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Major Contributions

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

Frank Battaglia,^{1,2} Céline Sayed,¹ Maria Merlano,¹ Meghan McConnell,^{3,5} Christopher Ramnanan,⁴ Jennifer Rowe,¹ Hao Wang,¹ Vishesh Patel,¹ Nikhil Rastogi⁵

¹Faculty of Medicine, University of Ottawa, Ontario, Canada

²Division of Emergency Medicine, McMaster University, Ontario, Canada

³Department of Innovation in Medical Education, University of Ottawa, Ontario, Canada

⁴Division of Clinical and Functional Anatomy, Department of Innovation in Medical Education, University of Ottawa, Ontario, Canada

⁵Department of Anesthesiology and Pain Medicine, The Ottawa Hospital, Ontario, Canada

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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 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 voted for a skill over the total number of physicians who were given the skill to rank. 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

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

Discussion

The landscape of student experience of procedural skills training throughout medical school is changing.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.^{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.^{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 list⁴, 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,³ 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,⁵ 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 essential 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.

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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.

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Appendix A.

Skill	Total Number of Responses	Absolute Responses Ranking	Number of Specialties with Option	Number of Respondents with Option	Relative Value	Relative Responses Ranking	Overall Ranking
IV access	28	1	6	35	0.800	1	1
Airway management	12	9	3	18	0.667	4	2
Local anesthesia/field block	23	2	6	38	0.605	12	3
Casting	9	13	3	12	0.750	2	4
Spontaneous vaginal delivery	10	11	4	15	0.667	5	5
Testing for STIs	9	14	3	13	0.692	3	6
Phlebotomy	13	7	4	20	0.650	10	7
Suturing of Lacerations	13	8	5	21	0.619	11	8
Nasogastric tube placement	20	3	6	38	0.526	18	9
Venipuncture	8	16	1	12	0.667	6	10
Abscess incision and drainage	14	5	5	26	0.538	17	11
Pap smear	12	10	4	21	0.571	15	12
Urethral catheterization	20	4	7	41	0.488	24	13
Closed Reduction of Simple Fractures	9	15	2	16	0.563	16	14
Topical anesthesia	14	6	4	36	0.389	25	15
Splinting	7	19	3	12	0.583	14	16
Cryosurgery	6	21	1	10	0.600	13	17
Arterial blood gas sampling	7	20	3	14	0.500	19	18
Anterior Nasal Packing for Epistaxis	6	22	2	12	0.500	20	19
Foreign body removal from ear/nose	8	17	3	24	0.333	26	20
Assessment of ruptured membranes/ferning	2	37	1	3	0.667	7	21
Remove warts fingernails toenail foreign body	5	24	1	10	0.500	21	22
Non-stress test, contraction stress test	2	38	1	3	0.667	8	23
Non-surgical and surgical management of severe post-partum hemorrhage	2	39	1	3	0.667	9	24
Abdominal paracentesis	4	27	1	8	0.500	22	25
Endotracheal intubation	10	12	6	38	0.263	38	26
Oxygen administration devices	3	29	1	6	0.500	23	27
Thoracentesis	8	18	4	26	0.308	34	28
Arthrocentesis	6	23	4	20	0.300	36	29
Endometrial biopsy	4	28	2	13	0.308	35	30
Lumbar puncture	5	25	4	20	0.250	39	31
Excisional biopsies	2	40	2	6	0.333	27	32
Anoscopy	3	30	1	10	0.300	37	33
Wounds major - debride/suture	2	41	1	6	0.333	28	34
Ultrasound Use for Intravascular Access	5	26	5	29	0.172	43	35
Basic prenatal ultrasound	3	31	2	13	0.231	41	36
Punch biopsies	3	32	2	16	0.188	42	37
Fetal scalp ph determination	1	48	1	3	0.333	29	38
Posterior Nasal Packing for Epistaxis	3	33	3	18	0.167	44	39
Low transverse caesarean section	1	49	1	3	0.333	30	40
Vacuum extraction	1	50	1	3	0.333	31	41
Defibrillation/cardioversion	2	42	3	8	0.250	40	42
Vulvar and vaginal biopsy	1	51	1	3	0.333	32	43
Wet mount of vaginal discharge	1	52	1	3	0.333	33	44
Peripheral nerve block	3	34	3	28	0.107	51	45
Monitoring a patient under general anesthetic	2	43	1	12	0.167	45	46
Video laryngoscopy	2	44	1	12	0.167	46	47
Arterial line placement	3	35	6	39	0.077	57	48
Central venous catheter placement	3	36	7	41	0.073	58	49
Paracentesis	2	45	3	18	0.111	50	50
Fine needle aspiration	2	46	3	19	0.105	52	51
Cardiac pacing	1	53	2	8	0.125	47	52
Focused Abdominal Sonography for Trauma (FAST)	1	54	2	8	0.125	48	53
Pediatric vascular access	2	47	4	23	0.087	56	54
Transvenous pacemaker insertion	1	55	3	8	0.125	49	55
Newborn circumcision	1	56	1	10	0.100	53	56
Vasectomy	1	57	1	10	0.100	54	57
Venous cutdown	1	58	1	10	0.100	55	58
Chest tube placement and management	1	59	2	14	0.071	59	59
Flexible sigmoidoscopy or colonoscopy	1	60	2	16	0.063	60	60
Compartment pressures (abdomen, extremity) - measurement	1	61	2	18	0.056	61	61
Cardiocentesis	0	62	2	8	0.000	62	62
Cervical biopsy and polypectomy	0	63	1	3	0.000	63	63
Dental blocks	0	64	1	2	0.000	64	64
Electrocautery	0	65	1	3	0.000	65	65
Endotracheal tube exchange	0	66	1	12	0.000	66	66
Epidurals	0	67	2	15	0.000	67	67
Forceps delivery	0	68	1	3	0.000	68	68
Fracture/dislocation reduction	0	69	2	2	0.000	69	69
Lymph node biopsy	0	70	1	6	0.000	70	70
Pulmonary artery catheter placement	0	71	2	15	0.000	71	71
Skin grafting	0	72	1	6	0.000	72	72
Temporary closure of the abdomen	0	73	1	6	0.000	73	73
Tracheostomy	0	74	3	8	0.000	74	74