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Emergency medicine ultrasonography in rural communities

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Introduction: The Canadian Association of Emergency Physicians (CAEP) published a position statement in 2006 encouraging immediate access to emergency medicine ultrasonography (EMUS) 24 hours a day, 7 days a week. However, barriers to advanced imaging care still exist in many rural hospitals. Our study investigated the current availability of EMUS in rural communities and physicians' ability to use this technology.

Methods: A literature review and interviews with rural physicians were conducted in the summer of 2010 to design a questionnaire focusing on EMUS. The survey was then sent electronically or via regular mail in November 2010 to all Ontario physicians self-identified as "rural." Descriptive statistics and the Fisher exact test were used to analyze the data.

Results: A total of 207 rural physicians responded to the survey (response rate 28.6%). Of the respondents, 70.9% were male, median age was 49 years and median year of graduation was 1988. The respondents had been in practice for a median of 20 years and had been in their present community for a median of 15 years. More than two-thirds of physicians (69.5%) practised in communities with populations of less than 10 000. Nearly three-quarters (72.6%) worked in a rural emergency department (ED). Almost all (96.9%) reported having access to ultrasonography in the hospital. However, only 60.6% had access to ultrasonography in the ED. Less than half (44.4%) knew how to perform ultrasonography, with 77.3% citing lack of training. Of those using EMUS, 32.5% were using it at least once per shift. The most common reason to use EMUS was to rule out abdominal aortic aneurysm (58.3%). Most respondents (71.5%) agreed or strongly agreed that EMUS is a skill that all rural ED physicians should have.

Conclusion: Patients in many rural EDs do not have immediate access to EMUS, as advocated by CAEP. This gap in care needs to be addressed to ensure that all patients, no matter where they live, have access to this proven imaging modality.

Introduction : L'Association canadienne des médecins d'urgence (ACMU) a publié en 2006 un énoncé de position encourageant l'accès immédiat à l'échographie médicale d'urgence (EMU) 24 heures sur 24, 7 jours sur 7. Des obstacles à l'imagerie avancée persistent toutefois dans beaucoup d'hôpitaux ruraux. Notre étude a porté sur la disponibilité courante de services d'EMU dans les communautés rurales et sur la capacité des médecins d'utiliser cette technologie.

Méthodes : On a effectué, au cours de l'été 2010, une recherche documentaire et des entrevues auprès de médecins ruraux afin de concevoir un questionnaire portant sur les services d'EMU. Le questionnaire a été ensuite envoyé électroniquement ou par la poste, en novembre 2010, à tous les médecins de l'Ontario qui se sont décrits comme « ruraux ». On a utilisé la statistique descriptive et la méthode exacte de Fisher pour analyser les données.

Résultats : Au total, 207 médecins ruraux ont répondu au questionnaire (taux de réponse de 28,6 %). Parmi les répondants, 70,9 % étaient des femmes, l'âge médian s'établissait à 49 ans et l'année médiane de collation des grades, à 1988. Les répondants pratiquaient depuis une médiane de 20 ans et vivaient dans leur communauté actuelle depuis une médiane de 15 ans. Plus de deux tiers des médecins (69,5 %) pratiquaient

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dans des localités de moins de 10 000 habitants. Près des trois quarts (72,6 %) travaillaient à l'urgence d'un hôpital rural. Presque tous (96,9 %) ont déclaré avoir accès à des services d'échographie à l'hôpital. Seulement 60,6 % avaient toutefois accès à des services d'échographie à l'urgence même. Moins de la moitié (44,4 %) savaient pratiquer une échographie et 77,3 % ont parlé du manque de formation. Parmi ceux qui utilisaient des services d'EMU, 32,5 % les utilisaient au moins une fois par quart de travail. Les répondants ont eu recours aux services d'EMU le plus souvent pour exclure l'anévrisme de l'aorte abdominale (58,3 %). La plupart des répondants (71,5 %) étaient d'accord ou fortement d'accord sur le fait que l'EMU constitue une compétence que tous les médecins des urgences rurales devraient avoir.

Conclusion : Dans beaucoup d'hôpitaux ruraux, les patients reçus à l'urgence n'ont pas accès sur-le-champ aux services d'EMU, ainsi que le préconise l'ACMU. Il faut chercher à combler cette lacune des soins pour assurer que les patients, sans égard à l'endroit où ils habitent, ont accès à cette technique d'imagerie qui a fait ses preuves.

