



Editor's key points

► Point-of-care ultrasound (POCUS) is an important clinical tool and an adjunct to the physical examination. It has been adopted across multiple medical specialties and is being incorporated into several medical school curricula across Canada. This study surveyed program directors of Canadian family medicine residency programs to provide a snapshot of POCUS training in Canada.

► Of the 14 participating program directors who described the role of POCUS in their residency programs, 21% of them indicated that their programs had an established ultrasound program as part of their curriculum, 7% were in the process of establishing an ultrasound training program, 14% offered electives in ultrasound, and 29% were considering adding ultrasound to their curriculum. Half of the programs that include POCUS teaching do so during either a family medicine or an emergency medicine rotation.

► At the current time, there appears to be no consistent manner in which ultrasound use is taught in Canada. Instructional formats for ultrasound training included shadowing clinicians or technicians who perform ultrasound, using a hands-on approach, and using audiovisual instructional material. Contexts and format of training, the backgrounds of instructors, and the pedagogy of teaching were all inconsistent across programs.

Canadian national survey of point-of-care ultrasound training in family medicine residency programs

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Abstract

Objective To assess the current state of point-of-care ultrasound (POCUS) training in Canadian family medicine residency programs.

Design Cross-sectional survey to evaluate POCUS education in accredited Canadian family medicine residency programs; only 1 completed survey was accepted per residency program.

Setting Seventeen accredited Canadian family medicine residency programs.

Participants Fourteen directors of family medicine programs across Canada.

Main outcome measures Opinions of program directors in family medicine education on the relevance of POCUS in family medicine, and the role of POCUS training in family medicine residency programs.

Results The Web-based, anonymous survey, which was completed during the months of March and April 2016, achieved a response rate of 82% (14 out of 17 program directors). About one-fifth (21%) of program directors reported having an established ultrasound curriculum. Almost all directors (93%) believed that POCUS teaching should be integrated into family medicine residency curricula. Barriers to establishing training included the following: lack of adequate equipment (57%), lack of instructors (57%), lack of available time in the curriculum (57%), and lack of funding available to support training (71%). Seventy-one percent of respondents believed that POCUS could be used in outpatient family medicine clinics to alter clinical decision making. Some potential benefits associated with POCUS in primary care include more rapid diagnosis, improved patient outcomes, and potential to reduce health care costs.

Conclusion Although only a few Canadian family medicine residency program directors reported actually having an established ultrasound curriculum, most of them believed that POCUS training should be offered to family medicine residents and that its use could positively affect primary care. A growing number of family medicine residency programs are considering incorporating ultrasound training into their curricula, but resource availability remains a considerable barrier to implementation.



Une enquête nationale sur l'enseignement de l'échographie au chevet du patient dans les programmes de résidence en médecine familiale au Canada

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Résumé

Objectif Déterminer l'état actuel de l'enseignement de l'échographie au chevet du patient (ECP) dans les programmes canadiens de résidence en médecine familiale.

Type d'étude Une enquête transversale pour évaluer l'enseignement de l'ECP dans les programmes canadiens accrédités de résidence en médecine familiale; on acceptait un seul questionnaire complété par programme de résidence.

Contexte Dix-sept programmes canadiens accrédités de résidence en médecine familiale.

Participants Quatorze directeurs de programmes de résidence en médecine familiale au Canada.

Principaux paramètres à l'étude L'opinion des directeurs de programmes en médecine familiale sur l'importance de l'ECP et la place d'une formation en ECP dans ces programmes.

Résultats Cette enquête anonyme a été effectuée en ligne, entre mars et avril 2016. Au total, 14 directeurs de programme sur 17 ont complété l'enquête (taux de réponse 82 %). Environ 21 % des directeurs ont déclaré avoir déjà instauré une formation en échographie. Presque tous (93 %) estimaient que ce type de formation devrait faire partie du curriculum de résidence en médecine familiale. Parmi les obstacles à l'instauration d'un tel cours, 57 % d'entre eux ont mentionné le manque d'équipement, 57 %, le manque de formateurs et 57 %, le manque de temps dans le curriculum, et 71 % ont mentionné le manque d'argent disponible pour donner cette formation. Enfin, 10 des répondants croyaient que l'ECP pouvait être utilisée dans les cliniques extrahospitalières de médecine familiale pour favoriser la prise de décision. Parmi les avantages potentiels de l'ECP dans un contexte de soins primaires, mentionnons un diagnostic plus rapide, de meilleures issues pour le patient et une réduction éventuelle des coûts de santé.

