Simulation Experiences in Canadian Physiotherapy Programmes: A Description of Current Practices

Meaghan Melling, BSc, MSc, MScPT;* Mujeeb Duranai, BSc, MScPT;*
Blair Pellow, BSc, MScPT;* Bryant Lam, BMSc, MScPT;* Yoojin Kim, BSc, MScPT;*
Lindsay Beavers, BSc, MPT;*† Erin Miller, BHSc, MScPT, MHM;*†
Sharon Switzer-McIntyre, BPE, BScPT, MEd, PhD*†

ABSTRACT

Purpose: Although health care professional education programmes around the world are increasingly using sophisticated simulation technology, the scope of simulation use in Canadian physiotherapy programmes is currently undefined. The current study explores the definitions of simulation, its current use, and the perceived benefits and barriers in Canadian entry-to-practice physiotherapy programmes. **Method:** Using a qualitative, descriptive study approach, we contacted Canadian physiotherapy programmes to identify faculty members with simulation experience. Using a semi-structured interview format, we asked participants to discuss their perspectives of simulation in their physiotherapy programmes. Interviews were audio recorded, transcribed, and analyzed for themes. **Results:** Of 13 eligible Canadian physiotherapy programmes, participants from 8 were interviewed. The interviews revealed three major themes: (1) variability in the definition of *fidelity* in simulation, (2) variability in simulation use, and (3) the benefits of and barriers to the use of simulation. **Conclusions:** Variability in the definition of *fidelity* in simulation among Canadian physiotherapy programmes is consistent with the current literature, highlighting a spectrum of complexity from low fidelity to high fidelity. Physiotherapy programmes are using a variety of simulations, with the aim of creating a bridge from theoretical knowledge to clinical practice. This study describes the starting point for characterizing simulation implementation in Canadian physiotherapy programmes and reflects the diversity that exists across the country.

Key Words: education; high fidelity simulation training; patient simulation; qualitative research.

RÉSUMÉ

Objectif: autour du monde, les programmes de formation des professionnels de la santé font de plus en plus appel à une technologie de simulation raffinée. On ne connaît pas l'ampleur de l'utilisation de la simulation dans les programmes canadiens de physiothérapie. La présente étude porte sur les définitions de la simulation, son utilisation actuelle et les avantages et obstacles perçus à son utilisation dans les programmes canadiens de physiothérapie de base. **Méthodologie:** les chercheurs ont utilisé une approche descriptive et qualitative. Ils ont pris contact avec les programmes canadiens de physiothérapie pour savoir quels professeurs avaient de l'expérience en simulation. Au moyen d'entrevues semi-structurées, ils ont demandé aux participants de parler de leurs perspectives de la simulation au sein de leurs programmes de physiothérapie. Ils ont enregistré les entrevues sur bande sonore, les ont transcrites et analysées pour en dégager les thèmes. **Résultats:** au sein des treize programmes canadiens de physiothérapie admissibles, les participants de huit d'entre eux ont été interviewés. Les entrevues ont fait ressortir trois thèmes majeurs : 1) la variabilité de la définition de *fidélité* de la simulation, 2) la variabilité dans l'utilisation de la simulation et 3) les bienfaits et les obstacles liés à l'utilisation de la simulation. **Conclusions:** la variabilité de la définition de *fidélité* de la simulation dans les programmes canadiens de physiothérapie correspond aux constatations des publications actuelles, ce qui fait ressortir un spectre de complexité qui passe de la faible fidélité à la haute fidélité. Les programmes de physiothérapie font appel à diverses simulations afin de créer un pont entre les connaissances théoriques et la pratique clinique. La présente étude décrit le point de départ pour caractériser l'adoption de la simulation dans les programmes canadiens de la physiothérapie et reflète la diversité au pays.

Simulation is defined as any educational aid that mimics a clinical scenario to facilitate experiential learning.¹ In the health care setting, simulation ranges from

using standardized patients (an individual trained to portray a patient in a clinical situation) and part-task trainers (artificial anatomical sections of a body) to using

From the: *Department of Physical Therapy; †Ontario Internationally Educated Physical Therapy Bridging Program, University of Toronto, Toronto.