INTRODUCTION

Ultrasonography is a focused, goal-directed examination, which answers a binary (yes or no) question based on a specific clinical sign or symptom.[1–4] It is a safe, noninvasive and timely procedure, which requires no contrast media and no special patient preparation.[3] In practice, ultrasonography complements the physical examination by rapidly providing additional anatomic, functional and physiologic information.[1] Access to such information reduces risk by increasing diagnostic accuracy, diminishing the time to definitive therapy and minimizing complications that may arise from blind procedures.[1,5] A study conducted by Lyon and colleagues in 2005 examining the effects that emergency medicine ultrasonography (EMUS) had on decision-making in a rural emergency department (ED) determined that EMUS frequently clarified the clinical situation by reducing the potential number of differential diagnoses.[6] This clarification changed patient management in nearly three-quarters (74%) of cases.[6] Furthermore, in almost 10% of cases, EMUS actually suggested diagnoses not originally included in the differential.[6] Thus, EMUS improves health outcomes in acute care patients through the early identification of life-threatening conditions.[3,5] Indeed, it is the timeliness of this test that has made it invaluable to emergency medicine.

In Canada, EMUS is mainly used in 5 clinical situations: 1) identifying an abdominal aortic aneurysm (AAA), 2) identifying an intrauterine pregnancy, 3) assisting in central venous catheter placement, 4) identifying free fluid following trauma (focused assessment with sonography for trauma [FAST]), and 5) identifying a pericardial effusion.[5] In each of these 5 cases a rapid assessment is crucial, and having access to bedside EMUS makes this possible. Furthermore, EMUS provides an alternative to transferring these potentially unstable patients outside of the ED for diagnostic testing.[7] It is for these reasons that the Canadian Association of Emergency Physicians (CAEP) published a position statement in 2006 encouraging EDs to offer EMUS 24 hours a day, 7 days a week.[7] However, barriers to this advanced imaging care still exist in many rural hospitals.[6,7] The purpose of the present study was to determine the access to, use of and opinions about EMUS in rural communities in Ontario.

METHODS

A literature review[5–15] and interviews with rural physicians were conducted in the summer of 2010 to design a questionnaire focusing on EMUS. The survey was then pilot tested on 10 local physicians to acquire feedback on ease of use, and face and content validity. Their suggestions were used to modify the survey. The refined survey consisted of 7 demographic questions and 13 questions regarding EMUS availability and use. Questions were yes-or-no, multiple-choice or open-ended format. Contact information for all Ontario physicians self-identified as "rural" was obtained from the Ontario Medical Association (OMA). Depending on the information provided, the survey was sent either electronically, using SurveyMonkey, or via regular mail, in November 2010. Nonresponders were sent a reminder email 2 weeks later. As an incentive to complete the survey, respondents were entered into draws for an iPod nano and an iPod touch.

All statistical analyses were conducted using SAS Statistical Analysis Software Version 9.1.[16] Descriptive statistics and the Fisher exact test were used to analyze the data. Hypothesis tests were conducted

using a 2-tailed level of significance, with results declared significant at the 5% critical α level. The University of Western Ontario's Research Ethics Board reviewed and approved the study proposal.

RESULTS

Respondents

Of the 725 surveys sent out, 207 were returned completed, resulting in a response rate of 28.6%. Respondent characteristics are summarized in Table 1.

Survey responses

Table 2 outlines the responses to the survey. Of the respondents, 146 (72.6%) worked in a rural ED. Most of their hospitals (96.9%) had ultrasonography, but less than two-thirds of them had it in the ED. Furthermore, only 88 respondents (44.4%) knew how to perform ultrasonography.

Stratified survey responses

When physicians were stratified based on their years of experience (group 1: ≤ 10; group 2: 11–20; group 3: 21–30; group 4: 31–40; group 5: ≥ 41), physicians with 10 or fewer years of experience were most likely to know how to perform EMUS (54.8%) (Table 3). With increasing experience, the use of EMUS decreased, and the difference between these groups was significant (p = 0.003). In general, the most common reason for not using ultrasonography in practice was a lack of training (85 physicians [77.3%]). Respondents were asked to select all answers that applied. A lack of equipment was the most frequently cited "other" reason for not performing ultrasonography. Responses that were listed as "other" within the survey but fit under one of the provided categories were included under the appropriate categories.

