

Family medicine residency program simulation survey

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ABSTRACT

Introduction: Simulation-based education is a rapidly growing field within medical training and has been shown to be superior to traditional didactic and clinical training in achieving and retaining medical skills. It allows learners the opportunity to develop their clinical decision-making skills in a realistic environment while focusing on learning rather than the busy demands of a service. This study explores simulation-based medical education utilization within Canadian Family Medicine residency training programs and determines perceived barriers to implementation of simulation.

Methods: Two cross-sectional surveys were developed, for site leads and residents, using a previously developed survey created by Dr. Andrew Koch at Queen's University to assess simulation-based education in emergency medicine training programs. The survey questions were adapted to be applicable to Family Medicine with the permission of the author. Ethics was approved by Newfoundland and Labrador Health Research Ethics Board. The surveys were anonymous and delivered using Qualtrics.

Results: The survey results found 62% of urban training sites have formal simulation curriculums compared to 36% of rural training sites ($p = 0.274$). Barriers included limited access to equipment and limited protected faculty time. Although 72% of resident respondents felt the addition of allied health professionals is beneficial in simulation, only eight sites participate in multidisciplinary simulation. While all sites agreed simulation is very valuable to residents training, 43% of the programs have four or less sessions a year.

Conclusion: These findings suggest a need for greater integration of simulation-based education across Canadian Family Medicine training programs to meet the learning needs of Family Medicine residents.

Simulation-based education is a rapidly growing field within medical education. Medical learners at both the undergraduate and postgraduate level have the opportunity to practice and develop skills in a realistic environment, without risk to patients, and to work with interprofessional team members to improve communication skills. It mirrors real-world clinical scenarios which allows them to further develop their clinical decision-making skills.^(1,2) Simulation training encompasses a wide variety of methods. These include high-fidelity mannequins, which can be programmed to have dynamic vital signs replicating real clinical conditions, procedural task trainers which allow learners to practice specific procedural skills and standardized patients, who are individuals trained to act as real patients allowing learners to enhance their communication skills. Virtual simulation and other online learning models are increasing in popularity to aid in the development of clinical decision making skills for learners who may not have access to high-fidelity mannequins or are training in rural or remote locations.⁽³⁾ A meta-analysis published by McGaghie, et al. demonstrated that simulation-based medical education was superior to traditional didactic and clinical training in achieving and retaining medical skills.⁽⁴⁾

Simulation allows residents to focus on learning rather than the busy demands of a service and provides a safe

environment to learn by trial and error. More importantly, it allows dedicated time for debrief and reflection to set future learning goals for areas of improvement.⁽³⁾ In addition to offering a higher standard of training, simulation is also shown to positively affect patient care practices and improve patient outcomes.^(1,2,5) Simulation has also become an effective form of assessment to monitor students' progress and perform competency assessments which are adaptive to the level of the learner.^(1,2,5)

Family physicians maintain a broad scope of practice, requiring Family Medicine residents to acquire extensive clinical knowledge and procedural competency within a two-year training program as Canada has one of the shortest Family Medicine training programs.^(6,7) A recent study showed that Canadian Family Medicine residency graduates do not feel adequately prepared for clinical activities outside of office-based Family Medicine, including emergency-care hospitals and obstetrics.⁽⁸⁾ With the CFPC's planned transition to a three-year training program, simulation based-education can be incorporated in the curriculum to facilitate the development of these diverse clinical and procedural skills.⁽⁸⁾ It provides the opportunity to gain hands-on experience in a realistic yet controlled environment to allow residents to learn and refine their skills to develop the confidence to perform in these clinical settings.⁽⁹⁾

A call was put forward in 2011 by the Future of Medical Education in Canada Postgraduate Project for postgraduate training programs to implement simulation into their residency curriculums.⁽¹⁰⁾ To date there have been no studies performed to assess the status of simulation-based education in Family Medicine residency training programs in Canada despite similar research by other postgraduate specialty programs that showed considerable variability in simulation utilization across programs.⁽¹¹⁾ A study characterizing simulation within Emergency Medicine programs found that the frequency of simulation ranged from weekly to once or twice per year and only 52% of residents felt their time dedicated to simulation met their needs despite the vast majority stating simulation improved their ability to care for patients in the clinical setting.⁽¹¹⁾ The objective of this study is to characterize the current state of simulation-based education in participating English-language Family Medicine residency programs across Canada and assess how simulation is delivered. It also seeks to determine site leads perceived barriers to its implementation, gain insight to current practices, and explore residents' opinions on simulation.