Correspondence to: Meaghan Melling, Department of Physical Therapy, University of Toronto, 160–500 University Ave., Toronto, ON M5G 1V7; meaghan.melling@mail.utoronto.ca.

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interactive, sophisticated manikins.^{2–4} Health care education incorporates simulation to develop students' clinical skills by providing repetitive learning opportunities in a controlled environment.⁵

Although the implementation of simulation has been well documented in medicine and nursing, the physiotherapy education literature has underrepresented the topic.^{6,7} The body of physiotherapy-specific literature that does exist has described simulation as a vital learning tool for addressing the specific learning objectives included in physiotherapy curricula. The one systematic review conducted reported a variety of types and uses of simulation in physiotherapy programmes, ranging from computer simulation education to using simulation in interprofessional events.⁸

Studies have shown that simulation-based education improves self- and preceptor-reported independence, clinical reasoning, and judgement in physiotherapy students during their clinical placements.^{9,10} Through simulation, students consolidate knowledge and develop competencies in clinical skills.¹¹ Simulated scenarios also address non-technical skills (e.g., interpersonal skills, manners, professionalism, teaching ability), and patients describe these skills as vital qualities when recalling good experiences with physiotherapists.¹² Many components of the essential competencies outlined by the Essential Competency Profile for Physiotherapists in Canada are addressed using simulation.^{13,14} Furthermore, simulation has been shown to be an excellent learning tool for cardiorespiratory and acute care techniques including tracheal suctioning and oxygen titration, both of which are high-risk activities for Canadian physiotherapists.^{14–16} These findings support the use of simulation as an adjunct to learning in physiotherapy education.

Australia, the United Kingdom, and the United States are the primary nations, to date, conducting research on the use of simulation in physiotherapy; no current literature has explored the use of simulation in physiotherapy programmes in Canada.^{15,17–19} Given the variation that exists in the scope of physiotherapy practice in Canada compared with other countries, exploring simulation in the context of the Canadian physiotherapy education system is warranted.²⁰

In addition to the absence of studies exploring simulation use in Canadian physiotherapy education, there is a lack of consistency about the fidelity of the technique.⁶ Simulation is often divided into high fidelity and low fidelity; however, even here, the terminology is inconsistent, and definitions vary throughout the literature. *High-fidelity simulation* is most often defined in terms of using sophisticated, computer-driven technology, but it is also defined by the believability of a scenario.^{3,21,22} *Low-fidelity simulation* is often framed as using lower levels of technology such as part-task trainers, standardized patients, and role playing.⁴ This variation in definitions impedes the discussion of how to implement simu-

lation in health professional educational programmes. Thus, with more technologically advanced and sophisticated manikins being integrated into health care education curricula, it is beneficial to explore the current perceptions of high fidelity and low fidelity to gain a better understanding of how these terms are being used to frame simulation use in physiotherapy education.

Given the gaps in the literature described here, this study explores the definition of, perceived benefits and barriers associated with, and use of simulation in entry-to-practice physiotherapy programmes across Canada. This study also provides an in-depth look at simulation experiences in physiotherapy education through the lens of the educators, an area that has not previously been explored.

METHODS

Study design

This study used a qualitative, descriptive methodology using individual semi-structured interviews. The study used collected individual narratives and thematic analysis to provide descriptive insights into simulation use in Canadian physiotherapy programmes.²³

Recruitment and sample

Research was conducted in the Department of Physical Therapy at the University of Toronto, and the study protocol was approved by the University of Toronto Health Sciences Research Ethics Board. Canadian physiotherapy programmes were the targeted population. Members of the Canadian Council of Physiotherapy University Programs were contacted by e-mail and asked to delegate a participant from their programme who met the study's inclusion and exclusion criteria.

Inclusion and exclusion criteria

To be included in this study, participants must first have been involved in simulation in one of the following capacities: (1) they had taught using simulation, (2) they had administrative experience with simulation, or (3) they had overseen simulation. In addition, they needed the ability to be interviewed in English and had to have been deemed the most appropriate individual for the study by the chair of their physiotherapy programme, based on the study objective outlined in our initial e-mail invitation. We excluded participants if they were current master's-level, entry-to-practice physiotherapy or bridging programme students, working in a physiotherapy programme conducted in French, or both.

