Recommendations for the use of point-of-care ultrasound (POCUS) by emergency physicians in Canada

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EXECUTIVE SUMMARY

INTRODUCTION

The Canadian Association of Emergency Physicians (CAEP) recognizes the role of point-of-care ultrasound (POCUS) as a valuable adjunct to the delivery of excellent emergency care. With this document, the CAEP Emergency Ultrasound Committee (EUC) updates the previous CAEP POCUS position statement[1] and provides an expanded framework and series of recommendations, based on the current evidence, to guide emergency departments (ED) and their POCUS programs in the delivery of high quality patient care. Evaluating and summarizing the evidence for the use of POCUS is challenging because, unlike other diagnostic tests where research is primarily focused on test performance, the value of POCUS is further scrutinized in terms of patient-oriented outcomes and system performance measures, such as time to diagnosis or length of stay. Add to this the operator-dependent nature of POCUS, and, not surprisingly, the application of POCUS literature becomes understandably complex.

The recommendations reflect the authors' synthesis of a combination of test performance metrics, patient-oriented outcomes, and system performance measures (when available). To date, there is still a paucity of prospective POCUS research focused on patient-oriented outcomes, but the authors do believe there is sufficient evidence in the current literature to support the recommendations within this document.

LIST OF RECOMMENDATIONS

The following summary of recommendations is expanded with detailed discussion in the full online version of this position statement.

Scope of practice

The role of POCUS in the practice of emergency medicine (EM) in Canada continues to evolve. **The current evidence supports the integration of several**

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potentially life-saving POCUS applications as core skills of the specialty. This list mirrors that of the CAEP EUC's recommended EM Residency emergency ultrasound curriculum.[2]

- ***Focused assessment with sonography for trauma*** (FAST includes abdominal and thoracic applications.)
- ***Identification of abdominal aortic aneurysm (AAA)***
- ***Identification of first trimester intrauterine pregnancy (IUP)***
- ***Thoracic ultrasound*** (including identification of pneumothorax, hemothorax, pleural effusion, and interstitial lung syndrome)
- ***Focused cardiac ultrasound*** (including assessment of global cardiac activity, gross left ventricular systolic function, right ventricular size, presence of pericardial effusion, and inferior vena cava calibre)
- ***Ultrasound-guided vascular access*** (including peripheral and central vascular access)

This document adopts the evolving approach of collating applications into the following groups: resuscitative, diagnostic, procedural, and therapeutic/monitoring (Table 1; also see Appendix 1). In addition, a clinical, presentation-based approach is recommended where selected applications are combined, to differentiate a diagnosis.

Training and competency

Training in POCUS should incorporate a significant amount of experience scanning patients in a clinical setting. Such experience may be supplemented by scanning workshops or training sessions that involve volunteers or POCUS simulation. The key features of this learning phase relate to optimizing the physician's skills in generating optimal images, interpreting the images, and incorporating the images into clinical decision-making.

Recommending methods of training and assessing proficiency in POCUS continue to stimulate debate. The CAEP EUC has published, in collaboration with EM training programs, a series of core POCUS objectives for EM residents and recommends that moving forward, completion of residency provides evidence of competency in these applications.[2] For physicians who did not receive POCUS training during residency, the CAEP EUC recommends that the following three components of training be considered essential when appraising a physician's POCUS credentials and determining corresponding privileges:

1. Clearly defined introduction to the POCUS skill
2. Traineeship with supervision that may include scanning in both the clinical and non-clinical setting. This training phase should maximize exposure to both normal and abnormal findings and should include exposure to a representative sample of model/patient body habitus.
3. A summative assessment of knowledge (including clinical integration and comprehension assessments) and an image generation assessment that includes an observed practical exam

Training for invasive POCUS applications, for example, transvaginal, transesophageal echocardiography, and procedural POCUS, may require a greater reliance on simulation. Incorporating simulation into the training for these applications has been shown to be effective and beneficial.[3–5]

Increasingly, non-physician healthcare providers are using POCUS to enhance their clinical practice. Encouraging evidence exists for both emergency medical services (EMS)/prehospital applications[6–15] and applications used by nurses.[16,17] It is recommended that POCUS training of these clinicians should include the three components described previously, albeit via a tailored pathway that reflects context and scope of practice.

