Point-of-Care Ultrasound Mini Workshop for IM Residents: A Pre/Post-Training Assessment of Bedside Diagnostic Confidence

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Introduction

- Point-of-care ultrasound (POCUS) is a goal-directed, bedside ultrasound examination performed by a healthcare provider to answer a specific diagnostic question or to guide the performance of an invasive procedure[1].
- Rapid advancements in ultrasound technology have made ultrasound much more accessible, portable, and affordable[2].
- Multiple studies have shown that point-of-care ultrasound improves clinical outcomes in various settings such as emergency rooms or low-resource areas[3,4].
- Point-of-care ultrasound to answer diagnostic questions has been widely accepted and validated in emergency medicine. The Accreditation Council for Graduate Medical Education (ACGME) has considered POCUS a core competency in emergency medicine. Also, it recently declared POCUS a core competency in family medicine residency in 2023[5,6].
- ACGME recently suggested offering point-of-care ultrasound to internal medicine residents who believe this will be relevant for their future career practice[7].
- As point-of-care ultrasound has been shown to improve patient health outcomes and satisfaction[8], it is critical that internal medicine residents receive training in it to improve their bedside clinical confidence in diagnosing common inpatient medical problems.

Methods

- Four internal medicine interns and three second-year residents in an inpatient setting at a single institution in 2023 were the participants in the study.
- All participants received a 45-minute online didactic lecture, including fundamentals of lung ultrasound and ultrasound criteria for diagnosing pneumonia, pleural effusion, and pneumothorax which were the pathologies of interest.
- Participants further received a one-hour hands-on skills demonstration of point-of-care ultrasound image acquisition and interpretation of these lung pathologies by a Critical Care physician.
- Participants were required to complete a pre-training questionnaire which consisted of four questions that asked them to rate their confidence in diagnosing pneumonia, pleural effusion, and pneumothorax at the bedside on a scale of one to five, with one being not confident at all to five being very confident[9].
- After the point-of-care ultrasound training session, participants repeated the same questionnaire to help identify improvement in confidence in diagnosing the previously mentioned three lung pathologies of interest pneumonia, pleural effusion, and pneumothorax at the bedside.
- A one-tail paired t-test was performed to quantify the improvement in confidence after POCUS training and intervention.

Results

Question 1: Pneumonia Pre/Post-training Assessment of Confidence Results

	Pre-Training Assessment	Post-Training Assessment
Sample Size	7	7
Mean	2.9	4.0
Standard Deviation	0.9	0.0
Average of Differences	1.14	
Percentage of Improvement	+38%	
One Tail Paired T Test P Value	**0.008, statistically significant improvement**	

Question 2: Pleural Effusion Pre/Post-training Assessment of Confidence Results

	Pre-Training Assessment	Post-Training Assessment
Sample Size	7	7
Mean	2.7	4.3
Standard Deviation	0.8	0.5
Average of Differences	1.57	
Percentage of Improvement	+59%	
One Tail Paired T Test P Value	**0.0009, statistically significant improvement**	

Question 3: Pneumothorax Pre/Post-training Assessment of Confidence Results

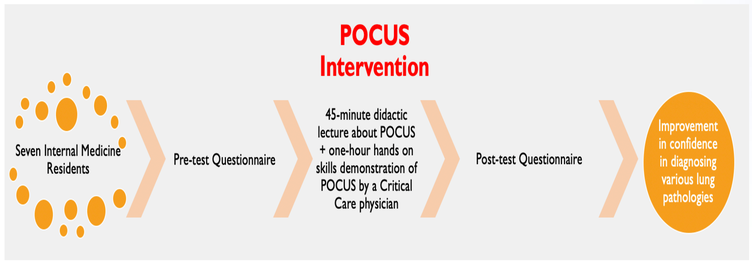
	Pre-Training Assessment	Post-Training Assessment
Sample Size	7	7
Mean	3.9	4.6
Standard Deviation	0.7	0.5
Average of Differences	0.71	
Percentage of Improvement	+18%	
One Tail Paired T Test P Value	**0.05, statistically significant improvement**	

Question 4: Overall Lung Pathology Pre/Post-training Assessment of Confidence Results

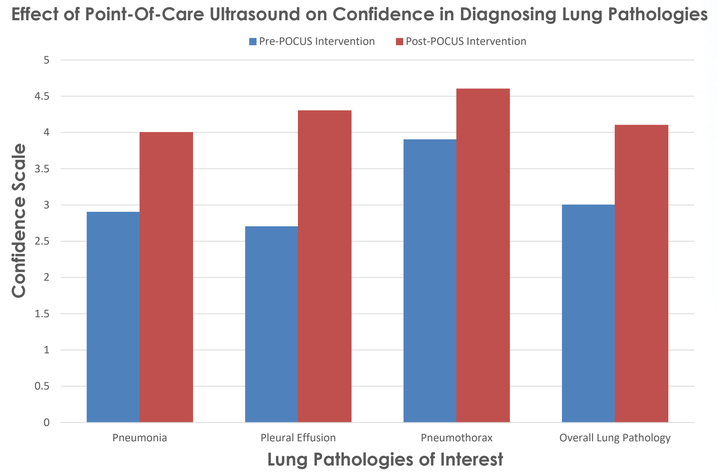
	Pre-Training Assessment	Post-Training Assessment
Sample Size	7	7
Mean	3.0	4.1
Standard Deviation	0.6	0.4
Average of Differences	1.14	
Percentage of Improvement	+37%	
One Tail Paired T Test P Value	**0.0001, statistically significant improvement**	

Research Question and Model

Research Question: Does point-of-care ultrasound training improve internal medicine residents' bedside confidence in diagnosing pneumonia, pleural effusion, and pneumothorax in an inpatient setting?
Design: The research design is primarily a quantitative study with the learners' responses based on the Likert scale of one to five, with one being not confident at all to five being very confident, pre and post-intervention with point-of-care ultrasound training.
We then utilized a one-tail paired t-test to quantify the improvement in confidence after POCUS training and intervention.



Data



Discussion

- Limitations: Small sample size, limited and easy-to-diagnose pathology, POCUS training session was limited to one 45-minute didactic session (knowledge) and a 1 hour long hands-on skills training (psychomotor).
- The results for all four questions on the questionnaire showed statistically significant improvement in confidence from pre-point-of-care ultrasound intervention versus post- intervention.
- Thus, point-of-care ultrasound intervention increased the confidence in diagnosing pneumonia, pleural effusion, and pneumothorax as well as overall confidence in diagnosing lung pathologies by a statistically significant amount for our internal medicine residents.
- Point-of-care ultrasound has been shown to improve patient health outcomes and satisfaction. It can become an adjunct to physical exam across multiple specialties[10].
- We hope this study demonstrates the positive impact POCUS can have on the confidence of internal medicine residents in diagnosing common inpatient pathologies. Also, it makes a case to integrate POCUS training into the overall internal medicine residency curriculum.

Citations:

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