METHODS

Ethics approval for this study was obtained from The Newfoundland and Labrador Health Research Ethics Board on June 15th, 2022. The reference number is 2022.081 and the research porter file number is 20230072.

Survey Design

The study design included developing two cross-sectional surveys - one for Family Medicine residency training program site leads and one for Family Medicine residents in Canada. A previously developed survey created by Dr. Andrew Koch at Queen's University which assessed simulation-based education in postgraduate Emergency Medicine training programs across Canada was used.⁽¹⁰⁾ The survey questions were adapted to be applicable to Family Medicine residency programs with the permission from Dr. Koch. The survey questions were divided into sections which included demographics, instructional format, content, resident assessments, benefits, and barriers. The survey contained a combination of likert scale, multiple choice, and short answer questions.

Survey Administration

The survey was delivered using the online survey platform Qualtrics® and responses were anonymous. The site lead survey was conducted from September 6th to September 30th, 2022 with a second opportunity to participate from January 4th to February 17th, 2023. The resident survey was conducted from November 4th to December 2nd, 2022, with a second opportunity to participate from January 4th to February 17th, 2023. Program administrators were contacted to determine if

their school was interested in participating. Interested residency programs were provided with the Qualtrics survey link and study information to distribute to site leads and residents.

Analysis

Microsoft Excel® and Qualtrics® were used to analyze the data. Descriptive statistics was used to calculate frequencies and proportions. To analyze the comparison between simulation curriculums in urban and rural sites a Pearson's Chi-squared test of Independence with Yates' continuity correction was performed. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Demographics

Seven universities participated in the survey, which constitutes ~41% of the 17 Family Medicine residency training programs in Canada. A total of 35 site leads responded to the survey, ~33% of the 107 site leads for English Family Medicine residency programs in Canada. A total of 108 residents responded - 29 in their first year of Family Medicine residency and 31 in their second year, with 48 others who did not specify. The population-base at the training sites ranged from less than 10,000 to more than 1,000,000 with 13 of the 35 (37%) site leads classified their location as urban and 22 (63%) sites considered rural (Table 1).

Program Characteristics

The results showed that 16 of the 35 (46%) sites have a formal simulation curriculum while 16 (46%) do not and 3 (9%) did not specify (Table 1). When comparing urban versus rural sites, 8 of the 13 (62%) urban sites have a formal simulation curriculum within their residency training programs, while only 8 of the 22 (36%) rural sites do ($p = 0.274$). Of the 16 sites without a formal simulation curriculum, 3 stated they are in the process of developing a curriculum, 6 sites are considering adding a simulation curriculum, and 4 sites currently have no plan to introduce a simulation curriculum (Table 1).

Instructional Format

Most simulation is occurring in a formal simulation lab - either hospital-based or within a medical school. Other sites included the emergency department, other clinical environments in-situ simulation, and off-site simulation labs (Table 1). The frequency of simulation sessions ranged from once per year to as frequent as monthly (Table 1). Both the site leads and residents reported the most common simulation modality being used is high-fidelity mannequins (35% (16

and 43% (67) respectively), followed by procedural task trainers (26% (12) and 21% (33) respectively) (Figure 1).

