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Canadian medical schools' preclerkship paediatric clinical skills curricula: How can we improve?

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Abstract

Background: Little is known about how Canadian medical schools teach paediatric clinical skills (history and physical exam) to preclerkship students, or its cost to the institutions.
Methods: Clinical skills program directors from all 17 Canadian medical schools were contacted to complete a questionnaire focused on teaching methods, and barriers/strengths of their Preclerkship Paediatric Clinical Skills program.
Results: Seventeen schools (100% response rate) participated. Seven schools (41%) do not introduce paediatric clinical skills until the second year of medicine. Half of the schools (53%) dedicate <10 total hours to preclerkship paediatric clinical skills. Fifty-nine per cent have ≤6 total hours of hands-on paediatric patient interaction (real or simulated). Medical students were least likely to be exposed to the infant age group (age 1 to 24 months). Twelve schools (71%) used simulated parent/child dyads. The most significant barriers identified by programs were limited time for sessions and patient availability. We describe one sample medical school's simulated parent/paediatric patient program where every student has hands-on learning with paediatric patients of all ages (program cost $938/student).
Discussion: This study is the first to summarize Canadian preclerkship paediatric clinical skills programs, among which there is great variability and commonly experienced barriers. Many students are not being exposed to all age groups of paediatric patients before their clerkship years. Medical schools can use this information to strengthen this important and challenging aspect of the curriculum, while being mindful of its fiscal implications.

Keywords: *Clinical skills; Curriculum; Feedback; Medical education; Preclerkship; Simulation*

Clinical skills, consisting of history taking, communication, professionalism, physical examination skills, and procedural skills, are a vital component of the preclerkship undergraduate medical curriculum. However, paediatric-specific clinical skills sessions are often limited in favour of clinical skills sessions with adult patients in the first 2 years of medical school (preclerkship). This has been highlighted in the USA, where the main challenges of implementing paediatric clinical skills in preclerkship are time constraints and limited preceptor availability, which has resulted in great variability of teaching methods between US medical schools (1).

The primary objective of this current study was to summarize what each medical school across Canada is doing to teach this critical component of the undergraduate medical curriculum,

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and to determine what types of barriers exist to its successful implementation. The secondary objective was to analyze the cost of one sample school's paediatric simulated patient program in order to provide a detailed example of running such a program (Figure 1) (2).

MATERIALS AND METHODS

Clinical skills program directors of all 17 Canadian medical schools were contacted to complete an online questionnaire (Opinio software, ObjectPlant, Inc., Norway) regarding their Preclerkship Paediatric Clinical Skills program. The questionnaire (Supplementary Appendix A) was developed de novo after an extensive literature review, as well as input from a clinical skills director, preclerkship paediatrics director, clerkship paediatrics director, and a faculty member specializing in the teaching of adolescent medical interviewing. The literature review included the following search terms: paediatric clinical skills, preclerkship, clerkship, paediatric simulated, simulated patient. It was piloted with the Department of Paediatrics at one medical school and clinical skills directors at two medical schools prior to distribution. Clinical skills program directors were identified through each medical school's website. They were contacted once, and subsequently sent two reminders through e-mail. The study was completed with implied consent, which was fully explained in the e-mail and the first page of the online survey. The cost analysis of one medical school's program was completed by collecting details from the simulated program centre director.

RESULTS

Curriculum organization

All 17 Canadian medical schools (100% response rate) responded. Ten schools (59%) incorporated paediatric clinical skills in both the first and second year of the program. The remaining schools (n=7, 41%) introduced paediatric clinical skills only in the second year.

When asked how many hours were dedicated to the entire paediatric preclerkship clinical skills program, eight schools (47%) dedicated ≥10 hours, three schools (18%) dedicated 8 to 9 hours, five schools (29%) dedicated 6 to 7 hours, and one school (6%) had 4 to 5 hours for the total curriculum.

Within this total curriculum time, medical student interaction with paediatric patients (real or simulated) comprised ≥9 hours (n=7, 41%), 5 to 6 hours (n=4, 24%), 3 to 4 hours (n=3, 18%), 1 to 2 hours (n=1, 6%), or less than 1 hour (n=2, 12%).

Patient interaction time made up the following percentages of the total curriculum time: 11 to 25%, <17%, <20%, 43 to 57% (n=3), 50 to 60%, 56 to 75% (n=2), 71 to 86%, and 90% (n=6).

Teaching methods and simulated patients

Teaching methods and details on the use of simulated patients are summarized in Tables 1 and 2. Four schools (29%) were able to provide students the opportunity to have one-on-one paediatric patient interactions.