In Canada, 10 entry-to-practice physiotherapy programmes and three bridging programmes for internationally educated physiotherapists are conducted in English. Bridging programmes were included in this study because they also educate pre-licensed physiotherapists. We required all participants to provide computer-based written consent via e-mail to participate.

Data collection

Five members of our research team (MM, MD, BP, BL, YK) developed a semi-structured interview guide with open-ended questions (reproduced in the Appendix). The aim was to discuss the participants' perspectives on how *high-fidelity simulation* and *low-fidelity simulation* are defined, how simulation is used in their programmes, what their goals are in using simulation, and the perceived benefits and challenges of using simulation. One of three investigators (MM, MD, BP), accompanied by one of two note takers (BL, YK) interviewed participants by telephone. We verbally administered a demographic questionnaire administered at the end of the interviews to provide context for the participants' perspectives. Each interview was audio recorded, professionally transcribed, and reviewed by one of the five investigators (MM, MD, BP, BL, YK) to ensure accuracy. Any names in the transcripts were de-identified using a numeric code after we had developed the master code list and the master identifier list.

Data analysis

Five investigators (MM, MD, BP, BL, YK) analyzed the data using the six steps of thematic analysis outlined by Braun and Clarke.²³ Each transcript was coded by two investigators individually, and then, as a group, the investigators reviewed each coded transcript to ensure consistency in analysis. The investigators listened to the audio recordings and critically examined the transcripts to identify and make notes on the tone of the participants' answers, become familiar with the data, and check for errors in transcription. The same five investigators developed a codebook to determine the preliminary topics discussed, and open coding was conducted. We used NVivo, version 9 (QSR International, Doncaster, Victoria, Australia), during the coding process to manage the data. The five investigators organized the codes into categories that enabled them to develop themes, which were reviewed by all investigators (MM, MD, BP, BL, YK, LB, EM, SSM) to ensure that they were robust and distinct. All the investigators participated in refining and finalizing the themes to convey a clear, concise message.²³

RESULTS

Participants' demographics

Of the possible 13 entry-to-practice or internationally educated bridging Canadian physiotherapy programmes conducted in English, 8 participated in this study. Eight separate individuals participated in the interviews, 2 from bridging programmes and 6 from master's-level entry-to-practice programmes. The participating bridging programmes were associated with two universities participating as entry-to-practice programmes and may have had access to similar resources. Most participants held multiple positions in their respective programmes, such

as associate director and programme administrator, clinical placement coordinator, and professor. Of the participants who identified holding a teaching position, 75% were involved in the cardiorespiratory or acute care units of their programmes. The participants' experience using simulation ranged from 3 to 20 years.

From the interviews, we identified three major themes in the data: (1) a variability in the definition of *fidelity* in simulation, (2) a variability in simulation use, and (3) the benefits of and barriers to simulation use.

Theme 1: variability in the definition of *fidelity* in simulation

To gauge how simulation is defined in Canadian physiotherapy programmes, we asked participants to provide examples of how they implemented both high- and low-fidelity simulation in their institution. The majority associated high-fidelity simulation with manikins of varying types. This included higher technology manikins, which connect to monitors and computers, as well as full-body, non-responsive manikins with no embedded computer technology. The most common example participants provided of low-fidelity simulation was the use of standardized patients, such as patients from the community, students role playing with one another, and persons hired and trained to emulate specific conditions and patient responses. Two participants also defined using part-task trainers as low-fidelity simulation.

We did not give participants definitions of high- and low-fidelity simulation, and several were uncertain of how to define them. After some probing, some qualified their responses by saying that their interpretation of the term *fidelity* was based on the extent of technology used.

So, I'm using *low-fidelity* synonymously with the term *low technology*. ... However, you can have a low-technology and very high-fidelity situation. For example, our task trainers you can feel the carina when you go down to suction and you can feel the resistance as it's passing through the oropharynx, so those are high-fidelity, very real believable feelings that you have as you're learning how to suction a patient. (Participant 5)

A few participants commented on that the perceived risk of the simulated scenario contributed to their interpretation of fidelity.