Conclusion Malgré le fait que très peu de directeurs de programme de résidence en médecine familiale au Canada déclarent avoir déjà instauré un cours sur l'échographie dans leur programme, la plupart estiment qu'une formation en ECP devrait être offerte à tous les résidents en médecine familiale et qu'une telle initiative permettrait d'améliorer les soins primaires. De plus en plus de programmes de résidence en médecine familiale envisagent d'ajouter une formation en ECP dans leur curriculum, mais les ressources disponibles restreintes demeurent un obstacle à l'instauration d'un tel cours.

Points de repère du rédacteur

► L'échographie au chevet du patient (ECP) est une technique clinique importante et un complément de l'examen physique. Elle a été adoptée par plusieurs spécialités et fait maintenant partie des curricula de plusieurs facultés de médecine canadiennes. Dans cette étude, on a mené une enquête auprès de directeurs de programmes de résidence en médecine familiale au Canada afin d'obtenir un portrait de l'enseignement de l'ECP au Canada.

► Sur les 14 directeurs participants qui ont décrit la place de l'ECP dans leur programme de résidence, 21 % ont indiqué que leur curriculum contenait déjà une formation en échographie, 7 % étaient en voie d'établir une formation en échographie, 14 % offraient un cours optionnel sur ce sujet et 29 % songeaient à ajouter l'échographie à leur curriculum. La moitié des programmes qui donnaient une formation en ECP le faisaient à l'occasion de stages en médecine familiale ou en médecine d'urgence.

► À l'heure actuelle, il semble qu'il n'existe pas de façon uniforme d'enseigner l'échographie au Canada. Les méthodes de formation suggérées comprennent l'accompagnement d'un clinicien ou d'un technicien qui effectue des échographies, la mise en pratique de la technique et l'utilisation d'une méthode audiovisuelle. Les contextes, les modes d'enseignement, les connaissances des instructeurs et la pédagogie utilisée différaient tous selon les programmes.

Point-of-care ultrasound (POCUS) has been described as an essential clinical tool and an adjunct to the physical examination.¹⁻⁴ It has been adopted across multiple medical specialties, including emergency medicine, critical care, and anesthesia.⁵ Improved diagnostic accuracy and patient satisfaction with its use have been well documented.⁶⁻⁹ As such, it is beginning to be incorporated into multiple medical school curricula across Canada and other countries.¹⁰

There are numerous reasons to use ultrasound in an outpatient family medicine setting including screening for abdominal aortic aneurysm (AAA), confirming intrauterine pregnancy and fetal position, assessing left ventricular function, identifying cholelithiasis, and guiding joint injections. These have all been studied and are practical uses for many family physicians.¹¹

In the United States, the American Academy of Family Physicians recommended POCUS postgraduate curriculum guidelines for family medicine. These guidelines include limited obstetric ultrasound (to assess fetal position, amniotic fluid index, placental location, and cardiac activity) as a core skill for maternity care.^{12,13} The American Academy of Family Physicians also offers workshops on musculoskeletal ultrasound and ultrasound-guided joint injections.^{14,15} It comes as no surprise that there is a small but rapidly increasing number of family medicine residency programs in the United States now incorporating POCUS training.¹⁶

The objective of this study was to conduct a Canadian survey of program directors of family medicine programs to better understand the current landscape of POCUS training in family medicine residency programs, program directors' opinions about the relevance of POCUS to primary care, and the barriers to its implementation.

— Methods —

The survey was developed by family physicians who were family medicine residents at the time of survey development (T.M., D.B., S.P.), with guidance and assistance from ultrasound experts including family physicians certified in POCUS (K.S., J.H., H.H., P.R., P.S.). The survey was closely based on previous surveys of ultrasound use conducted by Steinmetz et al and Hall et al.^{10,16} These studies were each independently validated and so we did not repeat pilot-testing of our survey. Our survey mainly used a similar 5-point Likert scale (5=strongly agree, 1=strongly disagree), as well as modified "rank sum" type questions to allow for multiple answers to a given question. The questions were reviewed and altered multiple times in order to maximize their clarity and avoid any biased language.

The survey was sent to the program directors of each of Canada's 17 family medicine programs. An English version was sent to the directors of the 14 English programs and a French version was sent to the

3 Francophone program directors. The survey was sent out via e-mail in March of 2016, with reminder e-mail messages sent at 2 and 4 weeks after the original invitation. The original invitation and first reminder e-mail messages were sent directly by the family medicine program director of Memorial University of Newfoundland (MUN) in St John's (D.O.) using the e-mail addresses known to be used by the program directors across Canada. The second reminder was sent by a family medicine resident (T.M.). Researchers were blinded as to which program directors had responded, so reminder e-mail messages were sent to all 17 program directors at 2 and 4 weeks. The data were collected via online survey using FluidSurveys, and were compiled by a research assistant from MUN (P.M.). Ethics approval was obtained through MUN.

