

Prehospital ultrasound use among Canadian aeromedical service providers – A cross-sectional survey

Anna Sedlakova, MD*¹; Paul Olszynski , MD, Med*²; Philip Davis, MD, MSc*³; John Froh, MD*⁴

CLINICIAN'S CAPSULE

What is known about the topic?

Prehospital point of care ultrasound (POCUS) has been widely used in European and Scandinavian countries where it changes patient management.

What did this study ask?

What is the current POCUS use among Canadian aeromedical service (AMS) providers?

What did this study find?

POCUS in AMS is available in Prairie Provinces. The Maritimes and the Yukon report plans to introduce it within the next year.

Why does this study matter to clinicians?

This study informs clinicians of the current AMS POCUS use and may aid in the development of prehospital training curricula.

currently using POCUS on fixed-wing aircraft. Most commonly reported frequency of POCUS use on missions was <25%. Most useful applications are assessment for pneumothorax, abdominal free fluid, and cardiac standstill. The most common barrier to POCUS use is cost of training and maintenance of competence.

Conclusions: Prehospital POCUS is available in Western Canada with one third of the Canadian population having access to aeromedical services using ultrasound. The Maritimes and the Yukon Territory will further extend POCUS use on fixed-wing aircraft. While there are barriers to POCUS use, those bases that have adopted POCUS consider it valuable.

RÉSUMÉ

Introduction: D'après des données probantes, l'échographie au chevet (EC) en phase préhospitalière pourrait influencer sur la prise en charge des affections. L'examen se pratique déjà à titre complémentaire pour le triage, l'examen physique, la pose du diagnostic ou les suites à donner. Toutefois, le taux d'utilisation de l'EC par les fournisseurs de services médicaux aériens (SMA) est inconnu au Canada. Aussi l'étude visait-elle à en déterminer le degré d'utilisation au pays.

Méthode: Il s'agit d'une étude d'observation transversale. Un questionnaire d'enquête a été envoyé par courriel aux directeurs des bases de SMA financées par les gouvernements, au Canada. Les données recueillies ont par la suite été analysées à l'aide de statistiques descriptives.

Résultats: Le taux de réponse a atteint 82,3% (14 directeurs de SMA sur 17), chiffre qui représente 41 bases sur 46. L'EC est déjà utilisée par les SMA en Colombie-Britannique (C.-B.), en Alberta, en Saskatchewan et au Manitoba. Pour ce qui est du Nouveau-Brunswick, de la Nouvelle-Écosse, de l'Île-du-Prince-Édouard et du Yukon, les autorités prévoient la mise sur pied de ce type d'examen au cours de la prochaine année. Quant à l'Ontario et à Terre-Neuve-et-Labrador, on n'utilise pas l'EC et on ne prévoit pas le faire non plus. Par ailleurs, la C.-B. est la seule province où l'EC est effectuée dans des aéronefs à voilure fixe. La fréquence d'utilisation de l'EC en cours de mission, déclarée le plus souvent est inférieure à 25%. C'est dans

ABSTRACT

Objectives: Evidence suggests that prehospital point of care ultrasound (POCUS) may change patient management. It serves as an aid in triage, physical examination, diagnosis, and patient disposition. The rate of adoption of POCUS among aeromedical services throughout Canada is unknown. The objective of this study was to describe current POCUS use among Canadian aeromedical services providers.

Methods: This is a cross-sectional observational study. A survey was emailed to directors of government-funded aeromedical services bases in Canada. Data were analyzed using descriptive statistics.

Results: The response rate was 82.3% (14/17 aeromedical services directors), representing 41 of 46 individual bases. POCUS is used by aeromedical services in British Columbia, Alberta, Saskatchewan, and Manitoba. New Brunswick, Nova Scotia, Prince Edward Island, and Yukon reported they are planning to introduce POCUS within the next year. Ontario and Newfoundland reported they are not using POCUS and are not planning to introduce it. British Columbia is the only province

From the *University of Saskatchewan, Saskatoon, Saskatchewan.

