that we have failed to record predominant local SP perceptions. In addition, our centre is affiliated with a tertiary academic institution and therefore our SP population may not represent those involved in telesimulations in more remote, rural or underserved areas. Additionally, our team composition and experiences may have influenced the findings within this work. All of the team participated in virtual simulation education and are simulation champions within the institution. It is possible that intrinsic biases regarding the experience of investigators during the transition from in-person to virtual simulations, both positive and negative, may have influenced their interpretation of the SP interviews.

Future work will be directed at crafting faculty development activities and initiatives addressing the limitations of telesimulation events we have delineated. Specifically, we seek to educate simulation educators in optimizing student behaviours during telesimulations and equip them with strategies to improve student professionalism and engagement in the virtual environment. The latter will involve education and utilization of existing virtual learner engagement assessment tools [21]. We will also assess the efficacy of hybrid events in ameliorating SP concerns regarding lack of preparation for "real life" in an exclusively virtual simulation environment. We plan to harness identified strengths of telesimulation for telehealth education through interprofessional simulation education.

Conclusion

SPs are key stakeholders in the educational process and provide important insight into the assessment and development of newer educational strategies. SP perceptions of telesimulation education revealed appreciation of the modality and identified potential benefit in telehealth education. SPs were concerned about learner participation, professionalism and resultant preparation for clinical practice. Incorporating SP stakeholders within development of telesimulation education may be important to ensure high-quality education for learners.

Declarations

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Authors' contributions

The authors confirm contribution to the paper as follows: study conception and design: Karen J Dickinson; data collection: Karen J Dickinson, Travis Hill, Sherry Johnson; analysis and interpretation of results: Karen J Dickinson, Travis Hill, Sherry Johnson, Michae Orfanos, Judith Casavechia, Margaret Glasgow, Kathryn Neill; draft manuscript preparation: Karen J Dickinson; revision of manuscript: Karen J Dickinson, Travis Hill, Sherry Johnson, Michae Orfanos, Judith Casavechia, Margaret Glasgow, Kathryn Neill. All authors reviewed the results and approved the final version of the manuscript.

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Availability of data and materials

None declared.

Ethics approval and consent to participate

Application for ethical approval was reviewed by the local institutional review board who considered the study an educational quality improvement study of virtual simulation services and not human subject research. Written consent to participate was obtained from all SPs.

Competing interests

The authors declare no conflict of interest.

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APPENDIX 1. SURVEY QUESTIONS

1. Age
2. With which gender do you associate?
 - Female
 - Male
 - Non binary/third gender
 - Prefer to self-describe
 - Prefer not to say
3. With which race do you associate?
 - Alaska Native
 - American Indian
 - Asian or Asian American
 - Black or African American
 - Native Hawaiian
 - Other
 - Other Pacific Islander
 - Prefer not to say
 - White
4. How many years have you been an SP?
 - 0–5
 - 6–10
 - 11–15
 - >15
5. How many learning events have you participated in as an SP for face-to-face simulations?

6. What date did you participate in your first virtual simulation as an SP?
7. How many learning events have you participated in as an SP for virtual simulations?
8. What training have you received as an SP for face-to-face simulations?
 - Didactics
 - Practice sessions
 - Recommended reading materials
 - Shadowing established SP in a real event
 - Other (please specify)
9. What training have you received as an SP for virtual simulations?
 - Didactics
 - Practice sessions
 - Recommended reading materials
 - Shadowing established SP in a real event
 - Other (please specify)

APPENDIX 2. SEMI-STRUCTURED INTERVIEW QUESTIONS

Semi-structured interview questions for SPs

1. How did you feel about participating in a virtual simulation as an SP before you took part in your first one?
2. How do you think your role as the SP in a virtual simulation compares to your role in a face-to-face simulation?
3. How does your ability to give and receive feedback compare between virtual simulations and face-to-face simulations?
4. How comfortable do you feel giving feedback in a virtual simulation? How does this compare to face-to-face simulations?
5. How respected do you feel participating as an SP in virtual simulations? How does this compare to face-to-face simulations?
6. What do you think are the benefits (if any) of being an SP in a virtual simulation compared to face-to-face simulation?
7. What do you think are the challenges (if any) of being an SP in a virtual simulation compared to a face-to-face simulation?
8. How do you feel about virtual simulations now after experiencing them during the pandemic?
9. What do you think is the future of simulations post-pandemic?
10. Any other thoughts about participation in virtual simulations as an SP?