POSITION PAPER

**Integration of Point of Care Ultrasound Into Formal Curricula Across Ontario Medical Schools**

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**INTRODUCTION**

Many professions are expected to change their practices in response to advances in theory and technology. This is no less true in medicine, as clinical practice often requires continuous adaptation, leading to paradigm shifts that improve care for patients. An example of one such shift was the invention of the stethoscope by Dr. Renée Laennec in 1819.1 With this new tool, physicians could non-invasively examine their patients with previously unattainable precision and clarity, further revealing previously imperceptible sounds.1 We believe that we are in a similar state of transition now with point of care ultrasound (POCUS).

Beginning in 1941 with its adoption into medicine, ultrasound has gained a wide variety of clinical and diagnostic uses.2 One of its most recent iterations is POCUS, a targeted ultrasound examination that is performed by a clinician at the bedside.3 It is often used in conjunction with a traditional physical examination to gain a more complete picture during a clinical assessment.4 In the face of diagnostic ambiguity, POCUS allows the practitioner to directly visualize the body’s underlying structures to help clarify the presence of pathology.4

The effectiveness of POCUS is well-described in the literature. Overall, it is associated with improved patient safety, reduced healthcare costs, and decreased need for invasive imagery.5,6 We have highlighted two examples of procedures that have been borne out of and aided by POCUS. First, the Focused Assessment with Sonography in Trauma (FAST) exam allows physicians to non-invasively evaluate patients for internal trauma and has reduced the need for more complex imaging.5 This protocol, similar to other POCUS applications, has been shown to be cost-effective and has reduced time to diagnosis and definitive care.5,6,7 Second, POCUS has enhanced the safety profile of central venous catheter placement.6,7 Ultrasound-guided cannulation has reduced complication rates and severity, leading to an overall increase in success rates across practitioners of varying skill levels.8

Additionally, there is support for POCUS within both professional medical societies and among medical students.8 In particular, the Society of Echocardiography and the Society of Cardiovascular Anesthesiologists have endorsed the use of real-time echography for the placement of central lines in the internal jugular vein.8 Due to these benefits and others, many specialties within medicine have adopted POCUS in some form or another into daily practice.3 Furthermore, there is strong evidence of willingness to learn among medical students.9,10,11

POCUS can serve as a means to effectively respond to the demands of the evolving landscape of clinical medicine, as the modality has broad applications and its use spans nearly every medical specialty today.3 For many physicians-in-training, however, ultrasound exposure remains relatively modest and tutelage often does not begin until clerkship or even residency.9,12 One 2014 survey of Canadian medical schools found that only half of UGME programs had any sort of POCUS teaching.9 Many institutions with ultrasound programs have emphasized the importance of frequent learning that begins early in the careers of medical students.10,13As a result of medical students’ minimal exposure to ultrasound, an appreciable gap has manifested in medical education.10

Schools that have integrated POCUS have received overwhelmingly positive feedback from students9,10,11 Nevertheless, despite students’ enthusiasm in embracing POCUS, there are barriers to both the development and implementation of a successful program exist, such as a lack of qualified instructors, funding, and space in an already condensed curriculum.14,15 Even with these challenges, numerous studies have documented increased knowledge of anatomy and increased physical exam competence when POCUS  is integrated into the UGME curriculum.15 For example, the University of South Carolina and McGill University have long standing formal POCUS curricula. Both have demonstrated successful acquisition and long-term retention of basic ultrasound skills upon completion of their respective programs.10,13

The aim of this position paper is to provide actionable recommendations to start the discussion around the integration of POCUS into undergraduate medical education, in order to better prepare medical students for the current clinical environment.

**PRINCIPLES**

The Ontario Medical Students Association makes its recommendations for the adoption of point-of-care ultrasound (POCUS) education in medical school using the following guiding principles:

1. Ontario medical students should have access to high-quality, evidence-based education that reflects the realities of clinical practice
2. Ontario medical students should have an input in the development and delivery of their education
3. Medical education should maximize patient safety and emphasize technologies which are harm reducing
4. Ontario medical education should mobilize existing resources and teach students to use modalities that are cost-saving to the healthcare system

**RECOMMENDATIONS**

The Ontario Medical Students Association recommends the following:

1. **That early and consistent POCUS instruction be included in undergraduate medical education**

Currently, POCUS integration into formal learning across Canadian medical schools remains low. A 2014 survey of Canadian medical schools found that only 50% of schools had adopted any form of focused ultrasound education.9  Nevertheless, the majority of surveyed vice-deans believed that bedside ultrasound education should be integrated into the medical school curriculum.9 Similarly, student feedback on integration of POCUS into UGME has been extremely positive, with students desiring a greater component of their medical education to have a focused ultrasound component.9,10,11 This clearly demonstrates that there is a faculty and student demand for POCUS to be included in the UGME curriculum.