Correspondence to: Dr. Anna Sedlakova, Regina General Hospital Emergency, 1440 14th Avenue, Regina, SK, S4P 0W5; Email: sedlakov@ualberta.ca

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l'évaluation des cas de pneumothorax, de liquide libre intra-abdominal et d'asystole que l'examen se montre le plus utile. Enfin, les deux obstacles le plus fréquents à l'utilisation de l'EC sont le coût de la formation et le maintien de la compétence.

Conclusion: L'EC en phase préhospitalière se pratique dans l'Ouest canadien, ce qui veut dire qu'un tiers de la population au pays peut profiter de cet examen offert par les SMA. Dans

les Maritimes et au Yukon, les autorités prévoient élargir le service aux aéronefs à voilure fixe. Malgré les obstacles, l'examen est considéré comme très utile dans les bases où l'EC a été adoptée.

Keywords: Emergency medicine, prehospital / EMS, ultrasound

INTRODUCTION

Point of care ultrasound (POCUS) is quickly becoming the standard of care in emergency medicine.¹ Ultrasound generated images have been shown to aid in physical examination, diagnosis, and triage of patients in the field.² There is growing evidence that prehospital POCUS may change patient management, expedite diagnostic and therapeutic care and decrease time to definitive management.³⁻⁵ Aeromedical services providers may use POCUS both in and out of aircraft. In-flight POCUS assessments by paramedics have been shown to have high rates of correlation (positive predictive value and negative predictive value) when compared with in-hospital imaging and operating room reports.^{6,7} Aeromedical services in several European and Scandinavian countries have been using POCUS for many years.⁸ Although a recent Danish systematic review did not gather enough evidence to show improved patient outcomes, it concluded that POCUS is feasible and changes management in trauma, cardiac arrest, and patients with breathing difficulty.³ A 2018 German cohort study showed prehospital ultrasound changed management in 49.5% of patients, 33% of which were transport related changes.⁹

A 2014 survey of North American emergency medical services (EMS) directors (ground EMS and aeromedical services) showed that only 4.1% of ground EMS and 3.7% of aeromedical services used POCUS while 21% of directors were considering it.¹⁰ Canada faces unique and significant patient transport and diagnostic challenges due to its landscape and population density heterogeneity. POCUS in the hands of aeromedical services providers could conceivably be beneficial to Canadian patients, especially in remote geographic locations. Current Canadian data on POCUS adoption and use among aeromedical services providers are lacking. The purpose of this study was to describe current ultrasound use among Canadian aeromedical service providers.

METHODS

This is a cross-sectional observational study using an online survey. The survey was developed using the FluidSurveys™ (San Francisco) and distributed by means of email to all directors of government-funded (fully or partially) aeromedical services bases in Canada (Appendix 1). For the purposes of this study, aeromedical services was defined as a service providing prehospital in-flight medical care and patient transport, by means of both rotary and fixed-wing aircraft. Respondents completed the survey between March 9, 2018, to April 26, 2018. To meet inclusion criteria, the survey was to be completed by medical base directors of Canadian government-funded aeromedical services. Privately funded services were excluded from this study. The study (BEH 18-07) was assessed by the University of Saskatchewan Research Ethics Board and met the requirements for exemption of full review. Surveys were sent to directors of all known aeromedical services throughout Canada. The survey included questions regarding demographic information, POCUS availability, and barriers to its use (Appendix 1). Directors currently using ultrasound were asked additional questions regarding details of POCUS use, training of crews, and quality control. Individual base directors were not identified by name; however, the location of each base was recorded. Data were analyzed using descriptive statistics (means and medians), and between group differences were analyzed by chi-squared analysis.