A growing number of Canadian medical schools have incorporated POCUS into their undergraduate medical

Table 1. POCUS scope of practice in emergency medicine

Resuscitative	POCUS used to determine the etiology of shock or hypotension, as well as to assist with identifying the cause of respiratory distress and to guide cardiac arrest management
Diagnostic	POCUS used in an emergent diagnostic imaging capacity. These applications have a positive impact by expediting patient care and improving departmental flow
Procedural guidance	POCUS used as an aid to guide a procedure
Therapeutic and monitoring	POCUS used in therapeutics or in physiologic monitoring, for example, fluid responsiveness and cardiac output monitoring

education.[18] There is evidence that this can enhance student knowledge and learning of traditional examination skills and also increase student satisfaction.[19] Emergency physicians are well placed and encouraged to facilitate and provide leadership in these programs.

POCUS fellowships are well established in Canada (www.PoCUS.ca), and The Royal College of Physicians and Surgeons of Canada (RCPSC) has recently approved an Area of Focused Competence Diploma.[20] Emerging EM POCUS leaders are encouraged to use these programs.

Physicians are expected to keep current with evidence and advances in POCUS practice throughout their careers and are supported by the Canadian colleges in their continuing professional development (CPD) and lifelong learning goals.

Emergency POCUS program management

Emergency POCUS program management includes components of program leadership, monitoring and quality assessment recommendations, as well as machine choice and maintenance. Recommendations are provided to assist EDs in developing POCUS leaders and to help those leaders develop expertise and establish robust programs that will enhance patient care.

All EDs with POCUS equipment should have a named physician (*POCUS Lead*) designated and responsible for development and maintenance of the emergency POCUS program. In smaller and rural hospitals, this role may be assumed by those with other quality improvement responsibilities (see Appendix 5 for Rural EM recommendations). Academic centres and larger EDs should have a *POCUS Program Director*. Recommended responsibilities for these positions are detailed in the full document and may include administration, education of trainees and staff, quality, and research. EM POCUS leaders are expected to have completed additional POCUS training and, in academic centres, have completed POCUS fellowships or the equivalent.[2] Regional POCUS leadership is recommended, with regional academic centres and their associated geographically located smaller EDs collaborating with respect to program management.

POCUS program quality is not only dependent on robust training and competency, but also documentation standards, image archiving (where applicable), and defined quality management process. Recommendations for these are detailed in the full document. Many larger and academic EDs in Canada are archiving images and clips for every examination performed. This is considered best practice and strongly recommended. A local POCUS quality program is the responsibility of the *POCUS Lead* (with the appropriate support and resources) and will include ongoing review, support, education, and development.

A POCUS program requires resources, including physician time and administrative support. Departments are expected to balance the competing demands placed on resource allocation in order to support successful program delivery. Many larger academic centres will already have implemented much of these mentioned. Others will have EM quality programs in place that could be expanded to include POCUS quality. Smaller hospitals will have to consider which of the previous recommendations are achievable locally and what support is available regionally, for example, regional archiving, regional POCUS education, and competency development.

An ultrasound machine must be immediately available to an attending emergency physician in the ED at all times. The CAEP EUC recommends that EDs should have a minimum of at least one machine for every distinct clinical area and strongly consider the provision of one ultrasound machine for every attending emergency physician on shift. Recommended ultrasound machine specifications are detailed in the full document.

Programs should have a clear policy for infection control, that includes machine hygiene (including keyboard, controls, screen, and cart) and the transducers.[21–26]

Pediatric emergency POCUS

Pediatric emergency medicine (PEM) has embraced the potential of POCUS to improve care for their patients.[27] Recommended core POCUS competencies for PEM physicians include eFAST, Focused Cardiac, Thoracic, IUP, Soft Tissue, and Vascular Access. Although clinical indications and use of POCUS in adults and children overlap greatly, our recommendations consider the important differences existing between the two populations. These are detailed in the full document and include resuscitation, lung, neck, ocular, renal/bladder, skull fracture, abdomen, testes, hip and fractures.

