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OCT 15-18 ——— ★ ——— VIRTUAL





Point of Care Ultrasound: Overview of Applications, Indications, Training, and Technology

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Disclosures

- Jeremy White, DO - Speaker
 - HERT Vest™ Wearable Critical Task Trainer - shareholder



**The ability and need to
effectively learn, apply, and
expand POCUS in EM has
never been greater than
today**

Objectives

- Discuss point of care ultrasound clinical applications and indications.
- Review point of care ultrasound advances in technology and equipment.
- Demonstrate competence in point of care ultrasound training modalities, applications, and opportunities



Figure 1. Ultrasound-guided peripheral IV cannulation, retrieved from <https://www.avatargroup.org.au/blog/tag/patient-safety>

Background

- After more than two decades of integration, POCUS is now considered a standard modality in patient evaluation and care in the emergency setting
- The scope and application of POCUS in emergency care continues to expand and grow
- Clinicians and patients alike are benefitting from significant advances in most aspects of this clinical tool



Figure 2. Portable US machines are now standard equipment in the ED, retrieved from https://www.news.vcu.edu/health/VCU_physicians_for_ultrasounds_at_every_bedside

Clinical Applications and Indications

- Now firmly established in EM across multiple clinical categories, applications, and indications due to:
 - Widespread use
 - Significant evidence base
 - Uniqueness in diagnosis or decision-making
 - Importance in emergency diagnosis and patient care
 - Technological advancement

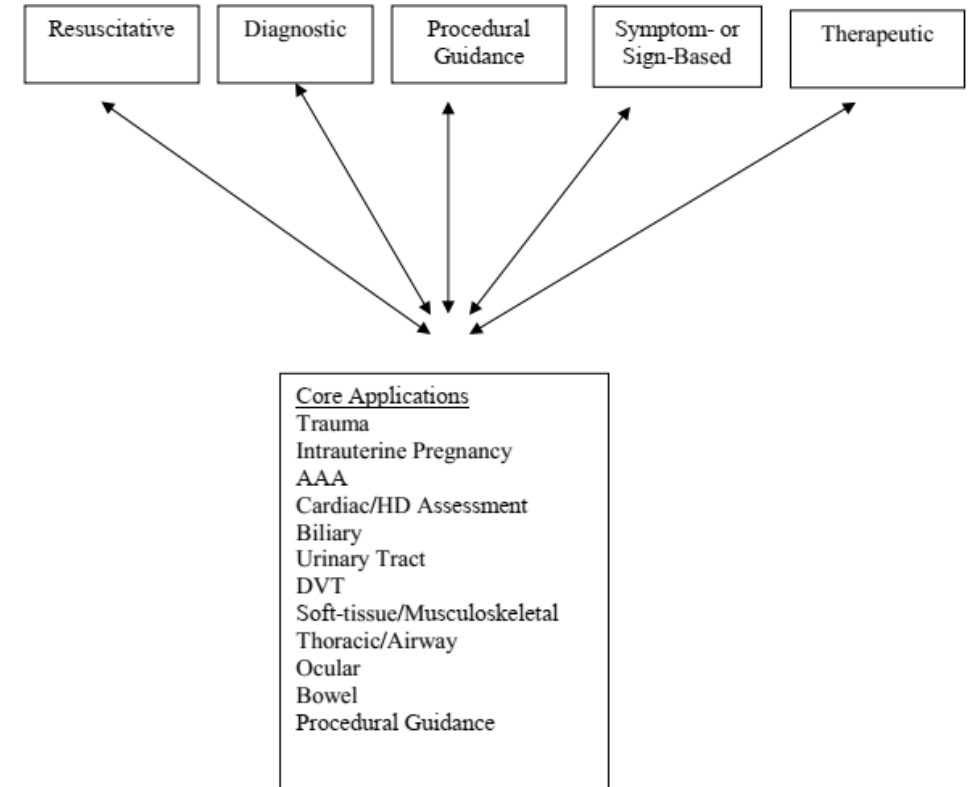


Figure 3. ACEP Emergency US Guidelines Scope of Practice, retrieved from <https://www.acep.org/patient-care/policy-statements/ultrasound-guidelines-emergency-point-of-care-and-clinical-ultrasound-guidelines-in-medicine/>. Copyright © 2016 American College of Emergency Physicians.

Technology

- Traditional US technology: piezoelectric crystal array converts electricity to ultrasound
 - Multiple transducers needed for different applications
- Ultrasound-On-Chip technology: use silicone chips to convert voltage to resonance
 - Only one transducer needed for different applications
- This advancement has disrupted the entire market, which is now trending like other consumer electronics devices

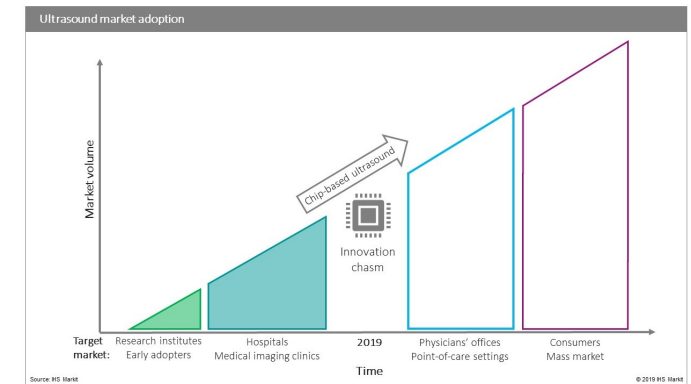
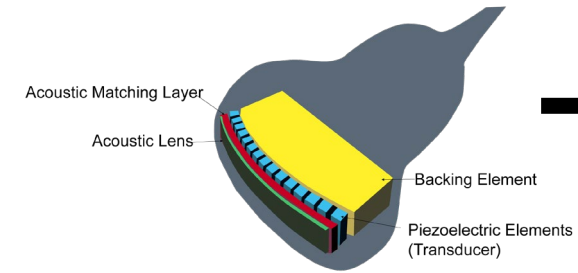