The Emergency Department Echo (EDE) course was the most common EMUS training program completed by respondents (60 physicians [59.4%]) and the American Registry for Diagnostic Medical Sonography course was the most popular "other" program. Of the physicians who worked in an ED, most (32.5%) performed ultrasonography at least once per shift, and ruling out AAA was the most common reason for such usage (70 citings [58.3%]). Sixty-nine responses (57.5%) also described "other" uses for ultrasonography, of which draining abscesses and identifying gallstones were the most common.

Almost half of all respondents strongly agreed that EMUS is a skill that they should have (67 physicians [46.9%]), and another 46 respondents (32.2%) agreed with this statement. Similarly, the most respondents either strongly agreed (56 physicians [38.9%]) or agreed (47 physicians [32.6%]) that EMUS is a skill that all rural emergency physicians should have. The Ministry of Health and Long-Term Care was the most common source selected to provide funding for EMUS training (58 physicians [40.8%]). However, when it came to providing the hardware, more than half of respondents (95 physicians [66.0%]) believed that the hospital should purchase its own equipment.

Table 1. Characteristics of 207 respondents

Characteristic	No. (%) of respondents*
Sex	n = 203
Male	144 (70.9)
Female	59 (29.1)
Age	n = 205
Median (range), yr	49 (27–80)
No. of years in practice	n = 206
Median (range)	20 (< 1–49)
No. of years practising in present community	n = 206
Median (range)	15 (< 1–47)
Year of graduation	n = 206
Median (range)	1988 (1955–2009)
Population of present community	n = 206
< 1000	10 (4.9)
1000–4999	75 (36.4)
5000–9999	58 (28.2)
≥ 10 000	63 (30.6)
Distance to nearest referral centre, km	n = 206
< 50	68 (33.0)
50–99	65 (31.6)
100–199	39 (18.9)
≥ 200	34 (16.5)

*Unless otherwise indicated.

DISCUSSION

Six years have passed since CAEP advocated for around-the-clock availability of EMUS in all EDs across Canada.[7] However, this has yet to become a reality in Ontario. Although almost all hospitals (96.9%) represented in our survey had access to ultrasonography, less than two-thirds (60.6%) had access within their ED. Furthermore, less than half of all respondents (44.4%) knew how to use this technology. Lack of training was identified as the greatest barrier to using ultrasonography in practice,

with 77.3% of respondents reporting it as such. In an attempt to remove this barrier, CAEP recommended in their 2006 position statement that EMUS be incorporated into emergency medicine residency programs of the Royal College of Physicians and Surgeons of Canada and The College of Family Physicians of Canada.[7] In 2009, Woo and colleagues surveyed the directors of the 17 CCFP(EM) (Certificant of the College of Family Physicians [Emergency Medicine]) residency programs across Canada and found that only 71.4% of programs offered introductory EMUS courses.[5] Moreover, only 60.0% of programs made these courses mandatory, and only 62.5% of the program directors believed that their residents acquired enough experience through these courses to perform EMUS independently and make the subsequent medical decisions necessary in practice.[5] Thus, even the training that is currently being offered in residency may not be sufficient to produce competent EMUS-trained physicians.