My impression was like high and low fidelity was more about the risks involved for the students dealing with that particular patient.... I don't think it is about sophisticated or not sophisticated. ... I really don't know because high-fidelity could also mean that you know it's authentic, representation of like what the real thing would [be] like. (Participant 2)

The perceived risk was reported as consisting of multiple factors, including the inherent risk of the specific skill being performed (e.g., suctioning vs. interviewing) and the perceived safety of the simulated environment

(e.g., the presence vs. absence of a supervisor to assist if necessary).

Several participants also commented that the degree of complexity guided their interpretation.

In my definition, I thought it was just around the complexity of the interaction and almost from the technological side. So, there's a lot of resources and technology and cost that goes into the high fidelity, like a simulation lab. (Participant 7)

Thus, interestingly, participants used varying degrees of technology, scenario risk, and complexity to determine their criteria for fidelity. The degree of complexity related to numerous features of the simulated scenario, including the setup of the simulated environment (e.g., a hospital setting vs. the institution's clinical skills lab), the demands of the scenario itself (e.g., reproducing a single psychomotor skill vs. multiple technical and non-technical skills, with responses from the simulator), the complexity of the technology involved, and the overall perceived authenticity of the scenario.

Theme 2: variability in simulation use

Equipment

We also asked participants to identify the simulation equipment that was used in their programme's curriculum. Most commonly used were manikins, part-task trainers, and standardized patients. Different simulation equipment served varying purposes at each institution. For example, the majority of universities most often used manikins and part-task trainers to promote the acquisition of technical skills (e.g., auscultation, tensoring limbs, acute care mobilization, and tracheal suctioning), whereas they used standardized patients more often for non-technical skills acquisition (e.g., communication, collaboration, and professionalism). Several participants also said they used standardized patients for basic assessment and treatment planning; for objective, structured clinical examinations; and to prepare for the Physiotherapy Competency Examination. In addition, one participant used online cases to simulate real-world scenarios and combine decision making with technical skill.

The majority of participants had off-site access to manikins at teaching hospitals and multi-faculty simulation centers. These centers used a combination of standardized patients and manikins for simulation at inter-professional events, ranging from a single event in the physiotherapy programme to extracurricular student courses available every week. In addition to involving physiotherapy students, these scenarios included students from the faculties of medicine, nursing, occupational therapy, midwifery, pharmacy, social work, dentistry, and speech-language pathology. Several participants also reported that their programmes had on-site access to computerized manikin simulation equipment. One participant indicated that

her programme did not use any form of manikin for simulation, despite the fact that she had reported having access to a simulation center. However, her department was researching how it could use manikins in the cardiorespiratory component of its curriculum or in an inter-professional capacity.

Area of practice

The majority of schools described using manikin simulation exclusively for acute care scenarios, cardiorespiratory scenarios, or both. Participants considered simulation to be an appropriate learning tool in these settings because of the added complexity of the scenarios and the ability to use technology to manipulate them.

Manikins ... are hooked up to monitors, and we can adjust everything from breathing, coughing, crying, you know, temperature, blood pressure, like everything that you would find in a real regular hospital. It's really like a real hospital surgical room, or hospital bedroom. (Participant 2)

These simulated scenarios were typically presented near the beginning of a programme to provide early exposure to the rapidly changing environments and common acute care skills (e.g., tracheal suctioning, heart and lung auscultation, and mobilization with multiple lines) required of physiotherapists. Some participants reported wanting to incorporate the use of manikins for simulation into the orthopedic curricula in the future; however, standardized patients were used most often for students to assess patients' strength, range, and mobility. When discussing the neurological curricula, most participants reported recruiting standardized patients, or real patients from the community, to be part of scenarios because certain characteristics of neurological conditions, such as spasticity, were difficult to capture using manikins.

Technical skills acquisition

All schools reported using simulation to facilitate students' acquisition of technical skills. Auscultation of breath sounds and tracheal suctioning were skills identified by all the participants, and the majority used manikins and part-task trainers for this purpose. Additional skills used in simulated settings included early mobilization in the acute care setting, measuring and interpreting vital signs, oxygen titration, and tensor wrapping of limbs.

