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Featured Article

Use of Virtually Facilitated Simulation to Improve COVID-19 Preparedness in Rural and Remote Canada

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Abstract
Background: The Alberta Health Services' Provincial Simulation Program (eSIM) is Canada's largest simulation program. The eSIM mobile simulation program specializes in delivering simulation-based education (SBE) to rural and remote communities (RRC). During the COVID-19 pandemic, a quality improvement project involving rapid cycle *in situ* virtually facilitated simulation (VFS) for COVID-19 airway management and health systems preparedness in RRC was successfully implemented.
Methods: Between April 24 and July 31, 2020, a team of six rural simulationists (four nurses and two physicians) provided 24 VFS sessions with virtual debriefing to 200 health care providers distributed across 11 RRC in Alberta and the Northwest Territories, covering a geographic area of approximately 169,028 km^2.
Results: Video analysis of sequential VFS rapid cycle sessions using a standardized observational tool indicated decreased personal protective equipment (PPE) breaches by 36.6% between the first and third cycles. Teams demonstrated increased competency with airway management such as correct use of bag-valve-mask ventilation, and implementation of health system process improvements, such as incorporation of an intubation checklist. Improvements occurred on average over 2.2 rapid cycles completed within 1.3 weeks per RRC. Postsession self-reported participant electronic surveys indicated self-reported improvement in clinical management, teamwork behavior, and health systems issues outcome

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measures which were categorized based on the Crisis Resource Management and Systems Engineering Initiative for Patient Safety (SEIPS) frameworks. Of the 48 survey respondents, 86.1% reported that VFS was equivalent or superior to in-person simulation. The cost of VFS was 62.9% lower than comparable in-person SBE.
Conclusion: VFS provides a rapidly mobilizable and cost-effective way of delivering high-quality SBE to geographically isolated communities.

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Key Points

- VFS is a technologically viable and cost-effective method of delivering SBE during the COVID-19 pandemic.
- VFS can rapidly mobilize a team of interprofessional co-facilitators from different locations to support geographically isolated RRC.
- Future postpandemic use of VFS merits serious consideration as a way of addressing access to SBE by RRC health care providers due to geographic considerations.

Introduction

Alberta Health Services (AHS) is the first and largest centralized provincial health authority in Canada (Alberta Health Services, 2020), serving 4.4 million Albertans spread over 661,000 km^2 (Statistics Canada, 2020; Travel Alberta, 2020), 17% of whom live in rural and remote communities (RRC) (Statistics Canada, 2015). The AHS Provincial Simulation Program (eSIM) is Canada's largest simulation program, training 29,836 health care providers in 2019 alone (Alberta Health Services eSIM Provincial Simulation Program, 2020). However, most of the dedicated simulation technology and infrastructure remains in large urban centers, far away from RRC. In 2009, eSIM began a mobile rural outreach program with trained rural simulationists who drove vast distances to facilitate in-person simulation-based education (SBE) throughout the province (Dubé et al., 2019a). This was a time-intensive and resource-heavy commitment to ensure equitable access to team-based deliberate practice for those health care providers who would otherwise be geographically precluded from such training (Canadian Institute for Health Information, 2020; Wilson & Oandasan, 2020). In early 2020, it became clear that the eSIM mobile simulation program, despite its effectiveness in equitable health care training, would not be sustainable in its existing form due to decreasing resources and the severe health care infrastructure disruption caused by the unprecedented medical and social changes of the COVID-19 pandemic. Unfortunately, this disruption disproportionately affected geographically isolated communities already subject to health care inequities (Government of Alberta, 2020; Wilson & Oandasan, 2020).