Table 2. Survey responses of 207 respondents

Question	No. (%) of respondents
Work in a rural ED	*n* = 201
Yes	146 (72.6)
No	55 (27.4)
No. of ED shifts per month	*n* = 145
< 40	33 (22.8)
41–80	53 (36.6)
81–120	46 (31.7)
121–160	9 (6.2)
> 160	4 (2.8)
ED volume, patients per year	*n* = 176
< 5000	12 (6.8)
5000–9999	26 (14.8)
10 000–14 999	47 (26.7)
15 000–19 999	33 (18.8)
≥ 20 000	58 (33.0)
Ultrasonography in hospital	*n* = 192
Yes	186 (96.9)
No	6 (3.1)
Ultrasonography in ED	*n* = 193
Yes	117 (60.6)
No	76 (39.4)
Know how to perform ultrasonography	*n* = 198
Yes	88 (44.4)
No	110 (55.6)
Don't perform ultrasonography because of …*	*n* = 110
Lack of training	85 (77.3)
Difficulty maintaining skills	48 (43.6)
Lack of need	24 (21.8)
Cost	13 (11.8)
Other	21 (19.1)
Training in ultrasonography†	*n* = 101
CAEP	15 (14.9)
EDE	60 (59.4)
Other	20 (19.8)
None	6 (5.9)
Perform ultrasonography …‡	*n* = 120
< once per week	37 (30.8)
Once per shift	25 (20.8)
> once per shift	14 (11.7)
NA	44 (36.7)
Perform ultrasonography for …‡	*n* = 120
Ruling out AAA	70 (58.3)
Ruling in intrauterine pregnancy	64 (53.3)
FAST	51 (42.5)
Ruling out pericardial effusion	49 (40.8)
Line placement	33 (27.5)
NA	38 (31.7)
Other	69 (57.5)
EMUS is a skill he or she should have‡	*n* = 143
Strongly agree	67 (46.9)
Agree	46 (32.2)
Neither agree nor disagree	18 (12.6)
Disagree	4 (2.8)
Strongly disagree	8 (5.6)
EMUS is a skill all rural ED physicians should have‡	*n* = 144
Strongly agree	56 (38.9)
Agree	47 (32.6)
Neither agree nor disagree	25 (17.4)
Disagree	5 (3.5)
Strongly disagree	11 (7.6)
Should pay for EMUS training‡	*n* = 142
The Ministry of Health and Long-Term Care	58 (40.8)
The physician	32 (22.5)
The hospital	31 (21.8)
Ontario Medical Association	6 (4.2)
The community	3 (2.1)
Other	12 (8.5)
Should pay for the hardware‡	*n* = 144
The hospital	95 (66.0)
The Ministry of Health and Long-Term Care	34 (23.6)
The community	11 (7.6)
The physician	0 (0.0)
Ontario Medical Association	0 (0.0)
Other	4 (2.8)

AAA = abdominal aortic aneurysm; CAEP = Canadian Association of Emergency Physicians; ED = emergency department; EDE = Emergency Department Echo; EMUS = emergency medicine ultrasonography; FAST = focused assessment with sonography for trauma; NA = not applicable.
*Respondents were encouraged to select all applicable responses.
†Some respondents completed multiple training programs.
‡Responses from physicians who worked in an ED.

Those who have not acquired adequate EMUS training in residency must rely on additional training courses, such as EDE or the CAEP Emergency Department Targeted Ultrasound Roadshow. However, these courses are time-consuming, somewhat costly and require organization. The EDE course is offered to groups of 8–12 physicians, who arrange for a course instructor to provide hands-on training for a single day at a local facility.[17] The course is organized 2 to 3 months in advance and requires at least 1 month of preparation.[17] The CAEP course is similar, except that it is offered in a specific location and physicians sign up individually.[18] Currently, these courses cost more than $1000 per person and the physician is responsible for covering the expense.[17,18]

Table 3. Survey responses of 207 rural physicians, stratified by years of experience

Question; group (years of experience)	No. (%) of respondents	*p* value*
Know how to perform ultrasonography	*n* = 197	0.003
Group 1 (≤ 10)	23/42 (54.8)	
Group 2 (11–20)	31/60 (51.7)	
Group 3 (21–30)	26/55 (47.3)	
Group 4 (31–40)	5/30 (16.7)	
Group 5 (≥ 41)	2/10 (20.0)	
Agree or strongly agree that EMUS is a skill he or she should have†	*n* = 142	0.026
Group 1 (≤ 10)	32/34 (94.1)	
Group 2 (11–20)	34/49 (69.4)	
Group 3 (21–30)	32/39 (82.1)	
Group 4 (31–40)	10/15 (66.7)	
Group 5 (≥ 41)	5/5 (100.0)	
Disagree or strongly disagree that EMUS is a skill he or she should have†	*n* = 142	0.41
Group 1 (≤ 10)	1/34 (2.9)	
Group 2 (11–20)	6/49 (12.2)	
Group 3 (21–30)	2/39 (5.1)	
Group 4 (31–40)	2/15 (13.3)	
Group 5 (≥ 41)	0/5 (0.0)	
Agree or strongly agree that EMUS is a skill all rural ED physicians should have†	*n* = 142	0.13
Group 1 (≤ 10)	28/33 (84.8)	
Group 2 (11–20)	31/50 (62.0)	
Group 3 (21–30)	30/39 (76.9)	
Group 4 (31–40)	9/15 (60.0)	
Group 5 (≥ 41)	4/5 (80.0)	
Disagree or strongly disagree that EMUS is a skill all rural ED physicians should have†	*n* = 142	0.78
Group 1 (≤ 10)	3/33 (9.1)	
Group 2 (11–20)	5/50 (10.0)	
Group 3 (21–30)	4/39 (10.3)	
Group 4 (31–40)	3/15 (20.0)	
Group 5 (≥ 41)	0/5 (0.0)	