We usually use [manikins] in terms of looking at different vital signs so you get them to practise taking heart rates, blood pressure, respiratory rate and some transfers and suctioning, so usually it's just to work on those psychomotor skills. (Participant 8)

Some schools reported using simulation to emulate acute clinical settings, playing out unpredictable scenarios to help students acquire the clinical skills necessary in a cardiorespiratory environment. These scenarios ranged

from practising basic technical skills on a manikin to multi-component scenarios requiring physiotherapy assessment, treatment, and decision making. Standardized patients were also used for technical clinical skills acquisition in areas such as performing joint range of motion, manual muscle testing, ambulation, gait aid training, and basic assessment skills.

Non-technical skills acquisition

The majority of participants emphasized using simulation in general for non-technical skills acquisition, specifically communication, collaboration, and professionalism.

It helps with some of that communication, some of those “non-technical” skills, so that’s a beautiful thing about simulation. Simulation can run the gamut from just pure psychomotor task acquisition skills all the way to, I would argue, non-technical skills, collaboration, communication, team functioning, etcetera. (Participant 5)

The majority of participants also reported using simulation to develop students’ communication skills and improve their interactions with patients and families. Many participants reported that they used complex, inter-professional simulations, as mentioned earlier, with both manikins and standardized patients to carry out collaborative and communicative learning objectives with other health care professionals.

Debriefing session

All participants described having a debriefing session when a simulated scenario finished, and several thought it was one of the most important components of using simulation.

I really felt strongly about having that debriefing as most of the learning occurs at that point. (Participant 1)

That’s a really important part of the simulation that we have the debrief and people can talk about it... It’s really meant to be a learning environment, not a punitive environment or a stressful evaluation environment. (Participant 8)

Despite the value of the debriefing component, there was some variability in how it took place. Debriefing sessions could consist of summative or formative feedback; delayed (post-simulation scenario) or immediate (during simulation scenario) feedback; and feedback received from peers, from clinical facilitators, or through self-reflection. Half the participants also reported recording videos that students could watch to reflect on their own simulation experience.

Theme 3: benefits and barriers associated with using simulation

Participants identified a variety of benefits of and barriers to implementing simulation in their physiotherapy programmes. All reported that simulation provided increased authenticity and stimulated students to develop clinical reasoning and integrate their lecture material into clinical practice.

It kind of bridges what they learned I guess in their lectures and maybe in their labs—put it into the context of a clinical application with a patient that feels a little bit I think more engaged than just reading, “Ms. Smith is a 49-year-old blah-blah-blah.” (Participant 7)

I can change the manikins to have ... altered vital signs that you may see in ... people that are sick, or elderly patients, or people after surgery ... [who have an] irregular pulse, arrhythmias, weak pulse—things that they might not be feeling on themselves. ... They’re not going to be treating healthy ... 23-year-old people. They’re going to be treating people [who] are elderly and sick. [Simulation is] ... sort of that bridge from practice to sort of a ... real situation. (Participant 8)

The majority of participants stated that using simulation enabled students to acquire psychomotor skills and gain confidence in performing them. Simulation also allowed students to develop problem-solving skills. A few participants reported that students developed other skills such as improved self-reflection on their performances; interviewing and assessment skills; and collaboration or communication with patients, peers, and health care professionals. Several participants also identified increased student confidence in their lecture material: “I think there is some benefit to practising their skills in a more realistic environment than on a classmate and just gives them a little bit more confidence I guess before they go on placement” (Participant 4).

The benefits of specific types of simulation were also mentioned. Standardized patients were more often effective for students’ acquisition of interpersonal skills. Participants consistently reported that manikins were more useful for providing a safe environment for high-risk skills acquisition and creating more realistic scenarios.

[Using manikins for simulation] is much more realistic, and it also allows it [to be performed] in a very safe environment where they can practise these skills without hurting anybody. If they have red flags or do something dangerous, at least it is done in a learning setting where no one is getting injured... It’s a really great step before they are actually going on to their clinical placements and working with real people, real patients. (Participant 1)

A few participants also said that manikins could provide a replacement for experiences that students may not encounter in clinical placement (e.g., tracheal suctioning and oxygen titration). Many participants added that they wanted to include computerized manikins in future initiatives on the basis of the benefits we have described.