At the beginning of the COVID-19 pandemic, urban, suburban, rural, and remote centers were requesting SBE for disaster preparedness (Dubé et al., 2020a), but RRC proved particularly challenging to reach because in addition to budgetary constraints, the pandemic resulted in new public health guidelines and restricted travel (Government of Alberta, 2020). In order to facilitate COVID-19 preparedness training for RRC, existing simulation techniques were applied through a novel approach using entirely virtually facilitated simulation (VFS) including virtual debriefing for communities with limited access to continuing medical education (Alberta Health Services eSIM Provincial Simulation Program, 2019; Cheng et al., 2017; Cheng et al., 2020; Ikeyama, Shimizu, & Ohta, 2012; INACSL Standards Committee, 2016; Shao et al., 2017). The program's rural simulationists evolved into a virtual team, leveraging their established rapport and trust with RRC clinical nurse educators for the subsequent development and implementation of VFS.

Prior studies have concluded that virtual SBE is noninferior to in-person SBE and that high-quality feedback is more important than the platform through which debriefing is delivered (Christenson, Oestergaard, & Watterson, 2018; Ilgen, Sherbino, & Cook, 2013; Savoldelli et al., 2006). In Canada, the need for development of virtual simulation for distributed postgraduate medical education has been recognized by the Future of Medical Education in Canada Postgraduate Project (Bates, Frost, Schrewe, Jamieson, & Ellaway, 2011) as well as a more general need for development of distance technology by the Rural Road Map for Action (Wilson & Oandasan, 2020). In rural Australia, educators have leveraged RRC clinical educators for virtual SBE, but not specifically in the context of COVID-19 preparedness (Masters, Elliott, Boyd, & Dunbar, 2017). Emergency departments and intensive care units have used virtual simulation for COVID-19 and pandemic preparedness but limited to an urban context (Chaplin, McColl, Petrosoniak, & Koch, 2020; Choi et al., 2020; Gross, Whitgill, Auzino, Auerbach, & Balmarks, 2020; Hanel et al., 2020). The VFS project fills the unmet need of virtual SBE in RRC during an unprecedented time in health care history.

The purpose of this article is to describe the VFS program for addressing COVID-19 preparedness in geographically isolated RRC, to highlight specific quality improvement outcomes of VFS, and to encourage replication by other rural simulationists. Of note, virtual simulation is a rapidly emerging field of study. VFS may fall under the Society for Simulation in Healthcare definition of “telesimulation” (Society for Simulation in Healthcare, 2020); however, the term VFS was developed to emphasize the virtual component as the facilitation and not the simulation scenario.

Methods

Context

Between April 24 and July 31, 2020, six rural simulationists developed and implemented a virtually facilitated COVID-19 protected intubation quality improvement simulation program at 11 geographically isolated hospitals in Alberta and the Northwest Territories, covering a geographic area of approximately 169,028 km^2. The rural simulationists are nurses and physicians with rural and remote clinical experience and simulation facilitation training (Cheng et al., 2017).

Participants

In total, 200 participants were recruited and trained through convenience sampling and 48 participants completed the postsession self-reported participant electronic surveys. The demographics of the participants captured a wide range of professions including nurses, physicians, respiratory therapists, paramedics, health care aids, and students from multiple professions. Participants had a wide range of clinical experience from students, to those in practice for more than 20 years. Approximately 19 out of 48 respondents (39.5%) had experienced fewer than five simulation sessions previously.