Figure 4 (top left). Piezoelectric US transducer, retrieved from <https://onscale.com/blog/the-advantages-of-using-composite-piezoelectric-transducers-for-medical-ultrasound/>
Figure 5 (top right). Chip-based US transducer, retrieved from <https://www.butterflynetwork.com/iq>
Figure 6 (bottom). Chip-based US market adoption, retrieved from <https://technology.informa.com/618180/the-future-of-ultrasound-is-on-a-chip>

Equipment

- Wide array of choices in a rapidly expanding market
- Quickly moving toward wireless and ultra-portable app-based ultrasound
 - Image quality and acquisition software improving
 - Cost significantly dropping
- Most equipment also incorporated into cloud-based training and data storage ecosystem



Figure 7 (top). Multiple US machines in a large ED, representing > \$200K investment, retrieved from <https://www.uab.edu/medicine/em/patient-care/emergency-ultrasound>.
Figure 8 & 9 (bottom). Two version of handheld US machines, representing < \$5K investment, retrieved from <https://www.scientificamerican.com/article/handheld-ultrasound-devices-are-speeding-diagnosis-of-covid-19/> and <https://www.postdicom.com/en/blog/ultrasound-device>.

Training

- Explosion in training options, delivery methods, curriculum integration, and competency guidelines at all levels of training:
 - UME
 - GME
 - Fellowship
 - Self-guided
 - FOAMED
 - Simulation



Figure 10 (top). Typical US conference, retrieved from <https://www.gcus.com/>.

Figure 11 (bottom left). Hands-on US training at the bedside, retrieved from <https://www.msdu.org/spring-seminar.htm>

Figure 12 (bottom right). Self-directed US-guided pericardiocentesis using HERT Vest™ wearable critical task trainer and SonoSim™ US simulator, retrieved from <https://www.hertvest.com/>.

EM POCUS Quality Assurance/Improvement

- EM POCUS QA/QI plans and processes should be integrated into overall ED operations, including:
 - Image archiving
 - Image review
 - Supervision
 - Feedback
 - Documentation
 - Credentialing
 - Accreditation

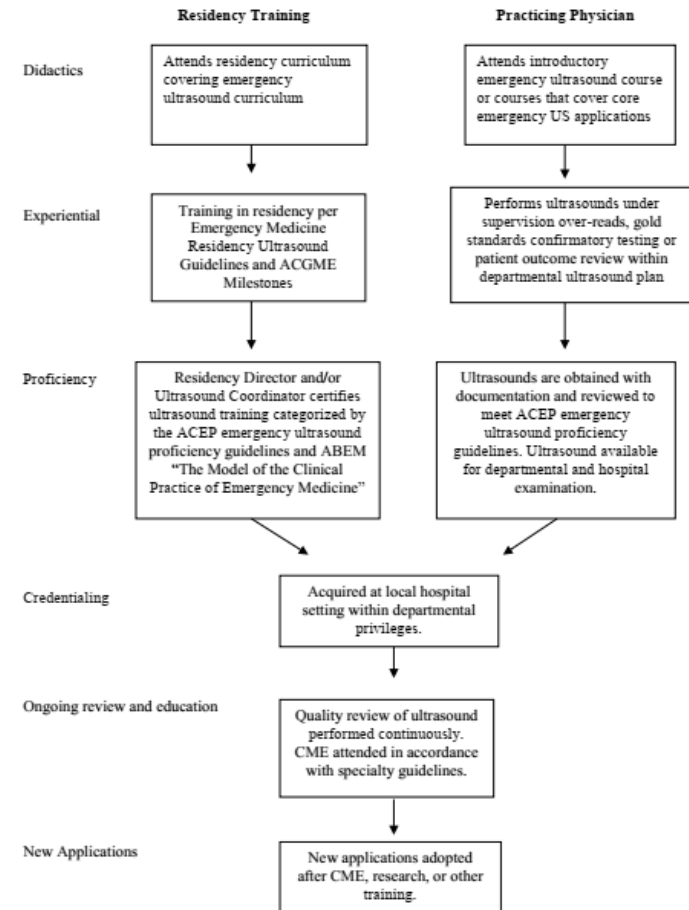


Figure 13. Pathways for EM US training, credentialing, and incorporation of new applications, retrieved from <https://www.acep.org/patient-care/policy-statements/ultrasound-guidelines-emergency-point-of-care-and-clinical-ultrasound-guidelines-in-medicine/>. Copyright © 2016 American College of Emergency Physicians.

EM POCUS Value

- Patient benefits >> cost by possibly preventing:
 - Further costly imaging
 - Invasive treatments
 - Unnecessary admissions/consultations
- While improving:
 - Patient safety during routine and critical procedures
 - Patient satisfaction
 - ED resource utilization
 - Clinical decision making
- Reimbursement:
 - Primarily CPT codes and RVU's



Figure 14. SonoSite Patient Safety Guide examples, retrieved from <http://response.sonosite.com/LP=2529>

Summary

- POCUS is a standard of practice in modern EM
- EM clinicians are expected to be proficient in multiple applications and modalities
- Proficiency in this fundamental skill has real value for the patient regarding safety, satisfaction, resource utilization, and clinical decision making
- Fortunately, the technological, educational, and practical advancements in POCUS have made achieving competence more obtainable than ever before



Figure 15. E-FAST being completed on trauma patient during primary survey, retrieved from <https://www.gehealthcare.com/products/ultrasound/point-of-care-ultrasound/venue>

Thank You!



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