Emergency Ultrasound in Canada

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ABSTRACT

The introduction of emergency room ultrasound (EUS) into Canadian emergency departments (EDs) has been a slow and complicated process mired with controversy and barriers to use. In the past several years, the evidence behind the benefits of EUS has grown substantially and continues to accumulate. Meanwhile, technological advancement continues to both enhance our ability to capture high quality images and reduce the cost of ultrasound equipment. Combining this with incorporation of EUS training into residency program curricula and increasing access to EUS professional development courses, the integration of EUS into every Canadian ED is now a reality that should soon be realized. This review will look into the use of ultrasound in Canadian EDs, as well as the inclusion of EUS in emergency medicine training and continuing medical education. This paper will also examine the current barriers and fears that have stalled the ubiquitous adoption of EUS in EDs across the country.

KEYWORDS: *emergency medicine, medical education, ultrasound, FAST, residency training program*

Ultrasonography is a safe and effective form of imaging that has been used for over forty years.[1] Emergency room ultrasound (EUS) is beneficial and unique in that it allows images to be obtained in real time, allowing findings to be immediately correlated with the patient's presenting signs and symptoms. Furthermore, EUS is repeatable in the event that a patient's condition changes. What makes ultrasound especially useful in the emergency room setting is that it penetrates well through fluid and solid organs, detecting blood, urine, bile and ascites in various emergent situations. Emergency room ultrasound is most commonly used to identify abdominal aortic aneurysm (AAA), intrauterine pregnancy, free fluid following trauma (FAST), and pericardial trauma, or to assist in central venous catheter placement.[1,2]

Emergency room ultrasound has been proven to influence clinical decision-making, improve diagnostic acumen, and shorten time to definitive treatment thereby improving quality of care.[1] Perhaps the best-studied use of ultrasound in the emergency department is the extended Focused Abdominal Sonography for Trauma (eFAST) examination. This technique examines for free fluid in the abdomen as well as presence of pneumothorax, pericardial fluid, pleural effusion, and fluid in the pelvis. This exam can be completed in as little as five minutes and has been shown to have a sensitivity of 73-99% and a specificity of 94-98% for clinically significant intra-abdominal injury.[1] Recent research has shown similarly promising results of EUS for other emergency room uses. The clear benefit of EUS in a variety of emergency situations has been publicized in recent years, leading to strong support for the widespread integration of EUS into every ED.[2-4]

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The Canadian Association of Emergency Physicians (CAEP) first started supporting the use of bedside ultrasound in 1999 with a vague position paper stating that emergency physicians could be among those who would benefit from focused EUS.[1] It was not until 2006, with the accumulation of more evidence supporting EUS, that the CAEP emergency medicine-targeted ultrasound interest group produced another position paper that provided a stronger endorsement for EUS, stating that "emergency departments should strive to have [EUS] immediately available, 24 hours per day, 7 days per week."[4] This paper also recommended that EUS training be incorporated into emergency medicine residency programs of the Royal College of Physicians and Surgeons of Canada (RCPSC) and College of Family Physicians of Canada (CFPC). Furthermore, the paper promoted training programs for physicians already in practice and encouraged development of quality improvement programs to ensure the safe and effective use of EUS.[4]

Six years after the aforementioned position paper, all 13 RCPSC and 15 of 17 CFPC emergency medicine residency programs have included EUS as part of their formal curriculum, and the majority of practicing rural physicians agree that EUS is a skill that all rural ED physicians should possess.[2-3] The amount of training and the type of ultrasound studies and ultrasound-assisted procedures that are taught vary significantly from one program to the next, and a significant number of programs still lack formal competency assessments.[2] A survey of emergency medicine program directors indicated that all programs (Royal College and CFPC-EM) receive FAST, AAA, and cardiac diagnostic ultrasound training. Assessment of intrauterine pregnancy and ultrasound-guided central line placement were also taught at the majority of programs.[2]