Recruitment and Planning

Recruitment was done by convenience sampling. The rural simulationists presented a series of webinars to RRC nurses and physicians in Alberta and interested RRC were asked to contact the team (Johnson, Reece, & Simard, 2020; Reece, Vyse, & Ward, 2020). A rural simulationist would then arrange two virtual meetings with the interested RRC site champion to explain the overall VFS process (Appendix A), reviewed the simulation case and objectives (Appendix B), and perform a needs assessment of the RRC (Appendix C). The three primary objectives of VFS were to decrease rates of personal protective equipment (PPE) breaches, to practice protected airway management strategies, and to test local health care processes specific to a protected intubation. These objectives were based on themes which emerged from within the organization in an earlier study (Dubé et al., 2020a). The needs assessment helped the rural simulationist uncover any secondary site-specific objectives, for example, to determine which of two rooms would be more appropriate for a protected intubation. The date and time of the VFS and technology requirements were coordinated between the rural simulationist and the RRC. Existing technology was used whenever possible including available onsite manikins, hospital internet connection, hospital laptops with built-in cameras, and smartphone cameras. The rural simulationist coordinated with the local site champion to use the highest fidelity simulated patient available, which could be either a standardized patient or a manikin varying from an intubation head, the Laerdal Resusci Anne Advance Skill Trainer 151-22000, to the Gaumard Adult HAL 3201. Cameras were strategically positioned to capture the contaminated hot zone (inside view), and clean cold zone (outside view) (Figure 1). Zoom Video Communications was selected as the virtual platform (Gordon, 2017).

Prebrief

The VFS session began with a prebrief (Appendix D), which is crucial to the success of any simulation, as it sets the tone and expectations for participants, observers, and facilitators (Bajaj, Minors, Walker, Meguerdichian, & Patterson, 2018; Page-Cutrara, 2014). The following format follows existing simulation standards but could be adjusted to accommodate site-specific needs (Rudolph, Raemer, &