Table 1. Summary of site lead survey results

	Sites, n (100%)	Chi-square (p<0.05)
Program Location		
Urban	13 (37%)	
Rural	22 (63%)	
Formal Simulation Curriculum		p = 0.274
Yes	16 (46%)	
No	16 (46%)	
Unanswered	3 (9%)	
Urban site formal curriculum	8 (62%)	
Rural site formal curriculum	8 (36%)	
In the process of developing a simulation curriculum	3 (23%)	
Considering adding a simulation curriculum	6 (46%)	
No plan to introduce a simulation curriculum	4 (31%)	
Simulation Location		
Hospital or medical school simulation lab	13 (39%)	
Emergency department	4 (12%)	
In-situ simulation	5 (15%)	
Off-site simulation labs	3 (9%)	
Other	8 (24%)	
Frequency		
2 or less sessions a year	7 (30%)	
3-4 sessions a year	3 (13%)	
6-10 sessions a year	8 (34%)	
Monthly	3 (13%)	
Multidisciplinary Simulation		
Yes	8 (23%)	
No	15 (43%)	
Unanswered	12 (34%)	
Designated Simulation Lead		
Yes	12 (34%)	
No	4 (11%)	
Unanswered	19 (54%)	
Simulation Lead Incentives		
Protected Time	7 (58%)	
Monetary Compensation	3 (25%)	
Assessment		
Formative Assessment	2 (8%)	
Summative Assessment	1 (4%)	

Only 8 of the 35 sites (23%) participate in multidisciplinary simulation with various interprofessional team members, most commonly nurses and staff physicians (Figure 2). Many residents reported the addition of allied health professionals was helpful in simulation training with 41 (45%) residents agreeing and 25 (27%) strongly agreeing, while only 2 (2%) disagreeing. Interestingly, for those who do not have multidisciplinary simulation, 10 (67%) sites said they would like to see it at their site (Figure 3).

When assessing who is responsible for running the simulation curriculum, 12 of the 35 sites (34%) have simulation leads, 7 (58%) of which have protected time and 3 (25%) are provided monetary compensation (Table 1). A paid position for a dedicated simulation technician to program the equipment was available at 10 sites, while no sites have a volunteer simulation technician. Finally, defined and recurring simulation curriculums were developed by faculty simulation directors/leads at 7 sites and other faculty/physicians at 2 sites.

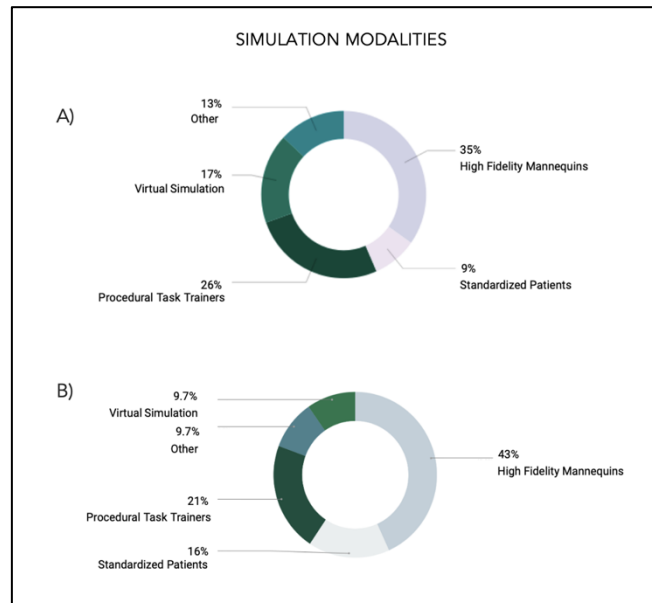


Figure 1. Simulation modalities utilized in the simulation curriculum (A) Site Lead Survey (B) Resident Survey