Figure 1. Simulated parent/infant pairs at the Simulated Patient Program for the Preclerkship paediatric clinical skills program at one sample Canadian medical school. This program includes simulated parents and their infant, toddler, grade-schooler, and adolescents.

Table 1. Methods of teaching paediatric clinical skills in 17 Canadian medical schools

Teaching methods[a]	**Count (%)**
Didactic lectures	16 (94)
Paediatric skills demonstration sessions	13 (77)
Instructional video	13 (77)
Simulated parent/child dyads	13 (77)
Small group instruction	13 (77)
Interactions with out-patients in clinics	10 (59)
Interactions with in-patients in hospital	8 (47)
Simulation with mannequins	6 (35)
One-on-one instruction	0 (0)
Medical specialties used for clinical skills teaching[a]**:**	
General Paediatrics	13 (77)
Neonatal-Perinatal Medicine	7 (41)
Paediatric Cardiology	3 (18)
Paediatric Neurology	3 (18)
Family Medicine	2 (12)
Paediatric Endocrinology	1 (6)
Paediatric Infectious Diseases	1 (6)
Paediatric Respirology	1 (6)

[a]Respondents could select one or more options.

Table 2. Simulated patient use and age groups of paediatric patients that preclerkship medical students are exposed to in Canada

	Count (%)
Medical schools that use simulated parents/paediatric patients[a]	13 (77)
Adolescents	8 (47)
Parent and grade-schooler	6 (35)
Parent and toddler	6 (35)
Parent and infant	5 (29)
Parent and neonate	2 (12)
Preclerkship medical students are guaranteed exposure to[a]:	
Adolescents	9 (53)
Grade schooler	8 (47)
Toddler	9 (53)
Infant	5 (29)
Neonate	11 (65)
No age group guaranteed	5 (24)

Adolescents (>12 years); grade schooler (5–12 years); toddler (2–5 years); infant (2–24 months); neonate (0–1 month).

[a]Respondents could select one or more options.

Age groups of patients

The most common age group of paediatric patients that students were guaranteed exposure to was neonates (0 to 1 month old). Students were least likely to be exposed to infants (2 to 24 months old) (Table 2).

Types of settings and paediatric subspecialty exposure

Less than one-third of the schools guaranteed exposure to paediatric inpatient units (n=5, 29%) or outpatient clinics (n=4, 24%). Medical specialties used for clinical skills teaching is summarized in Table 1.

Feedback and evaluation of students

Feedback to students was most often verbal feedback from the parent and/or adolescent patient (n=8, 47%). The second most common type of feedback was from the students' preceptor in the form of hand-written (n=7, 41%) or online (n=7, 41%) feedback. Two schools (12%) used written feedback from simulated parent/adolescent pairs. Four schools (24%) used video recording while students performed clinical skills during a simulated parent/child patient encounter.

Less than a third (29%) of the schools required students to practice writing a summary note of their history and physical examination findings in a paediatric patient encounter. Less than a third (29%) required students to document the specific paediatric clinical skills they learned and practiced in their preclerkship.

Barriers and strengths of program implementation

Significant barriers identified by program leads/directors are displayed in Table 3. Innovative ideas added to the curriculum in the past decade by program leads/directors are listed in Table 4.

Desired changes to the curriculum

Many program leads/directors wished for students to have earlier paediatrics exposure. There was also an expressed need for longitudinal exposure to paediatrics. Other desired changes included the addition of a well-baby session, encounters with less healthy children, and following the same child over 2 years. Lastly, program leads/directors wished for more paediatrician availability.

Description and cost analysis of one sample program

A description and cost analysis of the preclerkship paediatric clinical skills curriculum at one of the Canadian medical schools is summarized in Table 5.

DISCUSSION

Our study provides novel insight into how medical schools are teaching paediatric clinical skills to preclerkship medical students across Canada. We also conducted an in-depth

description and cost analysis of one sample program (Table 5). It has previously been described that research studies on simulation-based medical education almost always omit the discussion of cost (3). Therefore, we hope that our study can shed light on the cost of running a simulated patient program that provides medical students the opportunity to have hands-on learning with each paediatric patient age group before starting their clerkship years.