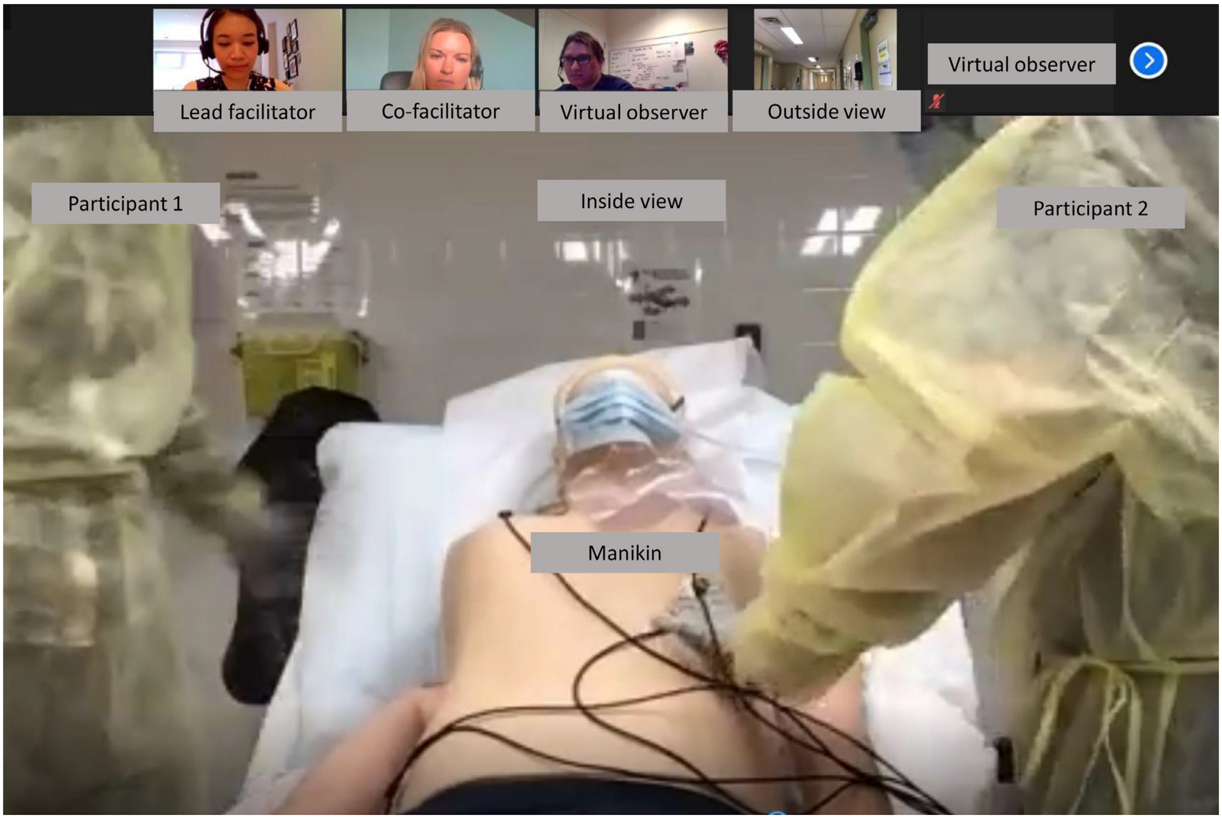

Figure 1 Screenshot of VFS in progress. Top of image shows virtual facilitators, virtual observers, and outside camera view. Bottom of image shows inside camera view of simulation in progress. *Note. VFS, virtually facilitated simulation.*

Simon, 2014). For the VFS program, the lead facilitator delivered the prebrief. First, all facilitators, observers, and participants introduced themselves, their designation, and their role (Table 1). Health care providers who were unable to participate in the simulation were welcomed to be in-person or virtual observers. On average, two in-person or virtual observers were hosted per session. Virtual observers were given the instruction to communicate through the chat box exclusively to avoid auditory overload during the simulation. Second, verbal consent to be recorded for teaching and research purposes was obtained from each participant. Third, the objectives of the simulation were reviewed. Fourth, the basic assumption of the facilitators was stated as the belief that all participants are intelligent, well-trained, and want to improve (Rudolph, Simon, Raemer, & Eppich, 2008). To mitigate any additional risk to psychological safety posed by the virtual environment, the lead facilitator stressed that uncovering deficiencies during the simulation served as an opportunity for improving patient care, and therefore, was encouraged. At last, participants were encouraged to use PPE, equipment, and medications as realistically as the local environment would allow. Some sites with low PPE supplies used expired PPE, and all sites were conserving medications such that no medications were drawn during the simulation.

Simulation

The simulation scenario began with a group PPE donning exercise which was either facilitated by the in-person co-facilitator or a virtual co-facilitator depending on comfort level with PPE protocol, and available personnel. The average group included eight participants, four of whom were active participants, and four of whom were in-person observers. The lead facilitator provided the case of a COVID-19 positive patient in respiratory failure requiring protected intubation and transport (Appendix C). The case was developed by eSIM for urban centers and was modified to align with the rural and remote context of limited resources, limited personnel, and potential weather-related transport delays (Dubé et al., 2020a). There was one lead facilitator and one to two co-facilitators, based on available resources. The role of lead facilitator was to verbally provide real-time patient vital signs and clinical status updates to the participants. The virtual co-facilitators divided the roles of tracking PPE breaches, monitoring potential communication issues between the participants, and managing the chat box. The simulation concluded with a PPE doffing exercise which was ideally facilitated one participant at a time due to the high risk of self-contamination during doffing.

Table 1 Facilitator and Observer Roles and Tasks

Facilitator Roles	Tasks
Virtual lead facilitator	Provide prebrief, deliver scenario, lead chronologic debrief
Virtual co-facilitator 1	Provide focused debrief on critical care management, monitor chat box for virtual observer comments and integrate into debrief
Virtual co-facilitator 2	Provide focused debrief on Crisis Resource Management, provide focused PPE donning/doffing exercise and monitor for PPE breaches, screenshare visual aides
In-person co-facilitator	Set up on-site technology/equipment/supplies, assist with PPE donning/doffing exercise as needed, manage resulting local process changes resulting from VFS, disseminate follow up resources to participants
Observer roles	**Tasks**
Virtual observer	Contribute comments to the chat box, contribute content expertise during focused debrief
In-person observer	Monitor for PPE breaches, participate in donning/doffing exercise, contribute to content expertise during focused debrief