RESULTS

Fourteen of 17 (82.3% response rate) directors completed the survey. As some directors were responsible for multiple bases, data were obtained for 41 of the 46 (89.1%) government-funded bases. Data from bases in

Table 1. Demographics and reported POCUS use

Director of: (responses)	Number of bases	Population served	Number of missions/year	Type of aircraft(rotary, fixed wing, both)	Reported POCUS use
British Columbia	7	>1 000 000	9 000	Both	Yes
Alberta Health Services Air Ambulance	10	>1 000 000	7 000	Fixed wing	No
STARS – Calgary, AB	1	>1 000 000	513	Rotary	Yes
STARS – Edmonton, AB	1	>1 000 000	500	Rotary	Yes
STARS – Grand Prairie, AB	1	100 000–249 999	110	Rotary	Yes
Saskatchewan Air Ambulance	1	500 000–1 000 000	1 800	Fixed wing	Introducing
STARS – Saskatoon, SK	1	500 000–1 000 000	350	Rotary	Yes
STARS – Regina, SK	1	250 000–499 999	450	Rotary	Yes
STARS – Winnipeg, MB	1	500 000–1 000 000	675	Rotary	Yes
Ornge – ON	12	>1 000 000	19 000	Both	No
MedFlight - Newfoundland Air Ambulance	2	500 000–1 000 000	1 100	Both	No
Ambulance New Brunswick's Air Ambulance – Moncton, New Brunswick	1	250 000–499 999	600	Fixed wing	Introducing
LifeFlight - Halifax, NS (covers PEI)	1	>1 000 000	910	Both	Introducing
Alkan Air – Whitehorse, Yukon	1	<100 000	1 200	Both	Yes

AB = Alberta; MB = Manitoba; NS = Nova Scotia; ON = Ontario; PEI = Prince Edward Island; SK = Saskatchewan.

Yellowknife (Northwest Territories), Inuvik (Northwest Territories), Cambridge Bay (Nunavut), Winnipeg (Lifeflight Manitoba), and Quebec were unavailable. Thirteen of 41 of the represented Canadian bases (7/14 responding directors) currently have access to POCUS onboard their aircraft, largely due to rotor wing aeromedical services. Ontario and Newfoundland and Labrador as well as Alberta Health Services Air Ambulance reported they do not have POCUS available and are not currently planning on introducing it. Bases in the Maritime region (New Brunswick, Nova Scotia/Prince Edward Island), the Yukon Territory, and Saskatchewan Air Ambulance (4/41 bases) are not currently using POCUS, but report they intend to implement it within the next year, increasing usage to 41.5% of responding Canadian bases. Twelve bases (29.2%) use exclusively fixed-wing aircraft, and six bases (14.6%) use exclusively rotary aircraft. British Columbia is currently the only province using POCUS on fixed-wing aircraft. (See Table 1 “Demographics and reported POCUS use” for each response.) Bases with rotary aircraft are significantly more likely to have POCUS ($\chi^2 = 11.79; p = 0.003$).

Barriers to POCUS use

The most commonly quoted barrier to POCUS use (by nearly all directors) was cost of training and maintenance of competence. Cost of ultrasound machines was more

commonly identified as a barrier by directors not using POCUS (not significant, Appendix 2).

POCUS application

POCUS use was reported by 7/14 responding directors (13/41 bases). Five of seven directors using POCUS reported obtaining scans on <25% of missions. POCUS use by aeromedical services personnel occurs at the referring hospital (71.4%) and/or in flight (50%). Assessment of abdominal free fluid, pneumothorax, and pericardial effusion in suspected tamponade are performed at all locations using POCUS, primarily by paramedics. Other commonly performed scans were for pulseless electrical activity/cardiac standstill, and abdominal aortic aneurysm (Appendix 2). All directors reported that scans were documented, most frequently in patient’s chart with quality control measures in place (Appendix 2). All directors using POCUS believe it has a positive role on patient care in the emergency department and believe aeromedical services POCUS should become common practice (7/7).