To ensure adequate preparation for clinical practice, this desire must be met with effective implementation into an established curriculum that benefits learners. The mandate of UGME is to develop generalists who can thrive in any specialty they choose to pursue.16 Thus, the integration of POCUS into Ontario medical schools must be congruent with the notion that skills be widely applicable across various clinical milieus. Currently, training in ultrasound is most well established at the post-graduate medical level and this is best highlighted in emergency medicine.17 Since 2018, POCUS has been formally incorporated into 100% of Fellow of the Royal College of Physicians of Canada - Emergency Medicine (FRCPC-EM)  programs and 88% of Certificate of the College of Family Physicians - Emergency Medicine (CCFP-EM) programs.18  Although POCUS is often associated solely with emergency medicine, this assumption does not accurately reflect the diversity of POCUS usage in other clinical settings. In particular, POCUS use is endorsed by multiple Canadian specialist societies, such as the Canadian Cardiovascular Society and the Society of Obstetricians and Gynaecologists of Canada.19,20 Similarly, ultrasound proficiency is reflected in radiology’s curriculum, as well as in the aforementioned residency programs in Canada.21,22,23

Furthermore, POCUS has an important role in generalist practice.24 Given that the highest proportion of medical matriculants chose to pursue a residency in family medicine, POCUS can serve as a valuable tool for our largest physician workforce.25 In a recent survey of 14 Canadian family medicine residency directors, participants reported that while only 20% of their programs had formal POCUS training included in their curricula, 93% of directors believed that POCUS training should be integrated into their residency programs’.24 Whether in specialist or generalist practice, medical students will need to learn POCUS to succeed clinically.

Given the convincing literature on its demand, impact and utility in clinical practice, we ask that the OMSA formally endorse the addition of POCUS into UGME education in Ontario. Specifically, we believe that this endorsement can facilitate the eventual integration of POCUS into Ontario medical schools.

1. **That a forum be provided, via a committee or working group, to support the implementation of POCUS in undergraduate medical education**

         To properly promote POCUS teaching across Ontario, a provincial consensus must be reached. Currently, the promotion of POCUS in the undergraduate medical curriculum by Ontario medical schools remains disjointed. Although each Ontario medical school has their own POCUS interest group and/or a designated group that promotes POCUS as part of its mandate, there is currently no united provincial dialogue evaluating the needs of medical students, faculty members and administrators alike. Without a coordinated effort to promote POCUS and advocate for its inclusion in the UGME curriculum, the modality is unlikely to gain traction in medical school education.

We envision that the overarching objective of this provincial working group will involve POCUS promotion and instruction in order to unify the various stakeholders in Ontario. In particular, two actionable goals of this group can be to promote POCUS teaching at the UGME level and facilitate sharing of both resources and expertise on POCUS education. Similar to other curricular development groups, this committee would ideally be composed of both medical students who are passionate about the subject matter and curriculum development, as well as a professionally diverse group of POCUS-using faculty members.

Students with an active interest in the use and/or teaching of POCUS will likely more readily identify the challenges and successes of its promotion and instruction at the UGME level. Furthermore, involving students provides a voice for learners who can tailor their learning experience to more adequately fit their needs.26 In addition, recruiting physicians from different professional backgrounds will ensure that the development of POCUS instruction is relevant, standardized, and clinically applicable across all medical specialties. This method was used by medical educators in the United States. Specifically, the American specialists from the Society of Radiologists in Ultrasound (SRU) and the Alliance of Medical School Educators in Radiology (AMSER), which both developed guidelines for the creation of a national POCUS curriculum.27 Their working group emphasized the need for multidisciplinary involvement, as much of the applications of POCUS exist outside the purview of a single medical specialty.27 Thus, multi-specialty input is required to ensure that a curriculum is generalizable to the medical student context.27

This working group would directly collaborate with the OMSA education committee members. Ideally, the committee would discuss key elements of POCUS integration and education, and follow up this discussion with a series of recommendations to help promote POCUS and its integration in UGME. By establishing this forum, the OMSA will give an opportunity to medical students across all Ontario medical schools to unite their advocacy efforts and better their pedagogical methods as it pertains to POCUS teaching in UGME.

