Great Evidence in Medical education Summary (GEMeS)

Summary By: Kristen Weersink and Andrew Hall

Educational Question or Problem	What is the bedside ultrasound (US) learning curve of Emergency Medicine (EM) trainees, and when do they reach a performance plateau?
Bottom Line	Current recommendations of the performance of 50 scans as a marker of competency may underestimate the experience needed to achieve good sensitivity and specificity in the majority of EM ultrasound (US) examinations using expert ED ultrasonographers as the criterion standard.
Why is it relevant to Emergency Medicine Education?	US has a multitude of clinical applications, has become part of the standard practice of EM, and is an integral part of most EM residency training programs. Current guidelines utilize number of scans performed as a measure of competency. This is based on expert opinion and consensus alone, with little supporting evidence[1,2]. In the present study, Blehar *et al.* seek to explore the learning curves associated with image acquisition and interpretation in US to better understand the threshold at which competency can be achieved and how best to assess this skill. Performance plateaus found in this study offer a guide to understanding skill acquisition over time in novice ultrasonographers and a potential threshold point beyond which little improvement occurs with more hands on experience. The current recommendation of 25-50 scans[1,2] is sufficient for some (i.e. soft tissue, cardiac) but too low for other examination types (i.e. renal, aorta, etc.). The present review concludes that 50-75 scans is a good benchmark level to achieve excellent image acquisition and interpretation in the majority of examinations. This study highlights some limitations to using a constant number of scans as the measure of competence in US and offers more information on how a given experience level translates into a predicted level of performance.
Reference	Blehar DJ, Barton B, Gaspari RJ. **Learning Curves in Emergency Ultrasound Education.** Academic Emergency Medicine 2015; 22:574-82. 10.1111/acem.12653
Study Design	This was a retrospective review of an educational database from a single EM residency training program over 5 years. Each examination was scored for agreement between initial interpretation and expert final review. Novice ultrasonographers' learning curves were plotted to establish the

	performance plateau for each type of US examination studied.
Funding Sources	None reported.
Setting	Four different emergency departments (ED) under one EM residency training program in the United States, ranging from a small community ED to a level I trauma center.
Level of Learning	All levels of residents and attending physicians in EM without prior US training or experience.
Synopsis of Study	A retrospective review of an educational database of 52,408 US examinations was undertaken to characterize learning curves of novice ultrasonographers and to compare their skills to expert ED ultrasonographers. Digital video recording of every US exam was reviewed by unblinded physician experts based on image interpretation, image acquisition skill, and resultant image quality using a center specific standardized rating scale. Trainees received immediate feedback via email throughout the study period. US examinations included aorta, cardiac, chest wall, endovaginal uterine, focused assessment with sonography in trauma (FAST), lower extremity duplex, renal, right upper quadrant, and soft tissue. Learning curves for each method were analyzed to determine the plateau point where experiential benefit diminished and to compare to an expert reference curve. Overall image quality and learning curves for image acquisition and interpretation differed by US application, with most displaying a slow steady improvement until a plateau point. In summary: • Performance plateaus for image interpretation occurred later in FAST (57), chest wall (60), renal (78) and aorta (66) compared to both cardiac (30) and soft tissue examinations (27) • Endovaginal uterus and lower extremity duplex did not have definable plateau points in the present study. • All US protocols had excellent specificity • Excluding the FAST exam, a threshold of 50 ultrasound scans for each protocol was found to yield a sensitivity of 84% and a specificity of 90% • For the FAST exam, 50 scans yielded a sensitivity of 80% and a specificity of 96%

References

1. Emergency ultrasound guidelines. Ann Emerg Med 2009; 53:550-70.

2. Lewiss RE, Pearl M, Nomura JT, *et al.* CORD-AEUS:consensus document for the emergency ultrasound milestone project. Acad Emerg Med 2013; 20:740-5.
3. Blehar DJ, Barton B, Gaspari RJ. *Learning Curves in Emergency Ultrasound Education.* Academic Emergency Medicine 2015; 22:574-82.