Schools can compare the cost of such a program to their current budget and operating costs. As we identified that over a third of schools are already spending the vast majority (90%) of the dedicated curricula on patient interaction, setting up a similar simulated patient program can continue emphasizing patient interaction, while at the same time ensuring exposure to all age groups in the most efficient and cost effective way. There are potential saved costs as you are removing the early learners from the outpatient and inpatient setting, thereby preventing prolonged patient appointments/interactions and saving money. Learners may also be more comfortable with paediatric patient care in their clerkship years, improving their efficiency and reducing their need for direct physician supervision, which also saves overall costs. A benefit of such a program includes self-sustainability as over the years younger paediatric patients become the older paediatric patients, and eventually even return as simulated parents with their own children. The medical school found that the same families/paediatric patients were willing to participate over multiple years in a row, with the paediatric patients moving up the age group brackets.

Over half of Canadian medical schools are dedicating <10 total hours to teaching paediatric-specific clinical skills to preclerkship students. For most, medical students are spending less than 6 hours interacting with paediatric patients. In keeping with this, limited time in the curriculum was the number one barrier for program implementation. This limited curriculum time dedicated to paediatric clinical skills, in contrast to adult patient clinical skills, does not match the reality that students will face when they encounter paediatric patients in almost every clerkship rotation and residency program. For example, students will treat paediatric patients not only in their paediatric rotations, but also family medicine, psychiatry, paediatric general surgery and surgery subspecialties. Students will also interact with teens that are newly aged out of the paediatric healthcare system in obstetrics and gynecology and internal medicine. Early paediatric clinical experience has also been shown to improve both comfort levels and performance when

Table 3. Most significant barriers to the preclerkship paediatric clinical skills curriculum identified by Canadian program leads/directors[a]

Barrier	Count (%)
Limited time for clinical skills sessions	13 (77)
Patients are limited or unavailable	12 (71)
Too many learners	8 (47)
Limited faculty involvement	8 (47)
Limited hospital infrastructure (e.g., clinic space)	5 (29)
Financial barriers	4 (24)
Limited teaching resources	3 (18)
Limited resident involvement	3 (18)
Limited recognition of faculty who participate	2 (12)
Perceptions that the Faculty of Medicine does not value the inclusion of paediatric clinical skills	1 (6)
Lack of formal medical education training among staff	1 (6)
Lack of paediatricians	1 (6)

[a]Respondents were allowed to select one or more answer options.

Table 4. Innovative ideas added to the preclerkship paediatric clinical skills curriculum by Canadian program leads/directors in the past 10 years

- A comprehensive book describing paediatric-specific history and exam findings
- Opportunity to complete one full history, physical exam, and write-up with a standardized adolescent patient
- Engaging community paediatricians to allow student exposure to out-patient clinics
- Adding paediatric-specific clinical reasoning learning sessions, to provide context and background to the clinical skills being taught
- Adding paediatric history taking to the already existing communication sessions in the undergraduate medical curriculum
- Simulated patient encounter with a parent/toddler pair that is experiencing domestic violence
- Standardizing the experience so that the students see a child in each age bracket (infant, toddler, grade schooler, and adolescent)
- Simulated adolescent patients to practice the HEADSS interview
- Using OtoSim to learn otoscopy skills
- Using videotaped sessions for the student to review their performance, as well as a checklist for self-reflection of the video
- Session where the student observes a toddler and guesses their age
- Require all paediatric faculty members to supervise five student-patient encounters per year to help with faculty recruitment

Table 5. The cost breakdown to run a simulated parent and child patient program (all age groups) for 80 medical students for 1 year from one sample medical school

	Hours	Cost per hour	Total cost
Training of simulated parent and simulated adolescents for the medical student sessions	307	$20	$6,140
Simulated patient educators (two total), used for training of the simulated parents and adolescents	374	$43	$16,082
The actual simulated patient medical student sessions	541	$20	$10,820
Physician tutors supervising medical student sessions	420	$100[a]	$42,000[a]
		Total cost of the program	$75,042
		Total cost per medical student	**$938.03/student**

[a]Fee is included in the physicians' Alternative Funding Plan.

caring for paediatric patients in clerkship (4,5). However, it is important to note that quantity does not necessitate quality. A program that devotes less total hours to their curriculum may provide better content and relevance than a program that devotes more total time. There is a need for national standardized content to ensure that regardless of the variability in the actual number of hours spent, Canadian medical students are all guaranteed exposure to a core set of paediatric clinical skills topics.

Our study found that paediatric subspecialties and family medicine are being under-utilized for student teaching. Using not only paediatricians as preceptors, but clinicians in family medicine and other specialities, can provide a rich learning experience in paediatrics for medical students (6). This may allow for a larger pool of clinician-teachers to choose from when designing curricula, and may help overcome the barrier of limited paediatrician availability identified in both our current Canadian study and a previous similar USA study (1). It is unknown why potential preceptors in these areas of medicine are being underutilized—whether they were not asked to be involved, or if they declined. Regardless, it remains an important source of clinical skills teachers that medical schools can try to access if they have not yet done so.