Despite increased uptake of point-of-care ultrasound

teaching in academic centres, there continues to be considerable barriers to nationwide EUS implementation, especially in rural settings. In a 2012 study in Ontario, less than half of the practicing rural ED physicians claimed to know how to perform ultrasonography. In this study, the most frequently cited reason for not using EUS was lack of training. There were also a considerable number of respondents who reported lack of access to equipment as a major deterrent of use. Interestingly, rural physicians who have been trained in EUS, and have access to equipment, use it at least once per shift.[2] This demonstrates the versatility of EUS and potential schism in the quality of care that is created between those with the knowledge and resources and those without. This study also revealed that, despite recent improvements, in 2012 patients in many rural EDs still do not have timely access to EUS, as was advocated by the CAEP in 2006.[2]

A potential downfall of the successful implementation of EUS across the country is the lack of quality improvement and quality control programs. This was a major focus of the 2006 Canadian Journal of Emergency Medicine (CJEM) position paper that has yet to be implemented successfully across Canada.[4] As of 2012, the majority of RCPSC and CFPC programs were lacking any formal quality assurance program for EUS training. Implementation of strict quality control programs and accreditation of EUS may contribute to the slow uptake and resistance to learn and utilize EUS; however, it is necessary to ensure that the benefits of EUS are maximized. Another reason to support quality assurance and training accreditation is to quell the concerns of Canadian radiologists, who as recently as 2006 stated that there is "... a growing body of evidence demonstrating the potential harm of misdiagnosis as a result of portable ultrasound exams performed by inexperienced operators who have a sub standard level of training."[5,6]

Emergency medicine physicians will always have a considerable overlap in their scope of practice with other specialists. At times, such as in the situation with EUS, this overlap leads to a turf war and resistance from specialists to allow the adoption of technology and procedures from their domain. The transfer of bedside ultrasound from the hands of radiologists and sonographers to emergency physicians has created its fair share of controversy.[3,5-8] The Canadian Association of Radiologists (CAR) claims that a minimum of 6 months of training is required to perform and interpret ultrasound exams. Some radiologists fear that the majority of emergency physicians lack the background and sufficient training in the use of ultrasound and that their detection rates in most studies would be deemed unacceptable in the specialty of radiology.[8] While emergency physicians generally recognize that they will be unable to utilize EUS to the same capacity as a radiologist, they still feel that the benefits of using EUS continue to outweigh the risks.[7] In an editorial published in the CJEM, one emergency physician dismissed the fact that emergency physicians cannot use EUS as effectively as radiologists, while still supporting its use, by stating "I can't use a stethoscope as well as a cardiologist, nor read plain films as well as a radiologist, nor interpret ECGs as well as a cardiologist; yet somehow we emerg docs are able to make life or death situations every day using these modalities."[7] In the end, using the technology to make better clinical decisions than could be made without the device is what matters most. Emergency physicians can and should continue to consult their radiology colleagues, when applicable and when available, but in many situations immediate access to this service is not realistic. In these situations, possessing the skills, even if limited, and having access to the technology, will benefit the quality of care that is provided to the patient.

Another cited impediment to the widespread use of EUS is the lingering fear of litigation. Despite the anecdotal reports of emergency physicians being sued over EUS leading to misdiagnoses, a 2012 database review of 20 years of American legal cases showed that there were no cases naming emergency physicians who erroneously performed EUS.[9] Conversely, there was one case of an emergency physician being sued for failing to perform EUS to diagnose an ectopic pregnancy.[9] This is not to say that indiscriminate use of point-of-care ultrasound will be immune to liability, but it suggests that failure to use bedside ultrasound when indicated may outweigh the risks of an occasional error.

In addition to technical limitations, another drawback of EUS by emergency physicians is time. An emergency physician engrossed in ultrasound studies is unable to see and evaluate a new patient, speak with consulting physicians, or perform a number of other tasks that emergency physicians are uniquely qualified to do.[10] For this reason it is important for emergency physicians be proficient at using ultrasound devices, and that EUS is used selectively in situations where quality of care and workflow efficiency are improved by its use.