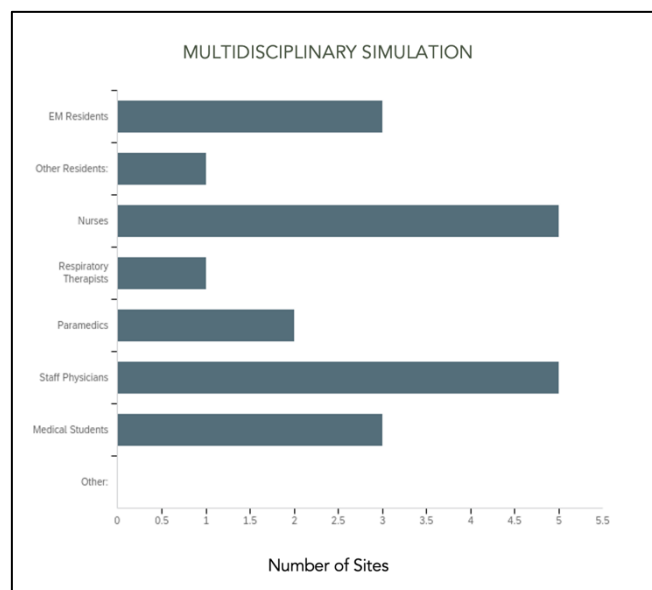


Figure 2. Site lead responses for multidisciplinary involvement in simulation

Content

Scenarios incorporated into the site's simulation curriculum are shown in Figure 4, with the most common being both adult and pediatric ER/resuscitation scenarios, cardiac arrest, and airway cases. Figure 5 demonstrates the scenarios site leads believe are important to incorporate into Family Medicine residents' simulation program.

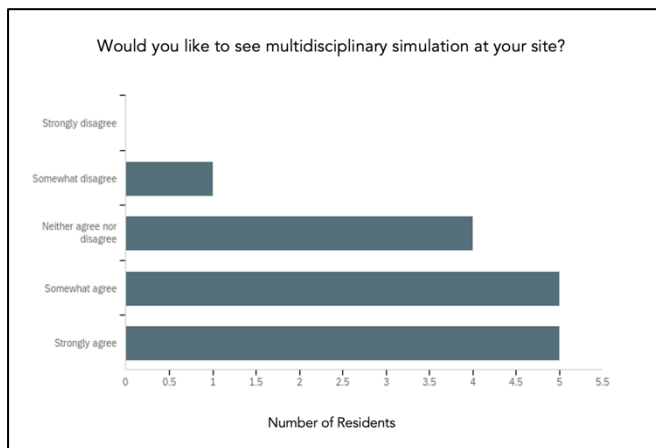


Figure 3. Resident opinions towards the incorporation of multidisciplinary simulation (N=15).

Some scenarios, such as breaking bad news and office based emergencies, are underrepresented within the curriculum, despite an interest in these experiences. No programs had breaking bad news scenarios in their current simulation curriculum but 31%, 11 of the 35 site leads report it is important to Family Medicine resident's training. Similarly, only 6%, 2 of the 35 programs have office-based emergency scenarios incorporated into their program but 40%, 14 of the 35 site leads report it is important to incorporate as well. Table 2 lists the procedures and scenarios incorporated into the simulation curriculum at select residency programs.

Resident Assessment

Only 6%, 2 of the 35 sites use simulation as a method of formative assessment of residents and only 3%, 1 of the 35 sites uses simulation for summative assessment (Table 1). Interestingly, 40%, 14 of the 35 site leads said simulation should not be used for assessment (Figure 6). Similarly, 44 (53%) resident respondents stated they would prefer if their performance during simulation was not assessed. However, only 22 (27%) residents stated they do not feel comfortable being assessed in a simulation environment, while 43 (52%) said they did feel comfortable.

Benefits

The most common perceived benefits by site leads included the opportunity to practice procedural skills, 57% (20 of 35 site leads), providing a safe learning environment to develop clinical reasoning skills, 54% (19 of 35 site leads), improving residents' abilities to care for patients, 51% (18 of 35 site leads) and allowing the opportunity for residents to gain exposure to cases/procedures not commonly seen at their site, 51% (18 of 35 site leads) (Figure 7). 82 of the 83 (99%) resident respondents felt all Family Medicine Residency programs should have simulation training and 80%, 40 of 50 question respondents reported their ability to care for real patients has improved because they have practiced similar situations in simulation training. Only 25 (50% of resident respondents) reported the time dedicated to simulation-based activities met their educational needs.