The survey consisted of 27 multiple-choice questions divided into 5 sections: timeline and duration of teaching (7 questions), instructional format (4 questions), administrator's opinions (5 questions), perceived relevance of POCUS to primary care (4 questions), and demographic characteristics of residency program directors (7 questions). The survey took approximately 15 minutes to complete.

— Results —

Fourteen program directors of the 17 family medicine residency programs across Canada responded to the survey, for an overall response rate of 82%. Of the 14 English program directors, 13 responded (response rate of 93%), and of the 3 French program directors, 1 responded (response rate of 33%).

Sections of the survey revealed the following results.

Timeline and duration of teaching. Most of the program directors (71%) indicated that their programs had an established ultrasound program as part of their curriculum (21%), were in the process of establishing an ultrasound training program (7%), offered electives in ultrasound (14%), or were considering adding ultrasound to their curriculum (29%) (**Table 1**). Implementation of POCUS has largely occurred since 2013, with only 2 program directors introducing POCUS to their programs before 2013 (however, only 7 respondents answered this question). Of the programs currently teaching or considering introducing POCUS, 2 offered training exclusively during first-year residency, 1 offered training exclusively in second-year residency, and 3 offered training in both years. Two program directors did not answer this question. All responding program directors reported less than 11 hours of POCUS training in both first-year and second-year residency. Half of the programs that include POCUS teaching do so during either a family medicine or an emergency medicine rotation.

Table 1. Current status of training: N = 14.

WHICH BEST DESCRIBES THE CURRENT STATE OF POINT OF CARE ULTRASOUND (PERFORMED AT THE BEDSIDE AS AN ADJUNCT TO THE PHYSICAL EXAMINATION) TRAINING IN YOUR PROGRAM?	RESPONDENTS WHO SELECTED THIS ANSWER, N (%)
We have an established core ultrasound curriculum or training	3 (21)
We are in the process of establishing a core ultrasound curriculum or training	1 (7)
We are considering the addition of ultrasound training to our program	4 (29)
We have elective opportunities in point-of-care ultrasound for our residents	2 (14)
We have no plans to establish ultrasound training	4 (29)
No response	0 (0.0)

Instructional format. Of the programs that offer ultrasound training, 60% use the format of review of ultrasound technique and imaging with didactic teaching. Another 60% also use shadowing or observing clinicians or technicians who perform ultrasound, and 50% use practical hands-on teaching with ultrasound equipment. Twenty percent use audiovisual instructional material. One program has residents take a formal POCUS course, which is paid for by their residency program. Most of the programs (80%) use hospital settings to teach POCUS, while 20% use classrooms, and 10% use a medical simulation centre.

Regarding resource availability, 70% of program directors report having reasonable access to ultrasound machines and have access to emergency department physicians who are trained to teach POCUS. Thirty percent reported that they have family physicians who are trained in POCUS, 30% have radiologists who are interested in teaching POCUS, and 10% have ultrasound technicians who are interested in teaching.

Administrators' opinions. Upon being presented with the statement "I am familiar with the literature on point-of-care ultrasound," 21% of program directors answered either "agree" or "strongly agree," 21% indicated they were "neutral," and the remainder (57%) answered either "disagree" or "strongly disagree." Despite most program directors not being entirely familiar with the literature on POCUS, 93% believed it should be included as part of the curriculum for both urban and rural family medicine training programs.

According to program directors, there are numerous barriers to implementing POCUS training in their residency programs, with 57% citing a lack of adequate equipment, lack of instructors, and lack of available time in the curriculum. Seventy-one percent reported a lack of funding available to support training; and 21% reported that clinic or hospital policies do not permit the use of ultrasound by primary care physicians in a meaningful way, and that time spent performing ultrasound might not be reimbursed.

Perceived relevance of POCUS to primary care. More than two-thirds of respondents (71%) believed that

POCUS could alter clinical decision making in outpatient family medicine settings. The perceived benefits of POCUS to primary care included more rapid diagnosis (86%), a useful adjunct to the physical examination (86%), improved patient outcomes (71%), the potential to reduce health care costs (71%), and improved patient satisfaction (43%). Most (64%) program directors believed that POCUS does not negatively affect patient safety, while 7% reported that it does, and 29% did not know.

From a list of 10 POCUS applications, program directors were asked if they believed that specific applications were likely to be used by future family physicians (Table 2). The program directors said that the most important indications for POCUS use were AAA screening (71%), procedural guidance (64%), and obstetric ultrasound for fetal position (64%). They also revealed that currently the only indication for which more than half of family medicine preceptors (estimated 57%) are using POCUS is for trans-abdominal scan for confirming intrauterine pregnancy. Other indications for current POCUS use by preceptors and residents include screening for AAA (estimated 36% of preceptors and 21% of residents), performing a FAST (focused assessment with sonography for trauma) examination (estimated 36% of preceptors and 21% of residents), and conducting an obstetric ultrasound for fetal position (estimated 36% of preceptors and 14% of residents).