Debrief

Following the simulation, the participants engaged in a focused debrief using a PEARLS learner-focused approach and then used PEARLS for systems integration at the end of each debriefing to target specific systems predetermined objectives (Dubé et al., 2019b; Eppich & Cheng, 2015). This blended approach, which was used throughout the province for COVID-19 SBE (Dubé et al., 2020a), allowed the facilitators to identify debriefing topics while providing actionable steps for local implementation and improvement (Table 2). The lead facilitator began with a reactions phase, then targeted learner focused objectives (e.g., clinical knowledge, skills, and teamwork) and concluded with preidentified systems objectives. Key debrief topics were grouped into three main learning objectives of mitigating exposure by correct use of PPE, recognizing and responding safety to respiratory decompensation, and identifying potential local health system process improvements. When time allowed, the lead facilitator enhanced the chronologic debrief with advocacy inquiry questioning to explore key topics in greater depth. The virtual cofacilitators subsequently guided focused debriefs on Crisis Resource Management, PPE breaches, critical care management, and health system processes. Of note, Table 2 serves as a comprehensive guide for facilitators; not all listed debriefing actions were incorporated into every debrief. Real-time facilitator judgment was used to triage the most important priority areas for each debrief due to time limitations with the goal of covering all debrief topics over the course of multiple sessions. Chat box comments from the virtual and in-person observers were incorporated into the focused debrief as needed. The lead facilitator concluded the debrief by inviting final takeaways from each participant and providing a summary of key systems issues identified. Postsession participant surveys and additional resources were electronically shared with the in-person facilitator to further disseminate to all participants. The session inclusive of the set-up time, prebrief, simulation, and debrief, typically lasted for two hours and was repeated anywhere between one day to one month later through an iterative approach called "rapid cycle simulation" (Hunt et al., 2014). The intentionally spaced repetitive practice allowed RRC to incorporate learning, practice skills, and implement health system process improvements with each rapid cycle (Martin, Bekiaris, & Hansen, 2017).

Analysis

Two measures were used to capture data in this quality improvement project. First, real time observation and video review were used to capture quantitative data through a standardized observational tool (Appendix E). The following PPE breaches were counted and categorized: mask/face touch, goggle/face shield touch, gown breach, and hand hygiene breach. Teams were evaluated for including all of the following BVM adjuvants: PEEP valve, viral filter, CO2 detector, and inline suction. Second, postsession self-reported participant electronic surveys were used to collect demographic data and self-reported outcome measures related to COVID-19 preparedness. The survey respondents were asked to select all applicable multiple choice options from a list of outcome measures in clinical management, teamwork behaviors, and health systems issues. Clinical management categories were based on content expertise of the research team, teamwork behavior categories were based on the Crisis Resource Management framework (Savoldelli et al., 2006), and health systems issue categories were based on the Systems Engineering Initiative for Patient Safety (SEIPS) model (Dubé, Kessler, Huang, Petrosoniak, & Bajaj, 2020; Holden et al., 2013). The SEIPS 2.0 model is a health care human factors framework which identifies key work system components (people/teams, organization, tools and technology, tasks, environment) that contribute to categorizing processes and outcomes in complex adaptive health care systems.

Ethical Considerations

This project followed the successful completion of the "A Project Ethics Community Consensus Initiative ARECCI"