The barriers described by participants to implementing simulation were similar, whether they were referring to manikins or standardized patients. All the participants identified logistics as a major barrier—for example, organizing students, staff, and volunteers; creating time in a busy physiotherapy curriculum; and coordinating with other faculties to use shared facilities were added tasks. “There

is [sic] eight different rooms acting every 8 minutes or 10 minutes at the same time, you know switching actors, switching rooms and all that. It takes a lot of coordinators within the sim center” (Participant 2).

The time commitment required to train personnel to run the simulation scenarios was also mentioned as a barrier by the majority of participants. Half included the cost of training personnel as a barrier to implementing simulation.

Well, it's not only training, but it is the actual hours that they spend, the whole activity has to be accounted for with our time, it's the actors' time, it's the actual session time, all the coordinators within the sim center because it doesn't just take the actors, it takes the whole team of coordination, coordinating all these activities. (Participant 2)

Few participants identified the cost of initial purchase or the maintenance of computerized manikins as a barrier to using simulation. The cost of renting space to run scenarios and store equipment were also rarely mentioned.

DISCUSSION

Definition of *fidelity*

Following most of the current literature on simulation, we began this study by defining *fidelity* as being based on technology.^{3,21} Our hypothesis equated high-fidelity simulation with computerized manikins and low-fidelity simulation with less sophisticated, part-task trainers and standardized patients. Participants reported a variety of definitions, some based on technology; most, however, included complexity or authenticity in their definition. For example, participants reported that complex scenarios involved authentic emulation of clinical environments, applying high-risk skills, more complex technology, and stressful dynamic scenarios.

Placing these components under the umbrella term of *complexity* increases the scope of the term *fidelity* in simulation and lays a promising foundation for improving future communication and clinical practice in Canadian physiotherapy programmes. Numerous countries are increasingly integrating high-fidelity manikins into physiotherapy and other health care professional programmes to promote numerous benefits to students.^{6,24} Ensuring a clear definition of *fidelity* across our physiotherapy programmes represents a critical first step in promoting a common platform of conversation and, eventually, standardization of the implementation of simulation. In Canadian physiotherapy education, fidelity in simulation could be defined using a gradient of complexity, ranging from high-fidelity scenarios using dynamic components, authentic tasks, and intricate technology to low-fidelity scenarios using standardized patients in informal environments.

Uses of simulation

In general, simulation is consistently used as a tool to bridge the gap between didactic lectures and physiotherapy clinical practice. Many of the reported purposes of using simulation correlated with the eventual objective of ensuring acquisition of skills outlined in the Essential Competency Profile for Physiotherapists in Canada.¹³ Participants explicitly described the physiotherapist roles of communicator, collaborator, and professional as those that students should learn when performing simulated activities.

Separating the uses of simulation by fidelity also has interesting implications for student education. The most frequently stated objective for using low-fidelity simulation was for students to acquire non-technical skills, whereas the objective for using high-fidelity simulation was for students to practise procedural, high-risk skills. Identifying high-fidelity scenarios as useful specifically for the safe practice of high-risk skills is consistent with the main uses of manikins reported in the literature.^{1,25} Furthermore, participants described using both types of simulation to target distinct student learning objectives. Although most participants used manikins solely for the purpose of procedural motor skills acquisition, some reported using standardized patients and manikins in the same scenario. It is important to consider opportunities to create scenarios that combine both types of simulation.