— Discussion —

There is a clear trend toward incorporating POCUS into the curriculum of family medicine residency programs across Canada. More than two-thirds of programs (71%) either currently offer POCUS training (mandatory or elective) or are planning to introduce it to their programs. Of the residency programs that currently offer POCUS training, the ultrasound curriculum was implemented after 2013 for all but 2 programs. However, only 21% reported having an established core ultrasound curriculum. The movement toward POCUS training might be owing to the growing body of literature supporting that POCUS is accurate, that it can be mastered by clinicians, and that it has broad usefulness in family medicine.¹⁷⁻¹⁹ Another likely reason is that program directors identified a broad

Table 2. Perceptions on future use of POCUS

APPLICATION	RESPONDENTS WHO BELIEVE THE APPLICATION IS LIKELY TO BE USED BY FUTURE FAMILY PHYSICIANS, N (%)*	RESPONDENTS WHO BELIEVE THE APPLICATION IS NOT LIKELY TO BE USED BY FUTURE FAMILY PHYSICIANS, N (%)*
Screening for abdominal aortic aneurysm	10 (71)	0 (0)
Evaluation of the abdomen for free fluid or FAST examination	7 (50)	2 (14)
Procedural guidance (joint injection, abscess drainage, paracentesis)	9 (64)	1 (7)
Assessment for DVT in lower extremities	7 (50)	4 (29)
Right upper quadrant to assess for gallbladder stone or signs of cholecystitis	8 (57)	2 (14)
Limited echocardiogram to evaluate for contractility or pericardial effusion	8 (57)	3 (21)
Musculoskeletal ultrasound to assess for tendinopathy	7 (50)	2 (14)
Transabdominal scan for confirmation of intrauterine pregnancy	7 (50)	0 (0)
Obstetric ultrasound for fetal position	9 (64)	0 (0)
Kidney ultrasound to rule out hydronephrosis	8 (57)	1 (7)

DVT—deep vein thrombosis, FAST focused assessment with sonography for trauma, POCUS—point-of-care ultrasound.

*Not all respondents answered all questions.

number of applications they believe are likely to be used by future family doctors. A staggering 93% of program directors want POCUS to be part of the family medicine curriculum and most believe there is considerable interest among their residents to receive training in POCUS. Furthermore, more than two-thirds of directors believe that the benefits of POCUS include the alteration of clinical decision making, improved patient outcomes, and a reduction in health care costs.

Despite the widespread enthusiasm toward incorporating POCUS training into family medicine residency programs, numerous barriers to its implementation remain. These obstacles include time and resource availability, access to ultrasound equipment, qualified instructors, and funding. At the current time, there appears to be no consistent manner in which ultrasound use is taught in Canada. Contexts and format of training, the backgrounds of instructors, and the pedagogy of teaching are all inconsistent across programs. The College of Family Physicians of Canada currently has no guidelines on POCUS training, and POCUS is not included in the 99 priority topics and key features.

Limitations

One limitation of this study is a possibility of sample bias. Program directors with a personal interest or experience in POCUS might have been more likely to respond than those without. Also, we did not stratify our data by urban-based versus rural-based programs. Given the large variety of practice settings, certain trends unique to urban or rural sites might have been missed. Finally, we had only a single respondent to the French-language survey, for a response rate of 33%. If there are any differences in trends within the Francophone residency programs, they might not be adequately reflected in our data.

Conclusion

These results provide the first snapshot of the state of POCUS training in family medicine residency programs across Canada. There is currently no broadly accepted manner of teaching POCUS and numerous barriers to its implementation exist. Overall, there is an overwhelming interest in adding POCUS training to family medicine residency programs, and program directors believe that ultrasound use will play an important role in the future of family medicine.

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Contributors

Drs Micks, Braganza, and **Peng** were the main developers of the survey and writers of the manuscript. **Ms McCarthy** was instrumental in manuscript editing and data collection. **Drs Sue, Doran, Hall, Holman, O'Keefe, Rogers,** and **Steinmetz** all provided considerable guidance in the development of the survey and editing of the manuscript. **Dr O'Keefe** initially distributed the survey to her family medicine program director colleagues across Canada. **Dr Steinmetz** was the overall project lead.

Competing interests

Dr O'Keefe was involved with the survey development and distribution of the survey but was also a survey participant, as she is one of the 17 family medicine program directors across Canada. Her responses to the survey were kept anonymous along with all of the survey responses.

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