Table 2 Facilitator Guide

Learning Objective	Facilitator Observations	Possible Debriefing Action
Mitigate exposure to team by correct donning/doffing of appropriate PPE	Presence of PPE cognitive aids	Screenshare sample PPE cognitive aids if helpful for team.
	Use of PPE Coach/"Dofficer"	Emphasize need for dedicated PPE coach if not done. A facilitator can coach donning/doffing with each participant individually, time allowing.
	Avoidance of personal equipment around neck	Suggest placement of personal items in bin outside of "hot zone" if not already done.
	Conscious decision to use N95 for aerosol-generating medical procedure (AGMP)	Ask "At what point in the simulation did you realize that the patient required an AGMP? Were you made explicitly aware of this?"
	Use of PPE cart and awareness of location	Ask "Is everyone aware of where to don/doff in the room?"
	Presence of signs of PPE fatigue	Ask "How does wearing full PPE make you feel?"
Recognize and respond safely to respiratory decompensation in a COVID-19 patient	Use of an airway management checklist	Screenshare sample airway checklist if helpful for team.
	Delegation of roles for intubation with most experienced intubator performing intubation	If the intubation was controlled and calm, discuss how role clarity helped to achieve this. If the intubation was not controlled and calm, discuss how role clarity could have helped.
	Trial of 2 sources of O2 for supplemental oxygen (NP and NRB)	Provide brief focused didactic teaching on local guideline recommendations on non-AGMP supplemental O2 limits.
	Trial of noninvasive positive pressure ventilation (NP with superimposed BVM and PEEP valve)	Provide brief focused didactic teaching on BVM set up and screenshare picture of BVM set up.
	Attainment of closed circuit upon intubation (cuff inflation, viral filter, inline suction)	Provide brief focused didactic teaching on each component.
	Use of appropriate dissociative and paralytic agents and appropriate weight-based dose	If any issues arose with medication selection or dosing, suggest development of a locally agreed upon cognitive aid with locally-available medications.
	Activation of transport	Provide time of transport activation. Ask "are you happy with the timing of the transport activation?"
Identify potential local health system process improvements	Demonstration of situational awareness	Ask "What systems level problems did this simulation help to uncover?"
	Establishment of roles prior to patient arrival	Ask “What strategies did you used to establish role clarity prior to patient arrival?”
	Physical delineation of hot and cold zones	Suggest waterproof tape to mark off space on floor if no physical barrier (i.e., door/wall).
	Use of a dedicated communication system between the hot and cold zones	Suggest possible solutions such as baby monitor or cellphone in plastic bag on speaker phone.
	Presence of at least two sources of oxygen	Confirm that simulated patient was given two sources of oxygen attached to separate oxygen ports.
	Use of system to pass medications and supplies into hot zone	Share observation of any contamination events or high-risk moments with passing medications and supplies between hot/cold zones.
	Removal of extraneous equipment/supplies	Ask "Is there anything in this room that could be moved outside?"
	Identification of contaminated equipment/supplies	Identify any drawers or carts that were opened during the simulation and point out that all these items are contaminated.
	Use of decontamination procedure	Ask "Please look around your room right now. Everything within 2 meters of your patient is considered contaminated. How will you decontaminate this space after the patient is transferred?"

Figure 2 Geographical distribution of 12 RRC spread across an area of 169,028 km^2. *Note. RRC, rural and remote communities.* (GoogleMaps 2020).

screening tool identifying the primary purpose of the project as a quality improvement program which involves minimal risk; therefore, formal ethics approval was not required. http://www.aihealthsolutions.ca/arecci/screening/446660/d5ac5e1757ef069c8358c94311de53c0

RESULTS

In total, 200 health care providers located at 11 RRC were trained, with each RRC completing an average of 2.2 cycles over 1.3 weeks. The pilot program occurred over the course of three months and covered a geographic area of approximately 169,028 km^2 (Figure 2). In total, 48 out of 200 participants completed the postsession survey resulting in a response rate of 24%.

The average number of PPE breaches decreased from an average of 6.7 events in cycle one, to 4.3 events in cycle three which represented a 36.6% decrease in overall self-contamination events. Only two cycle one teams correctly assembled their BVM with correct placement of a PEEP valve, CO2 detector, viral filter, and inline suction. With coaching during the debrief, three additional teams achieved correct BVM assembly in subsequent cycles. Only four cycle one teams used an intubation checklist. With coaching during the debrief, four additional teams incorporated an intubation checklist in subsequent cycles.