Training and competency assessment for PEM POCUS applications follows the same recommendations as those outlined in the previous section on training and competency.

Table 2. Summary of recommendation categories and highlighted themes

Recommendations	
Scope of practice	
Core POCUS for EM	FAST (extended), AAA, IUP, Thoracic, Focused Cardiac, Vascular Access This list mirrors that of the CAEP EUC's recommended EM Residency core ultrasound curriculum.[2]
EM POCUS applications (see Appendix 1)	Resuscitative, diagnostic, procedural, therapeutic and monitoring
Training and competency	
EM residency POCUS training	Completion of residency from a program with a verifiably robust POCUS training program provides an accepted national standard
Physicians in practice	Physicians in practice are strongly encouraged to continue developing and expanding their POCUS skill set. Where applicable, POCUS privileges should be based on evidence of competence as defined by a clear traineeship followed by an objective examination of skills and knowledge.
Other healthcare providers	POCUS skills may be useful in a number of settings, and further research is encouraged. Training and competency should follow general recommendations.
Medical students	Inclusion of POCUS within the curriculum is valued and enhances knowledge and clinical skills. EM physicians will continue to play a significant role.
Fellowships	There are a number of Canadian POCUS fellowships and the RCPSC POCUS Diploma, which will provide support and training for future EM POCUS leaders.
CPD	Physicians are expected to keep current with evidence and advances in POCUS practice throughout their careers.
POCUS program management	
Leadership	All EDs should have a named physician designated and responsible for development and maintenance of the emergency ultrasound program. In smaller departments, physicians with existing "quality" responsibilities may assume this role, and collaboration with regional centres is recommended.
Documentation	POCUS report documentation must be completed for all examinations and include indication, area examined, findings/interpretation, and subsequent integration.
Image archiving	Many larger and academic EDs in Canada are archiving images and clips for every examination performed. This is considered best practice and strongly recommended.
Quality management	A local POCUS quality program is the responsibility of the *POCUS Lead* and will include ongoing review, support, education, and development.
Machine availability	An ultrasound machine must be immediately available. EDs should have a minimum of at least one machine for every distinct clinical area and ideally have one ultrasound machine for every attending emergency physician on shift.
Machine specifications	Recommended ultrasound machine specifications are detailed in the full document.
Infection control	Programs should have a clear policy for infection control, that includes machine hygiene (including keyboard, controls, screen, and cart) and the transducers.
PEM POCUS	
Core POCUS applications for PEM	FAST (extended), Focused Cardiac, Thoracic, IUP, Soft Tissue, and Vascular Access
Key PEM applications	Resuscitation, lung, neck, ocular, renal/bladder, skull fracture, abdomen, testes, hip and fractures
Training and competency	Training and competency assessment for PEM POCUS applications follows the same recommendations as those outlined previously.
Research	
Priorities	A increased focus on outcome-centred research is required to answer the important questions that remain unanswered.
Needs analysis	CAEP EUS will perform a regular needs analysis and maintain a network database that will provide a list of POCUS research priorities.

Emergency POCUS research

The CAEP EUC would not be able to make these recommendations without the body of evidence provided by quality POCUS research. With a greater focus on outcome-centred research, researchers will need to establish networks to design and run the large-scale multi-centre studies required to answer

these important patient outcome questions that remain unanswered.[28]

SUMMARY TABLE

Table 2 shows the recommendation categories and themes. The complete list of recommendations is detailed in the full online document.

GOING FORWARD

These recommendations are intended to provide both motivation and support while being adopted by Canadian EDs. It is anticipated that the rate and completeness of adoption will vary depending on department size, leadership, and resources. The CAEP EUC will continue to provide leadership and support towards improving EM POCUS standards and will complete and publish an annual survey to measure adoption of the recommendations.

CONCLUSION

The future of POCUS in EM will be influenced by patient outcomes, research, medical school curricula, and technological advances. Local and national leadership is needed to ensure that future generations of emergency physicians will integrate POCUS seamlessly as part of their everyday practice to the benefit of their patients.

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