Overall, it is important that the global benefits and detriments of EUS be taken into consideration by individual physicians and emergency departments, as well as by policymakers at a regional and national level. There are many factors that are important to consider regarding EUS use and there needs to continue to be dialogue between emergency physicians and radiologists to find the optimal balance that will provide the most benefit to patients. Since the initial recommendations from the CAEP, EUS training has infiltrated the curricula of most Canadian residency programs, but there remain considerable discrepancies among scope of training, quality assurance, and standardization.[3] The commitment to EUS training among already practicing emergency physicians has not been as successful. This lack of participation could be because training courses are not easily accessible or affordable, or perhaps there is hesitancy because of a perceived malpractice threat or deterrence from colleagues in other specialties. Despite the sluggish uptake of EUS in Canada, it seems clear that EUS has become an important part of the practice of emergency medicine and will eventually be considered a standard of care, requiring all emergency physicians to be proficient in its use in order to practice in a Canadian ED.

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Hepatitis B: A Concise Review

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ABSTRACT

Since the introduction of Hepatitis B preventative measures including the vaccine, the worldwide prevalence of Hepatitis B viral (HBV) infection has fallen. Despite this, chronic infection still remains a major global health problem, with more than 350 million people chronically infected. Chronic infection leaves those affected at risk of hepatic decompensation, cirrhosis, and hepatocellular carcinoma. In developed countries, the burden of disease is greatest among marginalized populations and immigrants from regions where HBV is endemic, making chronic hepatitis B an important, but clinically silent public health issue. The approval of the first potent oral antiviral agent in 1998 has revolutionized the management of hepatitis B, and current treatments such as conventional and Pegylated Interferon alpha as well as nucleoside and nucleotide analogues are widely used to suppress virus replication, reduce hepatitis activity, and halt disease progression. Nevertheless, because those most affected rarely seek medical attention, these treatments often fail to reach those who most need them. Fear of stigmatization and insufficient knowledge of HBV are important barriers to screening and treatment. As the immigrant population increases in Canada, medical students should be aware of opportunities for education, screening, prevention, and treatment of chronic hepatitis B to increase awareness and limit the spread of the disease.

KEYWORDS: *chronic hepatitis B, HBV, cirrhosis, hepatocellular carcinoma*

INTRODUCTION

Hepatitis B is a serious global health problem, and despite the availability of a highly effective vaccine, approximately 350 million people are chronically infected worldwide. Approximately 0.5 to 1.2 million people die yearly due to Hepatitis B virus (HBV)-associated liver pathologies such as cirrhosis and hepatocellular carcinoma (HCC).[1-3] In Canada, between 240,000 to 600,000 people, up to 70% of them immigrants, are thought to have chronic HBV infection.[4-6]

Natural history of acute and chronic hepatitis B infection

HBV is a partially double-stranded, enveloped DNA virus that infects hepatocytes. Transmission of HBV can occur vertically from infected mother to child. HBV can also be transmitted horizontally through sexual contact or paraenterally through IV drug use, sharps injury, or contaminated blood products. After infection of hepatocytes, the viral genome is delivered to the nucleus and converted to covalently-closed circular DNA (cccDNA). This cccDNA serves as a template for the transcription of key markers of HBV infection, including the HBV surface antigen (HBsAg) and e-antigen (HBeAg).[7] HBV infection is not directly cytopathic, except under specific conditions of significant immunosuppression—such as chemotherapy or post-transplant immunosuppressive medications—but leads to a wide spectrum of liver disease from acute to chronic viral hepatitis. These outcomes are a result of the hosts' immune response attempting to control the infection, specifically in the case of cirrhosis. The serum level of HBV-DNA is associated with cirrhosis and HCC development in a dose-dependent manner, suggesting that HBV replication, with subsequent immune-mediated liver injury, is the primary driving force for liver disease progression, while cirrhosis, regardless of its etiology, is itself a strong risk factor for HCC.[8-9]

HBV infection can be either acute or chronic. In an acute infection, the initial incubation phase lasts 2-6 weeks, and the

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