DISCUSSION

Unlike Europe and Scandinavia where aeromedical services POCUS is common practice, only 31% of the represented Canadian aeromedical services bases reported POCUS use, predominantly on rotary aircraft. There is

a geographical distribution with respect to its availability revealing a large geographical area of the country without plans to introduce POCUS in the near future. As POCUS is more commonly used on rotary aircraft, there may be a difference in the utility of it between mission types (transport v. scene calls). Aeromedical services providers dispatched to scene calls fly directly to the acutely ill patient, often with very limited information. It is possible that several POCUS applications are of more utility during these scene calls as compared to standard inter-facility transport; however, our study did not explore these differences, with further research required. Currently, there are no specifically defined prehospital/aeromedical POCUS training standards in Canada. Of interest, lack of such guidelines was not identified as a major barrier to POCUS use among aeromedical services base directors.

Strengths and limitations

This is the first Canadian study describing the current climate in POCUS use within aeromedical services. There are several limitations to this study. Each survey response came from a medical director of an aeromedical services base(s); however, some were accountable for many bases. And as such, it is possible we did not capture all POCUS use within Canadian aeromedical services. Despite multiple attempts, we were unable to obtain data from Quebec, Manitoba LifeFlight, and the NWT/Nunavut. There is heterogeneity within our data possibly leading to selection bias. Furthermore, the survey design left directors not currently using POCUS without access to some of the survey questions (including quality assurance measures and training specifics).

CONCLUSIONS

Prehospital POCUS is used by aeromedical services in British Columbia and on rotary aircraft in the Prairie Provinces. There are plans by local providers to further extend its use to the Maritimes and the Yukon Territory within the next year. Cost of training remains the most significant barrier to POCUS use regardless of whether or not POCUS is already available. Although all directors currently using POCUS find it valuable, further

research will help inform the role of aeromedical services POCUS on patient outcomes.

Supplementary material: The supplementary material for this article can be found at <https://doi.org/10.1017/cem.2019.451>.

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REFERENCES

1. Olszynski P, Kim DJ, Chenkin J, Rang L. CAEP Emergency Ultrasound Committee curriculum working group. The CAEP emergency ultrasound curriculum – objectives and recommendations for implementation in postgraduate training. *CJEM* 2018; 20(5): 736–738.
2. Nelson BP, Melnick ER, Li J. Portable ultrasound for remote environments, Part II: current indications. *J Emerg Med* 2011;40(3):313–21.
3. Botker MT, Jacobsen L, Rudolph SS, Knudsen L. The role of point of care ultrasound in prehospital critical care: a systematic review. *Scam J Trauma Resusc Emerg Med* 2018;26:51.
4. O'Dochartaigh D, Douma M. Prehospital ultrasound of the abdomen and thorax changes trauma patient management: a systematic review. *Injury* 2015;46:2093–102.
5. O'Dochartaigh D, Douma M, Alexiu C, Shell R, MacKenzie M. Utilization criteria for prehospital ultrasound in a Canadian critical care helicopter emergency medical service: determining who might benefit. *Prehosp Disaster Med* 2017;32(5):536–40.
6. Yates JG, Baylous D. Aeromedical ultrasound: the evaluation of point-of-care ultrasound during helicopter transport. *Air Med J* 2017;36:110–5.
7. Press GM, Miller SK, Hassan IA, et al. Prospective evaluation of prehospital trauma ultrasound during aeromedical transport. *J Emerg Med* 2014;47(6):638–45.
8. Nelson BP, Chason K. Use of ultrasound by emergency medical services: a review. *Int J Emerg Med* 2008;1:253–9.
9. Scharonow M, Weilbach C. Prehospital point-of-care emergency ultrasound: a cohort study. *Scam J Trauma Resusc Emerg Med* 2018;26:49.
10. Taylor J, McLaughlin K, McRae A, Lang E, Anton A. Use of prehospital ultrasound in North America: a survey of emergency medical services medical directors. *BMC Emerg Med* 2014;14:6.