Major Contributions

Identifying essential procedural skills in Canadian undergraduate medical education
Définir les compétences procédurales essentielles dans la formation médicale canadienne de premier cycle

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Abstract

Introduction: We conducted a national survey to characterize current Canadian procedural skills training in Undergraduate Medical Education (UGME). The goals were to identify the most important procedures students should know upon graduation and assess clinician-educator perceptions regarding implementation of a pre-clerkship procedural program.

Methods: We distributed the survey to physician-educators across Canada’s 17 medical schools. Respondents were directed to an individualized survey that collected demographic data, physician-educator responses on essential procedural skills, as well as physician-educator opinions on the value of a pre-clerkship procedural training program.

Results: The response rate for this survey was 21% (42 out of 201 distributed surveys were completed). The top 10 most important procedures identified by physician-educators included IV Access, Airway Management, Local anesthesia/field block, Casting, Spontaneous Vaginal Delivery, Testing for STIs, Phlebotomy, Suturing of Lacerations, Nasogastric Tube Insertion, and Venipuncture. Physician-educators supported a pre-clerkship procedural program.
Conclusions: Identifying the most crucial procedural skills is the first step in implementing a competency-based procedural skills training program for Canadian medical students. With the list of essential skills, and the support for physician-educators in developing a pre-clerkship procedural skills curriculum, hopefully there can be future development of formalized curricula.

Résumé

Contexte: Nous avons mené un sondage à l’échelle nationale pour caractériser les compétences procédurales canadiennes dans la formation médicale de premier cycle. L’objectif était de reconnaître les plus importantes procédures que les étudiants devaient connaître à la fin de leur formation et d’évaluer les perceptions des cliniciens éducateurs au sujet de la mise en œuvre de leur programme procédural avant les stages.

Méthodes: Nous avons distribué le sondage à des médecins éducateurs dans les 17 écoles de médecine du Canada. Les répondants ont été dirigés vers un sondage individualisé qui recueillait les données démographiques, les réponses des médecins éducateurs sur les compétences procédurales essentielles, ainsi que les opinions des médecins éducateurs sur la valeur du programme de formation procédurale avant les stages.

Résultats: Le taux de réponse à ce sondage a été de 21 % (42 des 201 sondages distribués ont été remplis). Les dix plus importantes procédures recensées par les médecins éducateurs comprenaient l’accès IV, l’assistance respiratoire, le bloc anesthésie locale/champ, le moulage de plâtre, l’accouchement spontané par voie vaginale, les tests d’ITS, la phlébotomie, la suture des lacérations, l’insertion d’une sonde nasogastrique et la ponction veineuse. Les médecins éducateurs soutenaient un programme procédural avant les stages.

Conclusions: Établir les compétences procédurales les plus essentielles représente la première étape dans la mise en œuvre d’un programme de formation dans les compétences procédurales fondé sur les compétences pour les étudiants canadiens en médecine. Avec la liste de compétences essentielles et le soutien des médecins éducateurs dans le développement d’un programme de compétences procédurales avant les stages, nous espérons qu’un programme structuré sera élaboré.

Introduction

Medical education is filled with steep learning curves, and procedural skills education is no exception. A Canadian study emphasized the discrepancy between the expectations of clinical supervisors and the skills first year residents feel comfortable in performing without direct supervision.1 Evidently, this could negatively impact educational efforts and patient safety.1

Addressing these educational gaps should be a priority, given the incorporation of Entrustable Professional Activities (EPAs) in Canadian Undergraduate Medical Education (UGME), a group of core activities medical students are required to perform prior to starting residency. Notably, the 11th EPA set by the Association of Faculties of Medicine of Canada (AFMC) states the following: “perform general procedures of a physician.”2 Accompanying this EPA was the establishment of an AFMC clinical skills working group. The goal of this group was to set standard expectations for procedural skills for new medical graduates regardless of the specialty chosen in post-graduate medical education.3,4 Further accounts of cross-Canadian opinions are paramount in developing a comprehensive procedure set.

Our project systematically surveyed physicians in order to obtain a pan-Canadian opinion on the relevant procedural skills, as well as to gain insight into the need for a procedural skills program at the UGME level. This would enable us to determine whether the pan-Canadian opinion aligns with the conclusions of the AFMC clinical skills working group, and if not to be able to decide what to do about it. The specific goals of the survey conducted were to i) identify the most important procedures medical students should know upon graduation as selected by physician-educators; and ii) assess physician-educator support for the development and integration of a pre-clerkship procedural curriculum.
Methods

This project was granted an REB waiver by the Ottawa Hospital Research Institute.

Participants

We identified the 17 Canadian medical schools using the AFMC’s website. We used each medical school’s website to identify the Deans, the UGME Vice-Deans, and the UGME faculty members in pre-clerkship leadership positions (i.e. Block Director, Unit Director, Pre-Clerkship Director, etc.) and clerkship leadership positions (i.e. Rotation Director, Clerkship Director, etc.). We retained the UGME faculty members identified who specialized in one of the following skills-intensive specialties: family medicine, emergency medicine, surgery, obstetrics and gynecology, internal medicine, and anesthesiology. Through consultation with local medical education expert physicians, we determined the skills-intensive specialties. We selected 201 faculty members from the 17 Canadian medical schools for participation in the survey using this method.