Measured postsession self-reported outcomes included improvement across all domains of clinical management and teamwork behaviors (Table 3). The clinical management domain with the highest self-reported improvement was "COVID-19 specific airway management" with 43 (89.6%) survey respondents reporting improvement. The teamwork domain with highest self-reported improvement was "clear communication" with 35 (72.9%) survey respondents reporting improvement.

Respondents identified and reported improvement in all systems issue categories including tools and technology,

Table 3 Clinical Management and Teamwork Behaviors

	Respondents Reporting Improvement (%)
Clinical management	
COVID-19 specific airway management	89.6
Infection prevention and control	70.8
Doffing	68.8
Donning	62.5
General airway management	52.1
Early recognition of deteriorating patient	31.3
Activating transport	20.8
None of the above	0
Teamwork behaviors	
Clear communication	72.9
Understanding roles and responsibilities	70.8
Maintaining situational awareness	70.8
Equitable distribution of workload	31.3
None of the above	6.3

Table 4 Health Systems Issues

Systems Issue Category	Respondents Reporting Identification (%)	Respondents Reporting Improvement (%)
People and tasks	87.5	89.6
Environment	79.2	75
Tools and technology	75	66.7
Organization	50	52.1
Hidden safety threat/hazard	50	47.9
None of the above	0	0

people and tasks, environment, organization, and latent safety threats (Table 4). The area that most respondents identified as having improved as a direct result of VFS was "people and tasks" with 43 (89.6%) survey respondents reporting improvement.

For participants with prior in-person simulation experience, 86.1% of survey respondents reported that VFS was equivalent or superior to in-person simulations. The cost of a VFS session is 62.9% (1,403 CAD) lower when compared to an in-person SBE session. This difference is accounted for by eliminating travel and accommodation costs and by reducing simulationist travel time. Additional comments from respondents indicated an on-going need for SBE in RRC which could be successfully delivered through virtual technologies.

Discussion

To date, the VFS program has reached a wide range of health care providers spread over vast geography with limited prior exposure to SBE, which was a significant challenge with in-person facilitated SBE. VFS reduced the number of PPE breaches, provided rapid knowledge translation, and addressed health systems process issues rapidly during the COVID-19 pandemic. Most participants reported that VFS is noninferior to in-person facilitated SBE, with some even preferring VFS. This success is in part due to the virtual platform eliminating prior geographical barriers which made interprofessional cofacilitation time-consuming and costly. With VFS, experts from multiple professions are able to rapidly converge on a single RRC to cofacilitate from multiple different locations.

The success of the VFS program is in part due to the emphasis on peer-to-peer coaching (Cheng et al., 2017) where support is provided by experienced fellow rural and remote health care providers who understand the practicalities of practicing in a low-resource setting (Wilson & Oandasan, 2020). This peer-to-peer model is operationalized through the intentional engagement of the RRC clinical nurse educators who act as a bridge between the VFS team and the RRC team (Masters et al., 2017). The VFS program also has the added benefit of flexibility. Rapid cycles have been run anywhere from one day to one month apart with content experts in anesthesiology, transport medicine, and critical care medicine, based on availability and site-specific needs. The VFS program uses existing simulation equipment and requires minimal additional resources while eliminating the need for travel of simulationists (Ikeyama, Shimizu, & Ohta, 2012; Shao et al., 2017). This flexibility has allowed the program to be highly cost-effective in addition to being well-received by RRC. The caveat to this flexibility is increased variability of measured outcomes.