ED = emergency department; EMUS = emergency medicine ultrasonography.
*Derived from Fisher exact test.
†Responses from physicians who worked in an ED.

This may contribute to the cost barrier that was identified by 11.8% of respondents, especially when most did not believe they should be responsible for covering this fee. More than two-thirds (68.9%) of emergency physicians surveyed believed that the funding for EMUS training should come from another source, such as the Ministry of Health and Long-Term Care, the hospitals, the OMA or the community. However, funding is available to Ontario rural physicians to cover EMUS courses through the OMA for continuing medical education.[19]

Once physicians complete an EMUS training course, there is still a great deal of work that is required before they can obtain the title of "independent practitioner." Fifty scans each must be completed assessing AAA, intrauterine pregnancy, free fluid in trauma and pericardial effusion, for a total of 200 scans. Maintenance of skills was a barrier to EMUS use for one-quarter of survey respondents. In rural areas, the minimum training requirements can be particularly difficult to achieve because of the lower volume of cases seen when compared with larger, urban centres. One of the ways to address this concern is to allow groups of trainees to individually assess stored scans as they are performed. This would allow physicians to complete their training in a much more timely fashion, as they would not have to wait until these 200 patients arrived in their EDs. Allowing physicians the opportunity to complete the training in a more reasonable time frame may encourage more individuals to enroll in these programs.

A lack of need was another barrier to using ultrasonography that was identified within this study. Indeed, 21.8% of respondents believed this technology was an unnecessary addition to their practice. This response was somewhat surprising, as almost one-third of respondents (32.5%) reported performing ultrasonography at least once per shift and an additional 30.8% performed ultrasonography occasionally (less than once per shift). Furthermore, it has been previously documented just how valuable EMUS can be to a rural hospital.[6] Such technology allows physicians in these settings to become more diagnostically self-sufficient, which may prevent patient transfers to larger centres with more radiologic services.[6] This, in turn, prevents tying up ambulances on patient transfers

in areas that are lacking multiple crews.[6] Although teleradiology, which allows the transmission of diagnostic images between 2 facilities, may seem like an appropriate solution, it is hindered by interpretation delays.[6] When dealing with cases in which rapid diagnosis is imperative, such as AAAs or ruptured ectopic pregnancies, such delays are not acceptable.[6,20–22] Moreover, teleradiology can be very expensive.[6] Physicians who are adequately trained in EMUS could reduce their facility's expenses on teleradiology by preventing its use for unnecessary cases that could be easily remedied with EMUS.

As discussed previously, EMUS improves health outcomes in acute care patients,[3,5] which is likely why almost 80% of respondents in the present study agreed or strongly agreed that EMUS is a skill in which they should be competent. Furthermore, more than 70% of respondents agreed or strongly agreed that EMUS is a skill that all rural emergency physicians should have. Therefore, it would seem that reducing the barriers that are preventing physicians from undergoing this important training — including lack of training, difficulty maintaining skills, lack of need, cost and lack of equipment — would be a worthwhile step in improving patient care in rural Ontario.

Limitations

This study is limited by its low response rate of 28.6%. In an attempt to increase the response rate, the number of open-ended questions was kept to a minimum. This decision ensured the brevity of the survey, but conversely restricted the richness of the data obtained. It is hoped that future studies can delve more deeply into the concepts that were introduced in this study.

CONCLUSION

Patients in many rural EDs do not have immediate access to EMUS as advocated by CAEP. This gap in care needs to be addressed to ensure that all patients, no matter where they live, have access to this proven imaging modality.

Competing interests: None declared.

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