The majority of schools are performing their preclerkship paediatric program through didactic lectures, skill demonstration sessions, instructional videos, small group learning, and simulation sessions. We also identified that for over a third of schools, 90% of the total preclerkship paediatric clinical skills curricula time is spent on patient interactions (real or simulated patients). There are several innovative changes that individual medical schools have made to their curricula over the past decade (Table 4), many of which are new ways to utilize already existing resources. Creating a method of sharing these reusable resources and ideas across all schools, either at an annual conference or through an online system, could help improve curricula in a way that saves both time and money for all parties involved.

Simulation-based teaching and learning is arguably the most innovative change in medical education over the last 20 years, and is currently being used for teaching paediatric clinical skills in over three-quarters of medical schools. Since there are fewer patients in hospitals, more learners, reduced access to patients, and a focus on patient safety, simulation-based medical education has become essential to learner education. Simulation in paediatrics implemented in clerkship years has also been previously shown to lead to higher knowledge scores on the National Board of Medical Examiners Pediatric shelf examination and improvements in clinical clerkship performance (7). Simulation in preclerkship years has also been previously shown to improve performance. Simulation of surgical skills in preclerkship was found to stimulate interest, improve knowledge, and improve students' technical skills prior to clerkship (8). A previous study has also found that performance on preclerkship clinical performance exams can predict students at risk of failing clerkship clinical performance exams (9). Therefore, earlier introduction of simulation and assessment provides an opportunity for early remediation of deficits. Another study also found that the introduction of a preclinical skills curriculum was associated with improved clerkship performance (10). Simulation may also be more attractive to implement in preclerkship years as opposed to clerkship years as it is not detracting from real patient care experiences in outpatient clinics, inpatient care, emergency room consultations, and more.

In keeping with what has been documented in medical schools across the USA, there exists wide variability in how paediatric clinical skills are taught in Canadian medical schools (1). Students are currently not guaranteed exposure to all age groups of paediatric patients before heading into their clerkship years. A previous study identified that medical students with little prior experience with children had significantly less comfort interacting with children during their paediatric clerkship (5). This is an area of the curriculum that could

see significant improvement with the addition of simulated parents/patients of each age group.

This current study found that the majority of student feedback regarding their paediatric clinical skills is verbal feedback from the parent and/or adolescent patient. Written feedback may be more concrete, and can provide the opportunity for multiple types of feedback (both quantitative and qualitative). The Structured Communication Adolescent Guide (SCAG) or other standardized feedback forms may be beneficial as a programmatic assessment tool as it allows for multiple types of written feedback, from the patient themselves, in multiple different settings and time points over the course of their medical education (11). Programmatic assessment emphasizes assessment *for* learning, rather than assessment *of* learning, and has been emerging in medical education. Videotape review, which our study found to be underutilized in Canadian medical schools, has previously been reported as effective to students when learning history-taking skills (12,13).

The nationwide uptake of competency based medical education in all residency programs raises the question of whether we need to be including more direct observation and feedback of learned skills in undergraduate medical education as well. Teaching and evaluating a core set of competencies may help decrease the current wide variability that exists in curriculum hours, evaluation, and teaching methods in preclerkship paediatric clinical skills.

Results from the most recent 2018 Association of Faculties of Medicine of Canada National Graduation Questionnaire found that 12.1% of Canadian medical graduates reported their paediatrics education experience to be 'poor' or 'fair' in medical school. Including more guaranteed exposure to all paediatric ages in the preclerkship years can help medical students feel better prepared for clerkship and residency alike. We hope that this study can serve as a guide for implementing these changes to curricula and sharing resources across the country.

The limitations of this current study include that it relied on the program director/leader's own recall. We also did not collect information on the costs of more than one sample school's simulation paediatric patient program, so we were unable to summarize this nationwide data. We also did not collect data on the total number of hours dedicated to both adult and paediatric clinical skills teaching in the preclerkship years, so are unable to frame our results in comparison to what is being done to teach adult clinical skills in preclerkship. Future research should explore student satisfaction with paediatric clinical skills teaching, as well as the relationship between type of clinical skills teaching to student performance in clerkship paediatric rotations.

SUPPLEMENTARY DATA

Supplementary data are available at *Paediatrics & Child Health* Online

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