The VFS approach has been able to address many of the greatest barriers to SBE in RRC. These include geographic isolation, cost, and physician engagement (Canadian Institute for Health Information, 2020). We noticed a significant increase in physician engagement while simultaneously reducing travel time and cost per simulation. The virtual approach allows for rapid mobilization of facilitators and knowledge experts from any location. Furthermore, VFS was able to reach an unprecedented number of geographically-isolated communities distributed throughout the province in a relatively short period of time, which was a significant benefit given the rapidly expanding COVID-19 pandemic. One additional advantage to virtual facilitation compared to in-person facilitation may be that the participants are more likely to interact with each other instead of the facilitators. This in turn may empower the local team to develop and implement process changes themselves, instead of deferring to the facilitators who may not understand the local context (Christenson, Oestergaard, & Watterson, 2018).

Regardless of whether the simulation occurs in-person or virtually, the most valuable part of the simulation remains the facilitated debrief. We implemented a PEARLS learner-focused approach and targeted PSI approach to improve clinical knowledge, clinical skills, and health systems processes (Dubé et al., 2019b; Eppich & Cheng, 2015). For less experienced teams or shorter sessions, the debrief focused on directive feedback, teaching, and identification of systems issues. For more experienced teams or longer sessions, the debrief focused on guided self-correction and generation of locally-applicable systems solutions. We found that debriefing can be effectively facilitated virtually while maintaining the psychological safety of the participants (Cheng et al., 2020). This assumes availability of trained rural simulationists who are able to use their existing knowledge of in-person facilitation, debriefing, and codebriefing techniques to explore the rapidly emerging field of virtual facilitation and debriefing (INACSL Standards Committee, 2016).

Limitations

Although initial responses from facilitators and participants have been positive, the new platform may pose an additional challenge to maintaining participant psychological safety, especially for debriefing critical incidents, debriefing in the presence of many virtual observers, or unanticipated difficult debriefing situations. This sentiment may have contributed to the 13.9% of survey respondents who reported that VFS was inferior to in-person facilitated simulation. Limiting the number of virtual observers, introducing all facilitators and observers, and facilitator training (Savoldelli et al., 2006) are all essential for the success of the virtual approach. Another limitation of VFS is the facilitator's decreased ability to read nonverbal cues, or missing nonverbal cues occurring out of camera view. This limitation has been partially mitigated by using multiple cameras to capture different views, increasing the number of virtual facilitators to monitor the different views, and designating an in-person cofacilitator to manage the technology. The importance of participant psychological safety cannot be overstated as the nature of the simulation topic may generate strong emotional reactions from participants who may feel varying levels of support from their employer, anxiety regarding their own health or the health of their family, or fear of practicing outside of their comfort zone. Psychological safety was addressed throughout the process from planning meetings with site leaders, to the scenario prebrief and debrief with the participants (Cheng et al., 2020; Dubé et al., 2020b).

It is possible that the initial rapid acceptance of VFS for COVID-19 preparedness may be a result of temporary enthusiasm which may wane as the pandemic continues. Given the dynamic nature of the pandemic, this potential barrier could be addressed by encouraging RRC clinical nurse educators to request follow up sessions when they identify new site-specific needs. Another potential solution may be to offer continuing medical education credits for physician participation in the sessions. One final solution may be to create a longitudinal VFS curriculum for RRC, which could include high-yield topics such as obstetrical emergencies, cardiac arrest, and trauma care, among others.

Conclusion

The COVID-19 pandemic has led to unprecedented medical and social changes. The travel restrictions and limitations of the COVID-19 pandemic presented an opportunity to explore novel technology-based methods for SBE in geographically isolated communities with limited access to continuing medical education. VFS is a technologically viable and socially acceptable method of delivering SBE continuously to frontline health care providers in geographically isolated RRC. With consistent long-term commitment to a VFS curriculum, rural and remote teams can be better prepared for high acuity/low occurrence events, have consistent access to continuing medical education, improve local interprofessional teamwork, develop local simulation initiatives, and ulimately improve patient care. Given the initial positive feedback and the ability to quickly cover vast geography, this training and health system improvement model is worth further investigation and development even after the COVID-19 pandemic has passed.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ecns.2021.01.015.

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