Creating mixed-fidelity scenarios by combining manikins and standardized patients could integrate the perceived benefits of low- and high-fidelity simulation, allowing students to simultaneously learn technical and non-technical skills. For example, a station could require a student to auscultate a manikin for breath sounds while having to interact appropriately with a distraught family member, all under the additional pressure from other health care team members of having to make decisions. Studies have also shown that mixed-fidelity scenarios, in a medical and paramedical student population, highlight incompetency in learner-specific skills and identify skills that need to be further developed.^{26,27}

Many participants cited using high-fidelity manikins for inter-professional practice to increase students' exposure to collaboration and communication with other health care faculties. The current body of literature has documented inter-professional simulation events, which include physiotherapists, physiotherapy students, or both.^{28–31} King and colleagues²⁹ explored using mixed-fidelity simulation (manikin and standardized patient), as well as only standardized patients, for physiotherapy, registered nursing, and respiratory therapy students in a hospital scenario in which a patient was in respiratory distress. Students' responses were similar in both scenarios; they felt nervous and realized that they needed to develop their communication skills and knowledge

of the scope of practice among professions in real-life scenarios. If the goal of inter-professional simulation is to enable students to gain confidence in their communication and collaboration skills, the fidelity of the simulation (manikin vs. standardized patient) may not be an essential element to consider. However, if it is included specifically in a physiotherapy curriculum, a mixed-fidelity scenario may be more beneficial because it targets students' technical and non-technical skills development.

Another consistent comment of the participants about low- and high-fidelity simulation is the presence of a post-scenario debriefing session, although the timing, method, and specific goals of the session varied. There is agreement in the literature that encouraging feedback and holding debriefing sessions are key methods of maximizing the learning benefits of simulation.^{5,19} A study conducted by Day and colleagues¹⁵ showed that clinical observation of students' tracheal suctioning performance was improved, as was their knowledge retention, when sessions were followed up with tailored, performance-based feedback. Debriefing guides, such as the Debriefing Assessment for Simulation in Healthcare, can also help instructors introduce a standardized debriefing session into physiotherapy student simulations.³² Further research is necessary, however, before making specific recommendations for implementing debriefing sessions in physiotherapy simulation education in Canada.

Implementing simulation

Overall, the reported benefits and barriers associated with implementing simulation in this study reflect the published literature. The benefits named by the participants were similar to the collection from a review comparing student inter-professional (high-fidelity) simulation education experiences.³¹ The overlapping benefits included a realistic, yet safe environment for high-stress situations, opportunities to develop communication, and feedback from the experience.

Regardless of the type of simulation used, low fidelity or high fidelity, the barriers identified by participants are similar. The most common barriers are scheduling and logistics, followed by the cost of training personnel. Palaganas and colleagues³⁰ discussed the challenges of simulation in inter-professional health care education programmes; they included scheduling, time, and educating staff. Because many programmes have mainly off-site access to equipment, the added challenge of coordinating with other faculties to use their training facilities may overshadow cost as a barrier to high-fidelity implementation. Future research is needed to further investigate why programmes may be under-using high-fidelity simulation given participants' reports of the increased benefits for student education.

Research, undertaken primarily in Australia, has documented a steady progression toward using high-fidelity simulation to supplement the competency in skills that

physiotherapy students are unable to acquire during clinical placements^{17,33}—primarily cardiorespiratory practice and higher risk activities, such as tracheal suctioning and oxygen administration. One study indicated that some high-fidelity scenarios caused more psychological stress than clinical placements and may have had a negative impact on physiotherapy students' education;³⁴ however, that study used third-year undergraduate physiotherapy students in Australia, some of whom had only 3 days of exposure to an acute care environment. The researchers suggested that a gradual increase in student stress during realistic simulation scenarios would mediate the transition to clinical placement. Despite a handful of studies citing caution with high-fidelity simulation, the body of research is positive, reporting numerous benefits over low-fidelity simulation, including reliable formative assessment, improved skills acquisition, and student confidence.^{4,27,35}

Because of the variation in implementation described, there may be a need to standardize when and how simulation, especially high-fidelity simulation, is used in Canadian physiotherapy curricula. Standardization across physiotherapy programmes—bringing each curriculum up to the same level of simulation practice—may come at a cost; however, it could give pre-licensed physiotherapy students across the country equal opportunities to develop the skills necessary to become competent, safe, and successful physiotherapists.