1. **That the aforementioned provincial committee evaluate the current trends in POCUS education, integration and instruction**

Planning for the integration of POCUS into the UGME curriculum in Ontario medical schools can be a daunting task without proper direction. Thankfully, the integration of POCUS into UGME is not a novel concept, and a substantial amount of work has been done detailing the successes and challenges of this process. Thus, the proposed committee could integrate existing resources, and their own perspectives, as they pertain to the key concepts, integration and instruction strategies regarding POCUS education in UGME.

*3.1 Outline common learning objectives for Ontario medical students as it pertains to POCUS*

Currently, efforts by Canadian content experts have already started with respect to laying the groundwork for a POCUS UGME curriculum. Specifically, Ma and colleagues report on a consensus POCUS teaching experts from 13 out of the 15 Canadian medical schools to develop an 85 item list of teaching objectives for a potential Canadian POCUS curricula in UGME.28 These objectives highlight not only the basic practical skills and theoretical knowledge required for POCUS usage, but also showcase the wide variety of clinical environments in which POCUS can be used.28

The proposed committee could use resources such as these to identify the key elements that undergraduate medical students need in order to learn POCUS. These identified foundational concepts can serve as the groundwork for which individual schools, or a provincial entity, can develop a POCUS curriculum.

*3.2 Identify ways to integrate POCUS into UGME*

Many methods of POCUS integration have been proposed and have been variably successful as a function of a medical program’s specific needs.12, 27, 29, 30 One promising strategy, however, involves mirroring the progression of the general UGME curriculum. Specifically, this model would involve starting with foundational knowledge of the modality in pre-clerkship and progressing this training with a clinical focus during clerkship.27,29,30  In this two-phased approach, the preclerkship phase, aims to familiarize students with ultrasonography concepts to better understand anatomy, physiology, and pathology.27, with the clerkship phase aiming to teach students how to use POCUS effectively as an extension of their physical examination.27 Therefore, we suggest that the committee discuss how to best integrate POCUS into Ontario UGME, given the context, barriers and experiences specific to each program.

*3.3 Monitor innovative strategies to deliver POCUS education*

Several programs have evaluated various means of delivering an ultrasound curriculum. Given the technological aspects of POCUS, the modality lends itself well to self-directed learning using online resources and simulators.31 Some programs have begun to capitalize on this notion and have started to deliver their ultrasound content via online portals to maximize scanning time for students and minimize the need for continuous faculty involvement.31 Furthermore, medical schools can look to instructors who are not practicing physicians to provide teaching. For example, many schools with POCUS programs utilize medical students, who have a passion for POCUS and routinely use it in clerkship or as leaders of bedside ultrasound interest groups, to teach other students.32,33,34 One randomised controlled trial found that student mentors could teach ultrasound concepts at a level comparable to faculty members.35

Based on this, we suggest that this committee evaluate existing delivery methods, weighing them considering their own expertise and needs. In particular, committee discussions can touch upon the key concepts of POCUS educational content, integration and delivery methods. Through these meetings, the committee could then provide actionable, evidenced-based recommendations that could further promote the adoption of point-of-care ultrasound in Ontario medical schools, which will undoubtedly be instrumental in shaping the clinicians of tomorrow.

**Conclusion**

POCUS is rapidly becoming an important component of clinical practice. We believe that formal POCUS training should be integrated into undergraduate medical school curricula across Ontario. To achieve this goal, we have outlined the following recommendations: that OMSA endorse POCUS instruction at the UGME level; that a provincial working group be developed in conjunction with the Education Committee of the OMSA, to foster discourse about POCUS’ inclusion; and that this committee evaluate current trends in POCUS education and use the result of this evaluation to make actionable recommendations to help lay the groundwork for the eventual adoption of POCUS into UGME. Across institutions, point-of-care ultrasound has benefitted students, clinicians and patients. These actions, supported by the OMSA, will facilitate our movement towards a future where medical students are more adequately prepared for their clinical practice, through the inclusion of POCUS in their education.

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