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Point-of-care ultrasound: An emerging technology in Canadian paediatrics

Daniel Rosenfield MD[1], Charisse Kwan MD[1,2], Jason Fischer MD MSc[1,2]

The use of point-of-care ultrasound (POCUS) in Canadian paediatric medicine has grown exponentially in the past decade. Early adopters of the technology in paediatrics include anesthesiology, critical care, emergency medicine and rheumatology (1,2). The emergence of this innovative technology across specialties has been driven by its ability to deliver affordable, real-time imaging of patient anatomy at the bedside without pain or radiation. The purpose of the present commentary is to describe the current clinical use of POCUS in Canadian paediatric medicine and to forecast its role in the near future.

POCUS is defined as ultrasonography brought to the patient's bedside and performed by a health care provider in conjunction with a clinical examination. Diagnostic POCUS is a problem-based assessment that is generally qualitative and binary (or semiquantitative). The dynamic, real-time findings are correlated directly with the patient's presenting signs and symptoms, and scans can be repeated in a serial fashion. This focused approach enables the provider to maintain workflow while gathering key pieces of information that can narrow or determine diagnosis, streamline care, guide ongoing management and reduce cognitive errors.

For example, an emergency medicine provider may perform a POCUS examination of a child's abdomen with a high pretest probability of intussusception based on history and physical examination. The focused objective of the scan is to identify the presence or absence of a 'target sign'. In contrast, a radiology-performed, comprehensive ultrasound of the child's abdomen would describe the entire anatomy of the abdomen, including a systematic, detailed description of the solid and hollow viscous organs.

The ability of POCUS to visualize anatomy in real-time has led to its widespread use in peripheral venous access, regional anesthesia, foreign-body removal, fluid aspiration and fracture relocation confirmation, as well as several life-saving procedures such as pericardiocentesis and confirmation of endotracheal intubation (2,3). Its role in the assessment of the adult trauma patient has been well established and the extended focused sonography for trauma is rapidly becoming the standard of care in paediatric trauma (4).

The body of literature supporting the patient benefits of these diagnostic and procedural POCUS applications continues to rapidly expand as the capacity for research expands. This includes applications specific to paediatrics such as examining for intussusception (5), skull fracture (6), lung pathology (7,8), soft-tissue infection (9) and appendicitis (10). The current literature demonstrates that novice users can be trained to use the technology in a competency-based manner that is specialty-specific and feasible in both duration and resource use.

The implementation and capacity building of POCUS across specialties is now underway, with most Canadian paediatric institutions having overcome the challenges of bureaucratic inertia, resource constraint and lack of expertise. In the United States, adoption has been more rapid (11). The percentage of United States emergency departments with paediatric emergency medicine (PEM) training programs using POCUS has climbed from 65% in 2006 to 95% in 2011, with 88% of these incorporating POCUS into their PEM Fellowship curricula (12).

In Canada, it is anticipated that the Royal College of Physicians and Surgeons of Canada will begin to incorporate mandatory training in POCUS into paediatric emergency fellowship training curricula to match current evidence (G Neto, University of Ottawa [Ottawa, Ontario], personal communication). This has led to a demand for leaders in POCUS and the emergence of POCUS-specific fellowships that provide physicians with the administrative, research and scholarly skills needed to create and lead POCUS programs. In addition, mid-career physicians seeking training in POCUS are now being offered greater opportunities through workshops, immersive trainerships and reverse mentoring from their trainees (11).

The recognition of ultrasound as a core clinical skill across specialties has led to its recent incorporation into undergraduate medical education. Examples include the longitudinal curricula that have been introduced at the McGill University (Montreal, Quebec) and University of Toronto (Toronto, Ontario) Schools of Medicine. Although still in development, these programs will encompass all four years of training with a goal of achieving basic diagnostic and procedural competency before residency (13) (I Devito, University of Toronto, personal communication). The expertise of POCUS users from various specialties has made these undergraduate programs educationally rich and incredibly popular among students (14).

The continued widespread adoption of POCUS in paediatric medicine is predictable. Although being spearheaded by paediatric emergency departments, the decreasing cost and increasing personalization of ultrasound technology, in combination with its early introduction to medical students and a more connected world, allows for unprecedented self-learning and reverse innovation among all paediatric providers worldwide. Canadian providers must ensure that their current high standards of care are maintained and should be encouraged to seek opportunities for POCUS to improve their patient care.

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