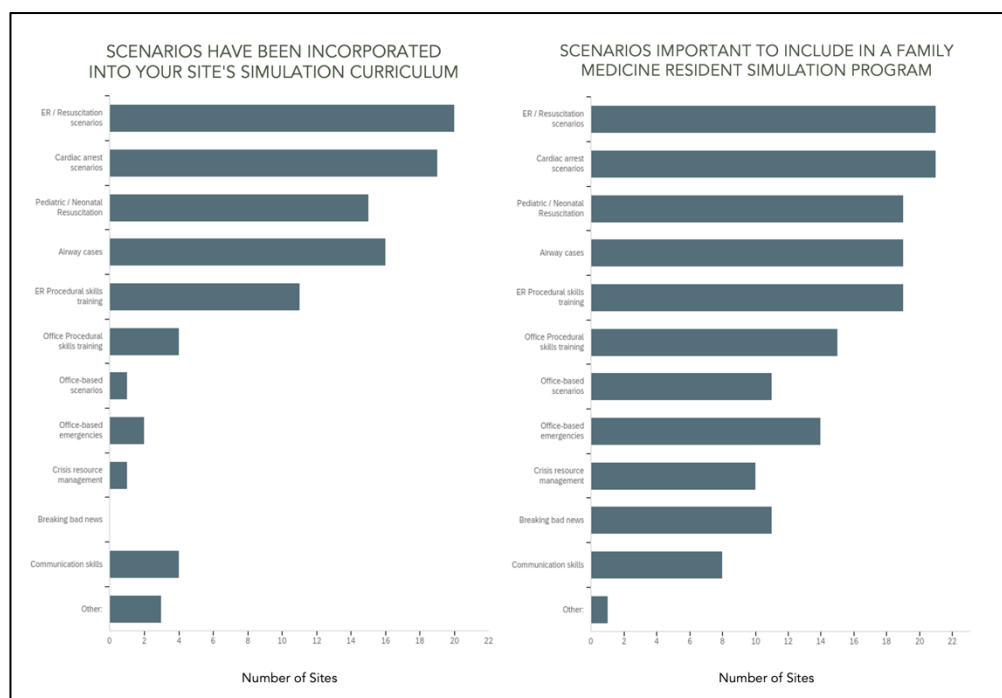


Figure 4. Scenarios incorporated in current simulation curriculum (N=35).

Figure 5. Scenarios important to resident training (N=35).

Barriers

Most commonly perceived barriers by site leads to developing a simulation curriculum within their residency training program included limited faculty time, 46% (16 of 35 site leads), limited access to equipment, 40% (14 of 35 site leads), and limited protected time in the current curriculum, 37% (13 of 35 site leads) (Figure 8). When asked how to improve simulation within their programs, the common themes amongst resident responses included: increasing frequency of simulation by having regularly scheduled time such as during academic half days, having prepared scenarios (including office based scenarios) and incorporating more allied healthcare professionals.

Table 2. Current procedures and scenarios incorporated into simulation curriculums as listed by site leads and residents.

PROCEDURES	SCENARIOS
Chest tubes	Cardiac arrest/ACLS
Paracentesis	Shock
Central lines	DKA and Thyroid Storm
Intubation	Anaphylaxis
IUD insertion	Altered LOC
Endometrial biopsy	Toxicology
Deliveries	Drowning
Perineal repairs	Respiratory Distress
Excisional and punch biopsies	MVAs/Trauma/ATLS
Laceration repairs	Sepsis
Casting	Seizures
Reductions	GI Bleeds
Joint injections	PALS
IOs	NRP
IVs	Ectopic
Tourniquets	ALARM

DISCUSSION

Numerous studies have highlighted the importance of simulation-based medical education in residency training programs.^(1,2,4,5) Based on our survey, only 46% of Family Medicine residency training programs included in the study had a formal simulation curriculum. The survey results found 62% of urban training sites have formal simulation curriculums compared to 36% of rural training sites.