Survey development and content

As part of our survey, we collected faculty member demographics including their current Canadian medical school affiliation, their level of UGME affiliation (pre-clerkship, clerkship, or both), and their respective specialty. We only used this demographic information for data sorting, and it remained anonymous with respect to respondent and medical school.

Next, we used Competency-Based Medical Education (CBME) guidelines5-10 to generate a list of frequently performed skills for each of the six procedure-intensive specialties. Based on their medical specialty, participants were given their respective list and asked to identify the procedural skills they believed medical students should know upon graduation. We asked the participants to answer this question by taking into consideration that the medical student could be entering any specialty following graduation. To note, there was not a limit on the number of procedures the participant could choose, and responses were binary. “Knowing” a skill was defined as the ability to perform a given skill independently with a supervising physician present to help, if needed.

The final section of the survey assessed the respondents’ overall support regarding the development and implementation of a pre-clerkship procedural skills curriculum. All participants answered the same question in this section, regardless of their academic role or specialty using a 5-point Likert scale.

To test for ease of comprehension or other technical errors, we conducted a a pilot test of this survey with eight physician-educators (two anesthesiologists, four emergency medicine physicians, and two surgeons) and two experts in medical education. The survey was translated into French for maximal outreach to all medical schools across Canada.

Survey dissemination

We developed a web-based survey using GoogleForms and stored it on a secure and encrypted faculty account. The 201 identified Faculty members were emailed the initial survey in September 2017. We sent a follow-up email every two weeks while giving respondents a total of six weeks to complete the survey. No incentives were given to respondents for participation.

Data analysis

We calculated descriptive statistics for survey responses. We computed counts and percentages for questions with categorical variables, while using mean, median, and mode scores for Likert-type questions. We report the list of all skills identified as most important using absolute and relative measures number of physicians’ responses.

We wanted to account for the fact that some skills are more prominent in certain specialties. We gave physicians skills to rank based on their area of expertise. This meant that for any individual skill, not all physicians had the opportunity to determine the rank. The absolute number of responses is a count of how many physicians, regardless of their specialty, voted for that skill as important. The relative number is the percentage of how many physicians, regardless of their specialty, voted for that skill as important. The relative number is the percentage of how many physicians, regardless of their specialty, voted for that skill as important. The overall rank is the average of the absolute and relative ranks.
Results

I. Demographics

The response rate for this survey was 21% (42 out of 201 distributed surveys were completed). Demographics for the respondents are found in Table 1. Anesthesiology and Family Medicine represented 29% and 24% of the 42 responses respectively, followed by Internal Medicine (19%), Surgery (14%), Obstetrics and Gynecology (7%), and Emergency Medicine (5%). Clerkship faculty represented nearly two-thirds of the respondents (67%), followed by Deans/Vice-Deans (19%) and pre-clerkship faculty (14%). The majority were anglophone respondents (86%).

Table 1. Respondent demographics

| Survey Dissemination | | |
|----------------------|-----------------------------|
| Surveys distributed  | 201                         |
| Surveys completed    | 42 (21%)                    |
| Specialties (n = 42) | | |
| Anesthesiology       | 12 (29%)                    |
| Family medicine      | 10 (24%)                    |
| Internal medicine    | 8 (19%)                     |
| Surgery              | 6 (14%)                     |
| Obstetrics & gynecology | 3 (7%)            |
| Emergency medicine   | 2 (5%)                      |
| No response          | 1 (2%)                      |
| Level of Medical Education (n = 42) | | |
| Pre-Clerkship        | 6 (14%)                     |
| Clerkship            | 28 (67%)                    |
| Deans/Vice-Deans     | 8 (19%)                     |
| Language of Respondent (n = 42) | | |
| French               | 6 (14%)                     |
| English              | 36 (86%)                    |

The 42 respondents represented 12 of the 17 Canadian medical schools. However, over 50% of responses came from two institutions.

II. Expectations of procedural skills competence upon graduation

The 10 skills that physician-educators identified as essential for a medical student to know how to perform upon graduation can be found in Table 2. The complete list can be found in Appendix A.

III. Physician-educator perceptions on integration of a novel pre-clerkship procedural curriculum

We used a Likert scale in order to assess physician-educator support for a pre-clerkship procedural curriculum. Respondents were asked the following question: “To what extent do you support the development of a pre-clerkship procedural curriculum for 2nd year students, which formally teaches, integrates, and allows students to practice procedural skills in a simulated environment?” A Likert rating=1 signified that the respondent did not support, while a Likert rating=5 signified that the respondent strongly supports. The mean of responses was 3.73 with standard deviation 1.32.

