OBJECTIVES
- Design a point-of-care ultrasound (POCUS) curriculum for Yale Primary Care internal medicine (IM) residents
- Orient residents to ultrasound basics: choosing appropriate setting, probe, orientation, depth and gain
- Appreciate the growing applications of bedside ultrasound as an extension of the physical exam
- Develop skills in diagnosis and US guided procedures

BACKGROUND
- POCUS to answer diagnostic questions has been widely accepted and validated in Emergency Medicine
- Utilizing POCUS to enhance procedural safety and bedside diagnosis is an ACGME requirement for critical care fellows since 2016
- Medical schools are teaching POCUS in parallel to the physical exam demonstrating improved appreciation of relational anatomy and physical exam skills
- Many POCUS applications are translatable and valuable in IM, but have traditionally not been taught or performed in IM settings
- Since 2012, literature demonstrates the need and effectiveness of POCUS in IM
- A 2013 survey of Internal Medicine program directors found 95% programs desired ultrasound training to enhance procedure safety; 54% taught POCUS to enhance diagnosis
- In 2013, Drs. Soares and Chia created a POCUS program at Waterbury Hospital, modelled after the Yale Medical Student Ultrasonic Curriculum and Yale POCUS Basic CME Course
- In 2015, The Yale Primary Care residency program committed to education of evidence based POCUS

METHOD
- Faculty leaders (Drs. Soares, Donroe, Sofair) trained with EM and ICU POCUS experts to learn technical and procedural skills from 2012-2016
- A comprehensive literature search reviewed implementation of POCUS in other internal medicine programs and courses
- A local needs analysis of high-yield ultrasound applications was conducted via interviews with program leadership, local POCUS experts, critical care faculty, resident focus groups
- Curriculum proposal developed and reviewed with YPC and critical care program leadership
- Ultrasound machine funding obtained, machines tested for optimal utility in IM
- Phillips Sparq machine secured and optimized
- Pilot Curriculum for POCUS developed in 4 modules:
  1) Fundamentals of Using Machine
  2) Acquisition of Lung Artifacts and Anatomy
  3) Acquisition of Basic POC Echocardiography
  4) Interpretation of images following a diagnostic algorithm to diagnose etiology of dyspnea
- Pilot curriculum trialed during ambulatory workshops – initial 1 hour introductory lecture, supplemented by online video and laminated pocket cards
- 2 hour workshop with a 1:3 faculty ratio for: bedside scanning practice and image acquisition; Image interpretation in clinical context
- 2 week follow-up to reinforce knowledge, skills and attitudes regarding POCUS, its utility and limitations
- Residents participated in an anonymous online Qualtrics survey to provide feedback
- Residents invited to participate in weekly scanning sessions on medicine or ICU floors to practice skills

RESULTS
- Over 6 month pilot period 21/54 residents participated for IM residents
- 10/21 residents completed the Qualtrics evaluation
- 100% residents found the Introductory lecture very or extremely effective in developing foundational knowledge
- 89% residents found the hands-on scanning sessions very or extremely effective in developing tactile scanning skills
- 71% found the image interpretation session very effective
- 33% found the pocket card “extremely useful”; 55% found it “moderately useful” – group requested electronic versions
- 100% residents stated that Yale Primary Care should have a core POCUS curriculum
- “This is essential and needs to be incorporated into our core ambulatory curriculum. Diagnostic US seems as though it will be an essential skill for any diagnostian of the next 5-10 years, no reason to fall behind the curve.”
- “I think that including this curriculum is visionary – POC US I believe will become standard in clinical practice in the future”

CONCLUSIONS
- POCUS is an evidence-based and clinically useful skill for IM residents
- Yale Primary Care residents had positive feedback about the pilot POCUS Curriculum
- The mixed learning modalities of lecture, electronic pocket card, deliberate practice scan time was effective in learner satisfaction
- Residents desire more core curricular time for POCUS
- Future Directions:
  - Subsequent modules will focus on developing core procedural skills as identified by program directors’ survey, including peripheral IV placement, central line placement, paracentesis, point-of-care ECHO to assess for pericardial effusion and volume status
  - Development of a musculoskeletal ultrasound module in collaboration with rheumatology
  - Assessment of skills using the SonoSIM simulation models to demonstrate procedural and image acquisition competency
  - Development of a 2-week internal medicine POCUS elective
  - Collaboration with the ICU rotation for procedural skill practice and POCUS assessment of shock
  - Collaboration with the ICU rotation for procedural skill practice of paracentesis

REFERENCES

ACKNOWLEDGEMENTS
- Teaching and Learning Center Medical Education Fellowship: Special thanks to Janet Halter, Ed D and Christos Hionos
- YPC Ultrasound Faculty: Joseph Donroe M.D., Andre Sofair M.D., David Chia M.D.
- YPC leaders: John Moriarty M.D., Stephen Huot M.D.
- Yale EM ultrasound mentors: Rachel Liu M.D., Sheeja Thomas M.D., Chris Moore M.D.