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CLINICIAN'S CORNER

An introduction to point-of-care ultrasound

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A 67-year-old is brought to your resuscitation room in your emergency department. She is in acute distress and has a blood pressure of 211/120, a heart rate of 130 per minute, a respiratory rate of 31 breaths per minute, and an oxygen saturation of 88% on room air. You are about to call for a portable chest radiograph, but the emergency nurse practitioner reaches for the point-of-care ultrasound machine, puts the probe on the patient's chest, and in under a minute, states: "I see B-lines and weak cardiac contractility; there is normal lung sliding."

What is point-of-care ultrasonography?

Point-of-care ultrasonography (POCUS) is the process of transporting a compact ultrasound machine to a patient's location, which is then operated by the treating clinician; the images generated by the clinician are then immediately integrated into patient care (Díaz-Gómez et al., 2021; Moore & Copel, 2011; Soni et al., 2020). For example, POCUS can help answer the question: "Is there pulmonary edema?" but in most cases cannot answer "What is the left ventricular ejection fraction percentage?" POCUS is not intended to replace consultative ultrasonography, the traditional process of requesting an ultrasonography study, which is often performed in a dedicated radiological location by a licensed sonographer and requires a radiologist to interpret and share their findings with the treating provider (Díaz-Gómez et al., 2021). Consultative ultrasonography is also a comprehensive study because it provides a complete evaluation of the various structures located near the area of interest, whereas POCUS is viewed as an extension of the physical examination and intended to answer specific clinical questions.

Why is POCUS important to emergency registered nurses?

In the proper clinical context, POCUS findings can help an emergency registered nurse (RN) anticipate the next steps in patient care; predicting the next step is arguably the most critical skill of emergency RNs. Using the above case as an example, having a POCUS machine readily available can help the healthcare team rapidly rule out or rule in conditions that could be responsible for acute dyspnea, such as pneumothorax, pulmonary edema, and pericardial effusion. An emergency RN who hears critical terms such as "absent lung sliding" or "B-lines" could then anticipate a chest tube setup to treat a pneumothorax or furosemide to treat pulmonary edema.

What key POCUS findings should I be familiar with?

As the scope of this article is an introduction to POCUS for emergency RNs, Table 1 focuses on the Canadian Point-of-care Ultrasound Society (CPOCUS) clinical questions POCUS can answer (CPOCUS, n.d.-a) in acute care and their respective critical terms and anticipated actions.

Can emergency nurses be certified to operate POCUS?

While the literature demonstrating that RNs can safely operate POCUS continues to evolve, there are reports that nurses, physiotherapists, and respiratory therapists with appropriate training can safely operate POCUS with beneficial patient outcomes (See et al., 2016; Tulleken et al., 2019; Whittaker et al., 2007; Zisis et al., 2022). One hospital system in California has trained nurses to identify features of pulmonary edema, roughly estimate ejection fraction, and detect pathological features of cardiac physiology with POCUS (Lai & Paquin, 2020). Lastly, in a prospective observational study of fluid resuscitation among patients with sepsis, emergency RNs were found to have excellent inter-rater agreement with emergency physicians for all ultrasound scans, and these RNs were able to safely make adjustment to ongoing fluid resuscitation requirements (Selden et al., 2017).

There are several pathways to learn POCUS in Canada, but little is known about POCUS training programs designed specifically for emergency RNs. One certification stream that has the potential to meet regulatory standards are CPOCUS accredited Acute Core Independent Provider courses, which confers a nationally recognized certification (CPOCUS, n.d.-b). However, it is unclear how this credential meets each provincial and/or regulatory college standards of practice. Provincial nursing act/regulations, the provincial regulatory college, and local policies that one practises within determine if POCUS is within an RN's

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Table 1

Key POCUS Findings

Clinical Question	Critical Terms	Anticipated Actions
Is there pulmonary edema?	B-Lines	Diuretics, afterload reduction, ventilatory support
Is there a pleural effusion?	"Spine sign" "Jellyfish sign" "Diaphragm 6-12 o'clock" "Absent curtain sign"	Diuretics, thoracentesis, chest tube insertion
Is there a pneumothorax?	"Absence of comet tails, B-lines, and lung sliding" "Pathological lung point"	Thoracostomy, chest tube insertion
Is there cardiac activity?	"Cardiac standstill" or "absent" "Poor" or "good"	Start or continue cardiopulmonary resuscitation, chronotropic and/or inotropic medications, mechanical circulatory support
Is there a pericardial effusion?	"Positive" or "negative"	Pericardiocentesis
Is there an abdominal aortic aneurysm?	"Positive" or "negative"	Transport to the operating room (OR) and/or computed tomography suite, blood transfusion, multiple large bore intravenous (IV) access, prioritization of blood group and screen, possibly resuscitative endovascular balloon occlusion of the aorta (REBOA)
Is there abdominal free fluid?	"Positive in RUQ/LUQ/both" or "negative"	Transport to the OR, large bore IV access, prioritization of blood group and screen, blood transfusion,
Is there an intrauterine pregnancy?	"No definite intrauterine pregnancy"	Large bore IV access, prioritization of blood group and screen, higher level of monitoring within the emergency department, Transport to the OR or ultrasound department

scope of practice. For example, an RN in British Columbia (BC) can apply ultrasound for diagnostic or imaging purposes if given a patient-specific order as per the *Nurses (Registered) and Nurse Practitioners Regulation* (2008) and their college's scope of practice (BC College of Nurses and Midwives, 2022). Still, the RN needs to be familiar with the local hospital policies and whether there are policies outlining the nurse's responsibility.

Case resolution

You hear the terms "B-lines" and "weak contractility" and recognize that these POCUS findings fit with the patient's clinical presentation for acute pulmonary edema. Instead of calling for a chest radiograph, you prioritize setting up a biphasic positive airway pressure machine and reach for a vial of furosemide.

Summary

POCUS is the process by which the treating clinician uses ultrasonography to expeditiously answer clinical questions at the patient's location. A nurse familiar with POCUS findings can rapidly anticipate patient care needs and thus dramatically increase the quality of patient care. While there is evidence showing that nurses with appropriate training can safely operate POCUS, nurses should be cognizant of their respective provincial laws and standards of practice before operating POCUS. Lastly, emergency RNs, and nursing leaders must embrace POCUS in order to stay relevant in the future.

Author notes

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