Table 2. Top 10 reported skills for medical students to know – overall ranking

<table>
<thead>
<tr>
<th>Rank</th>
<th>Skill</th>
<th>Relative Responses</th>
<th>Absolute Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IV Access</td>
<td>0.800</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>Airway Management</td>
<td>0.667</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Local anesthesia/field block</td>
<td>0.605</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>Casting</td>
<td>0.750</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>Spontaneous Vaginal Delivery</td>
<td>0.667</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>Testing for STIs</td>
<td>0.692</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>Phlebotomy</td>
<td>0.650</td>
<td>13</td>
</tr>
<tr>
<td>8</td>
<td>Suturing of Lacerations</td>
<td>0.619</td>
<td>13</td>
</tr>
<tr>
<td>9</td>
<td>Nasogastric Tube Insertion</td>
<td>0.526</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>Venipuncture</td>
<td>0.667</td>
<td>8</td>
</tr>
</tbody>
</table>

Discussion

The landscape of student experience of procedural skills training throughout medical school is changing.\textsuperscript{11–13} Therefore, the establishment of early direct teaching and a procedural training program could benefit students. Through developing increasing technical ability, students could gradually but steadily progress towards competency in essential skills before entering residency.\textsuperscript{14,15} It is an ideal time in medical education to implement such training, as increasing emphasis is being placed on EPAs and CBME in undergraduate and graduate medical education.\textsuperscript{16,17} Therefore, we conducted a national survey to i) identify the most important skills faculty members believe medical students should know upon graduation, ii) assess physician-educator support for the development and integration of a pre-clerkship procedural curriculum.
Based on the responses from physician-educators, the following procedural skills were deemed 10 most important for medical students: IV access, airway management, local anesthesia/field block, casting, spontaneous vaginal delivery, testing for STIs, phlebotomy, suturing of lacerations, nasogastric tube insertion, and venipuncture. Our data from Canadian physician-educators is congruent with the AFMC working group’s list of procedural skills, as 9/10 of our identified top 10 skills are largely accounted for on their list, with only, “Testing for STIs” not being identified by the AFMC working group. While the AFMC list was curated through semi-regular meetings of medical experts in procedural education, this survey aimed to gather perspectives from a larger pool of physicians from different specialties and regions, thus lending additional support to the AFMC list of procedural skills. The consistency between these sources, using two different methods to identify essential skills, gives us confidence that the skills delineated by both groups are the essential procedural skills for graduating medical students.

While trainee support of procedural skills education has been previously documented, these studies have not investigated the perceptions of other stakeholders, such as physician-educators. To address this item, the last section of our survey focused on assessing the perceptions of physician-educators across Canada regarding procedural skills education in UGME. Overall, physician-educators were in support of the development of a pre-clerkship procedural skills curriculum. The benefits of a pre-clerkship procedural curriculum are supported by the literature, and the results of this survey suggest the specific skills that should be emphasized and that the value of such a curriculum is recognized by physician-educators across Canada.

Survey respondent demographics pose a number of limitations on the interpretation of survey results. Importantly, the specialty with the highest response rate (29%) was the department of anesthesia. This is likely attributed to the fact that the primary investigator of the project was a staff anesthesiologist.

Another limitation to this survey is the limited response rate from physician-educators at the pre-clerkship level of UGME, with a majority of respondents (67%) representing the clerkship level of education. Given the emphasis of procedural skill competency at the clerkship level, clerkship-level physician-educator may be more familiar with the teaching around procedural skills in UGME and may have thus been more willing to participate in the survey.

Another limitation is the lack of rural practitioners in the respondent pool. However, this should be mitigated by having surveyed a wide variety of specialties.

A final limitation to this survey is that more than 50% of responses reflected the opinions of two of the 17 medical schools in Canada. This may be largely due in part to recognition of the primary investigator at the two institutions. As the standards of graduating medical students are standardized across Canadian medical schools, the sample is representative despite greater responses from just two of the medical schools.

With the information gleaned from this survey, our goal is to develop a pre-clerkship procedural skills curriculum to be integrated within Canadian medical school curricula. The program will be centered around the 10 essentials skills identified from this survey. First, a pilot study will be carried out to assess the benefits to students, then the program will be expanded in later years to increase the number of skills taught and the number of participating students.

Conclusion

In a medical education landscape that is in full-transition to competency-based medical education, it is time to turn the attention of future competency education to medical students. In this transition, identifying the most crucial procedural skills is the first step in implementing a competency-based procedural skills training program for Canadian medical students. This survey has produced a robust list of procedural skills and illuminated physician-educator support for the development of a program, both of which will hopefully guide future curricula in Canada.

Acknowledgements: It is important to acknowledge the efforts of Dr. Francis LeBrun, University of Ottawa medical alum, for his efforts translating the entire survey into French. Without his efforts, this project
would have neglected to measure the opinions of a very important part of Canadian medical education

Conflicts of interest: The authors state that they have no conflicts of interest to declare at this time.

References
### Appendix A.

<table>
<thead>
<tr>
<th>Skill</th>
<th>Total Number of Respondents</th>
<th>Absolute Responses Ranking</th>
<th>Number of Specialties with Option</th>
<th>Number of Respondents with Option</th>
<th>Relative Value</th>
<th>Relative Responses Ranking</th>
<th>Overall Ranking</th>
</tr>
</thead>
</table>