This study had several limitations. The first was that we recruited participants from only English-language programmes because the interviewers were not bilingual. There are 15 physiotherapy schools in Canada; 10 programmes are conducted in English, and 5 are conducted in French. In addition, there are 4 physiotherapy bridging programmes for internationally educated physiotherapists, 3 conducted in English and 1 in French. This may have reduced the richness of data. A second limitation was that some individuals interviewed did not think they were the best person to speak about the day-to-day use of simulation (e.g., Participant 2 stated, "I am less familiar with those because I don't participate in high- or low-fidelity simulation with manikins; it would be more the professor who works in the cardiorespiratory unit"), and this may also have reduced the richness of the data. Nevertheless, we decided to retain this individual in this study because she fit the inclusion criteria of having administrative involvement with simulation in that physiotherapy programme.

CONCLUSION

Simulation in Canadian physiotherapy education has received minimal attention in the peer-reviewed literature. This study describes current practices of simulation in physiotherapy programmes in the country, specifically how programme representatives defined high-fidelity versus low-fidelity simulation, the perceived benefits

and barriers associated with using simulation, and how their respective curricula integrated simulation. On the basis of this study, simulation, in a variety of forms, is currently integrated into Canadian physiotherapy education programmes conducted in English. Although participants used a variety of definitions to categorize the fidelity of the simulation, these results provide a unique opportunity to define *fidelity* in terms of the complexity of a scenario.

This study also serves as the starting point for characterizing simulation use in physiotherapy programmes in Canada. The results reflect the diversity that exists across the country in the use of simulation with respect to curriculum implementation, the equipment used, the targets for skills acquisition, the importance of debriefing, and the perceived benefits and costs of using high versus low fidelity. We recommend that Canadian physiotherapy programmes and governing regulatory bodies convene to examine the effectiveness and unique student learning outcomes and behaviors achieved from high-fidelity versus low-fidelity simulation. This would aid in developing optimal recommendations and standardization for the future use of simulation in physiotherapy curricula.

KEY MESSAGES

What is already known about this topic

Simulation in health care education is widely documented and used in numerous countries, especially in the fields of medicine and nursing, and it has been shown to have a positive impact on student skills acquisition. Presently, there is a gap in the literature regarding the use of simulation in Canadian physiotherapy programmes.

What this study adds

Canadian physiotherapy programmes are using both high- and low-fidelity simulation to bridge students' theoretical knowledge and clinical practice. However, there is a need to define *fidelity* to standardize the terminology and practice of simulation in these programmes. This study proposes a definition, based on the participants' experiences, that is rooted in the complexity of the procedure; this definition could provide a platform for communication and implementation. This study also serves as the starting point for characterizing current simulation use and implementation in Canadian physiotherapy programmes and reflects the diversity in simulation use that exists across the country.

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APPENDIX

Interview guide: Semi-structured questions

1. Can you tell me about your role in the physiotherapy programme?
Probing Questions
 - How long have you been involved in the curriculum?
 - Can you elaborate on the type of students you interact with?
 - Can you describe the structure of the physiotherapy curriculum at your school?
2. Can you describe an example of how you use simulation in your physiotherapy programme?
Probing Questions
 - What is it used for? By whom?
 - Where is it used in the curriculum?
 - In what capacity is it used? For example, open labs, teaching.
 - How much and/or how often?
 - Do you have any other examples of how it's used in your programme?
3. You've described several examples of using simulation in your programme; what is your overall goal for using this as a teaching strategy?
4. Can you describe the benefits of using simulation, if any, in the physiotherapy curriculum in your programme?
Probing Questions
 - Can you provide us with an example?
 - Why do you feel this is a benefit?
5. Can you describe any challenges, if any, with implementing simulation in the physiotherapy curriculum in your programme?
Probing Questions
 - Can you provide us with an example?
 - Why do you feel this is a challenge?
 - How have you met this challenge?
6. Can you give an example of how low-fidelity simulation is used in your programme?
Probing Questions
 - Why do you describe this as low fidelity?
 - How often do you use this?
 - Why is it used?
 - Who implements this?
 - When do you use this?
 - Where is this used?
7. Can you give an example of how high-fidelity simulation is used in your programme?
Probing Questions
 - Why do you describe this as high fidelity?
 - How often do you use this?
 - Why is it used?
 - Who implements this?
 - When do you use this?
 - Where is this used?
8. Is there anything you would like to add about the use of simulation in your programme that hasn't already been covered?
9. Is there anything else in general you would like to add that you feel is important to capture?