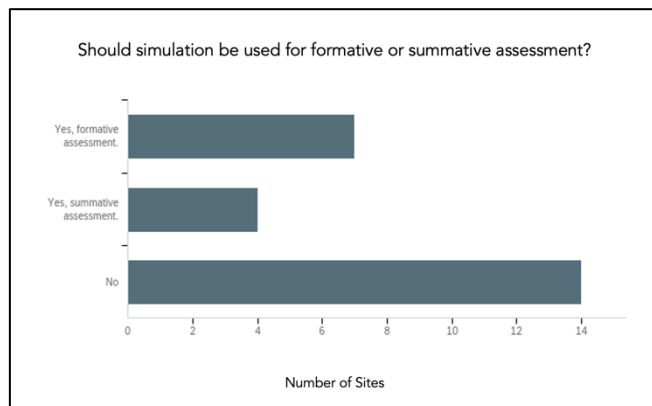


Figure 6. Site leads' opinion on simulation use for assessment (N=25).

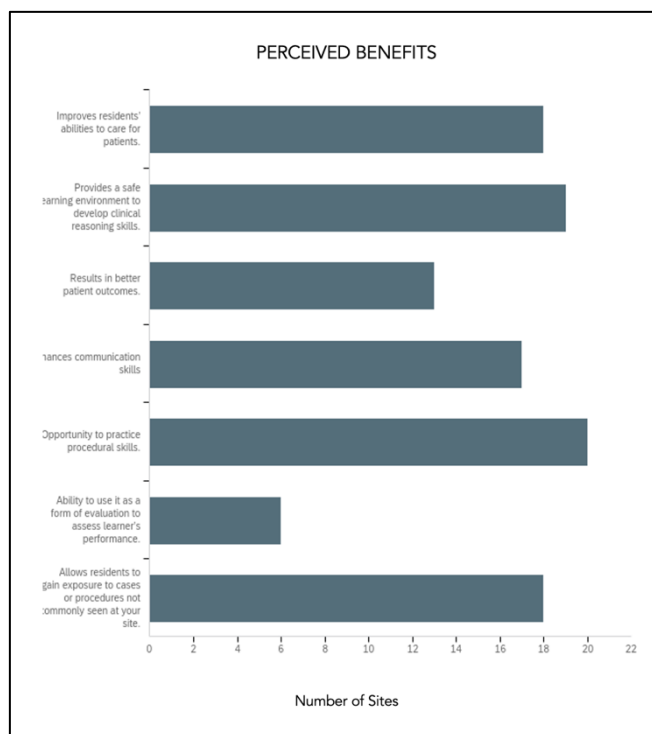


Figure 7. Benefits of simulation to Family Medicine resident training (N=35).

Multidisciplinary simulation is valuable in developing communication, leadership, and teamwork skills required to provide comprehensive, patient-centered care.⁽¹²⁾ It also expands resident knowledge of other healthcare providers' scope of practice.⁽¹²⁾ However, only 8 of the 35 sites surveyed participate in multidisciplinary simulation. Programs that did offer multidisciplinary simulation have opportunities to expand the number of interprofessional team members participating. Of those that did not offer it, many expressed an interest for increased interprofessional involvement.

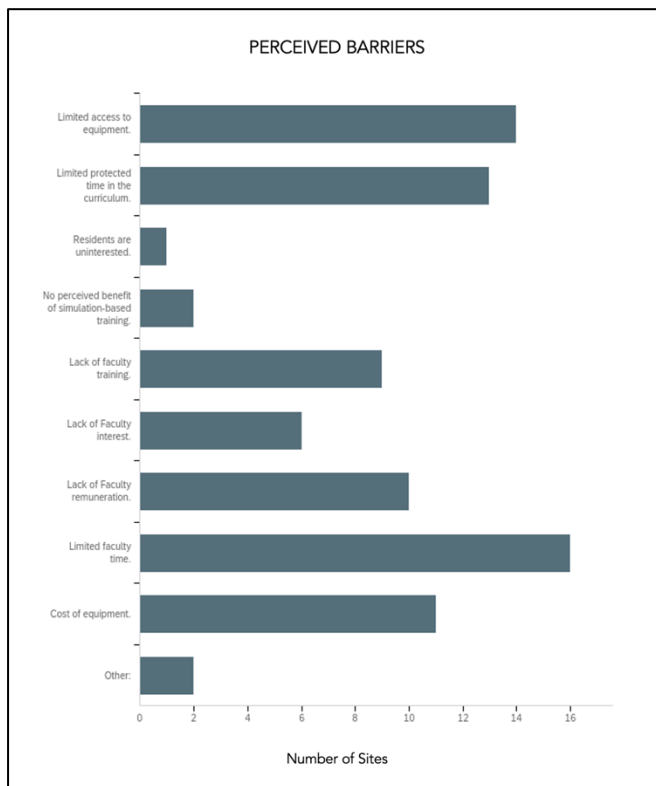


Figure 8. Barriers to incorporating a simulation curriculum (N=35).

Although there were mixed opinions on whether simulation should be used as a form of assessment amongst both site leads and residents, many site leads believe simulation-based medical education is valuable to Family Medicine residents training. Identified benefits included providing a safe learning environment to develop clinical reasoning skills, and providing opportunities to practice procedural skills and gain exposure to cases not commonly seen at their site. This corresponds with 99% of resident respondents who felt all Family Medicine Residency programs should have simulation training and 80% reporting their ability to care for real patients has improved because of simulation. However, many programs offering simulation have only a few sessions a year and only 50% of resident respondents reported the time dedicated to simulation-based activities in their program meets their educational needs.

Barriers to delivering simulation-based education included limited access to equipment and limited protected faculty time which correlates with only 7 sites having protected time for simulation leads and only 3 providing monetary compensation. Implementing a simulation curriculum can be financially challenging as it involves purchasing and maintaining specialized equipment and trained faculty. However, with the advancement of technology, virtual simulation is becoming more common and can be useful in limited resource areas.⁽¹²⁾ Other cost effective methods in

areas with limited access to specialized equipment include the utilization of standardized patients which have been shown to enhance learners' communication skills and clinical decision making skills.⁽¹²⁾

Finally, some scenarios, such as breaking bad news and office based emergencies, are underrepresented within the simulation curriculums, despite being deemed important to resident learning by site leads. This survey, in addition to the current literature supporting simulation-based medical education, aims to help Family Medicine residency programs advocate for access to the equipment and the protected time for faculty required to develop a simulation curriculum at their site to meet the learning needs of Family Medicine residents.

LIMITATIONS

Only 35 site leads and 108 Family Medicine residents in Canada responded to the survey therefore this may affect the validity of the results. Additionally, French programs were excluded in the survey, thus, including them may have improved response rates. As well, programs with an interest in simulation may have been more likely to respond. Finally, PGY1s had limited exposure to simulation at the time the survey was completed. As such, the results may not be an accurate reflection of their yearly simulation curriculum and may be more representative of the PGY2's simulation curriculum within their residency training.

CONCLUSION

This study explores simulation-based medical education utilization across Canadian Family Medicine residency training programs. Additionally, it highlights several barriers facing simulation delivery. Our aim is to encourage programs to incorporate simulation-based education into their residency training programs, adapt their curriculum to meet the evolving learning needs of Family Medicine residents and learn from best practices of established simulation curricula. Participating simulation programs included a mixture of simulation modalities and provided the investigators with lists of current procedures and scenarios. This may help inform future development of a national simulation curriculum that shares standardized cases among all Family Medicine training programs in Canada, which is the future aim for this study.

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