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### Focused POCUS: Cardiopulmonary Curriculum for Internal Medicine Residents

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## PROBLEM STATEMENT

Point-of-care ultrasound (POCUS) is not currently a required core competency in internal medicine (IM) residency despite its inherent benefits. Consequently, many hospitalists are not equipped to confidently acquire or interpret basic ultrasound images.

## BACKGROUND

POCUS is used at the bedside by physicians to answer directed clinical questions to help guide patient management. During the COVID-19 pandemic, the use of ultrasound for quick, accurate diagnosis of life-threatening pathology has been instrumental in early detection of acute cardiopulmonary failure, monitoring treatment response, and minimizing nosocomial spread. We aimed to determine interest in learning POCUS, confidence level, self-rated proficiency, and perceived barriers to mastering imaging techniques and interpretation before and after implementing a dedicated curriculum.

## METHODS

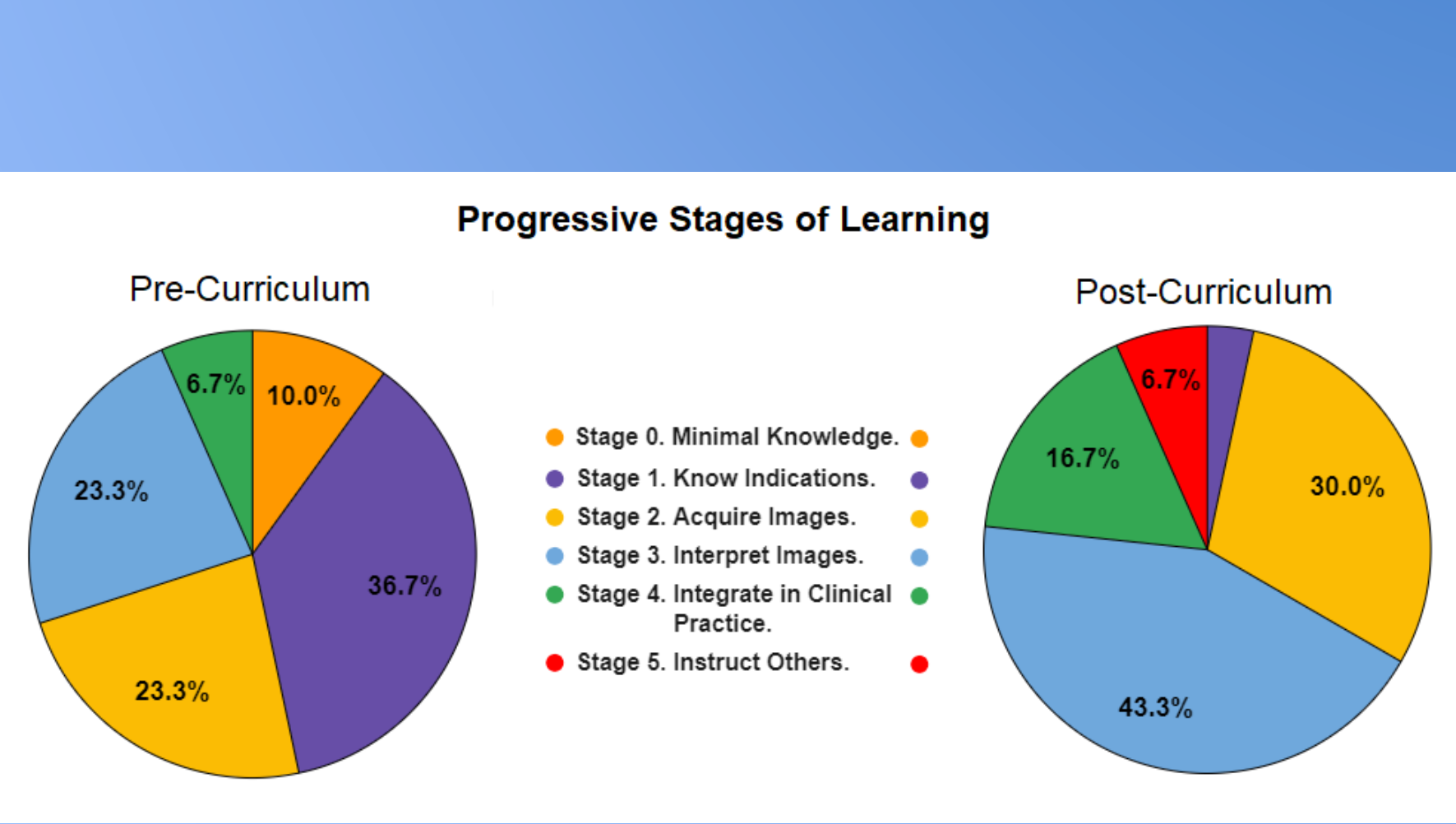
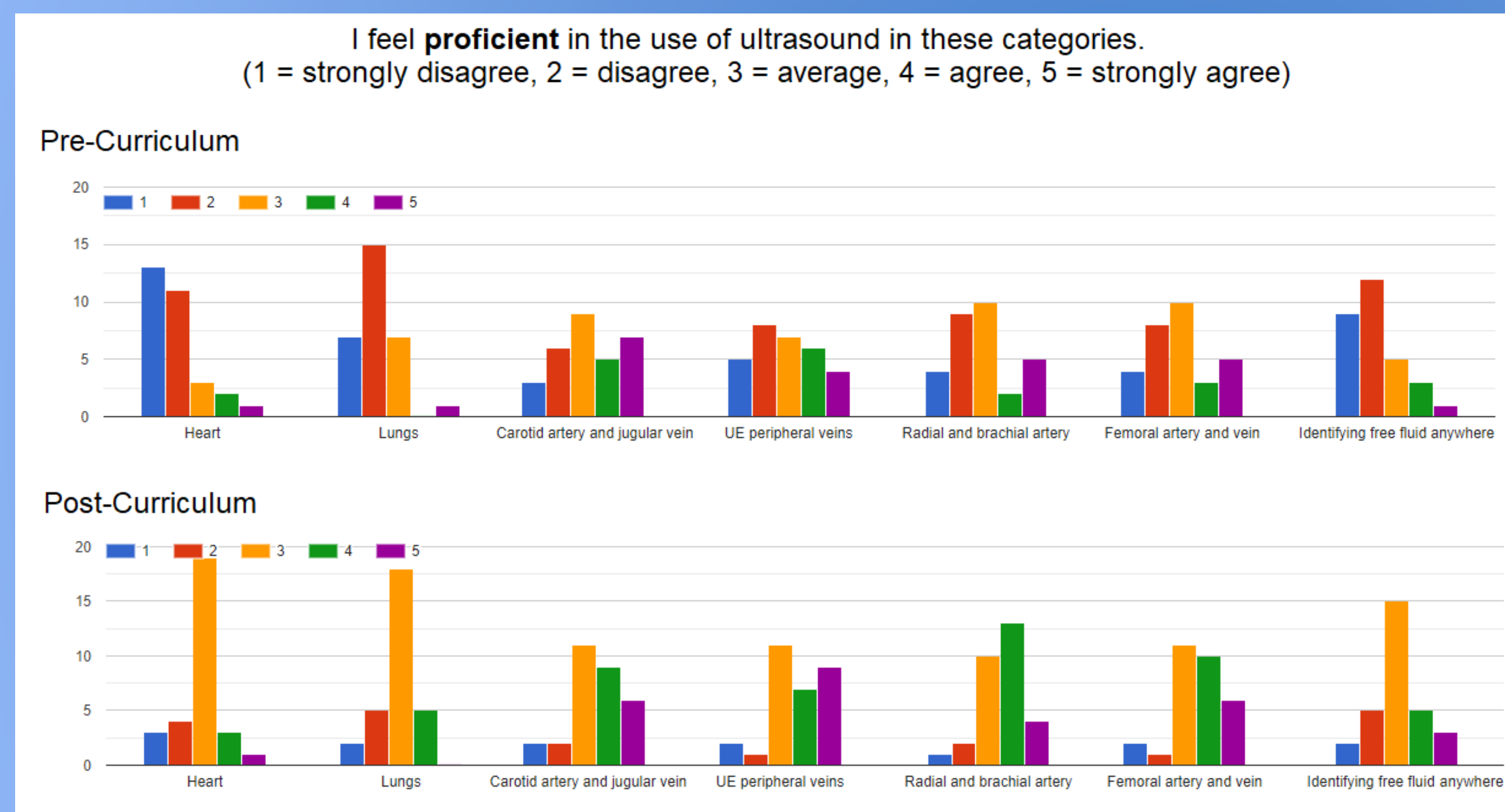
Anonymous pre- and post-curriculum surveys were obtained from 30 IM residents at a community hospital program from 2020-2021. A curriculum consisting of one monthly didactic course with an associated hands-on simulation lab was implemented in small groups of six residents over one year. Topics included basic echocardiography, identifying right heart strain, inferior vena cava collapsibility, techniques for ultrasound-guided vascular access, locating compartmental free fluid, and identifying various pulmonary disorders. The training was facilitated using a low-cost handheld portable ultrasound machine.

## REFERENCES

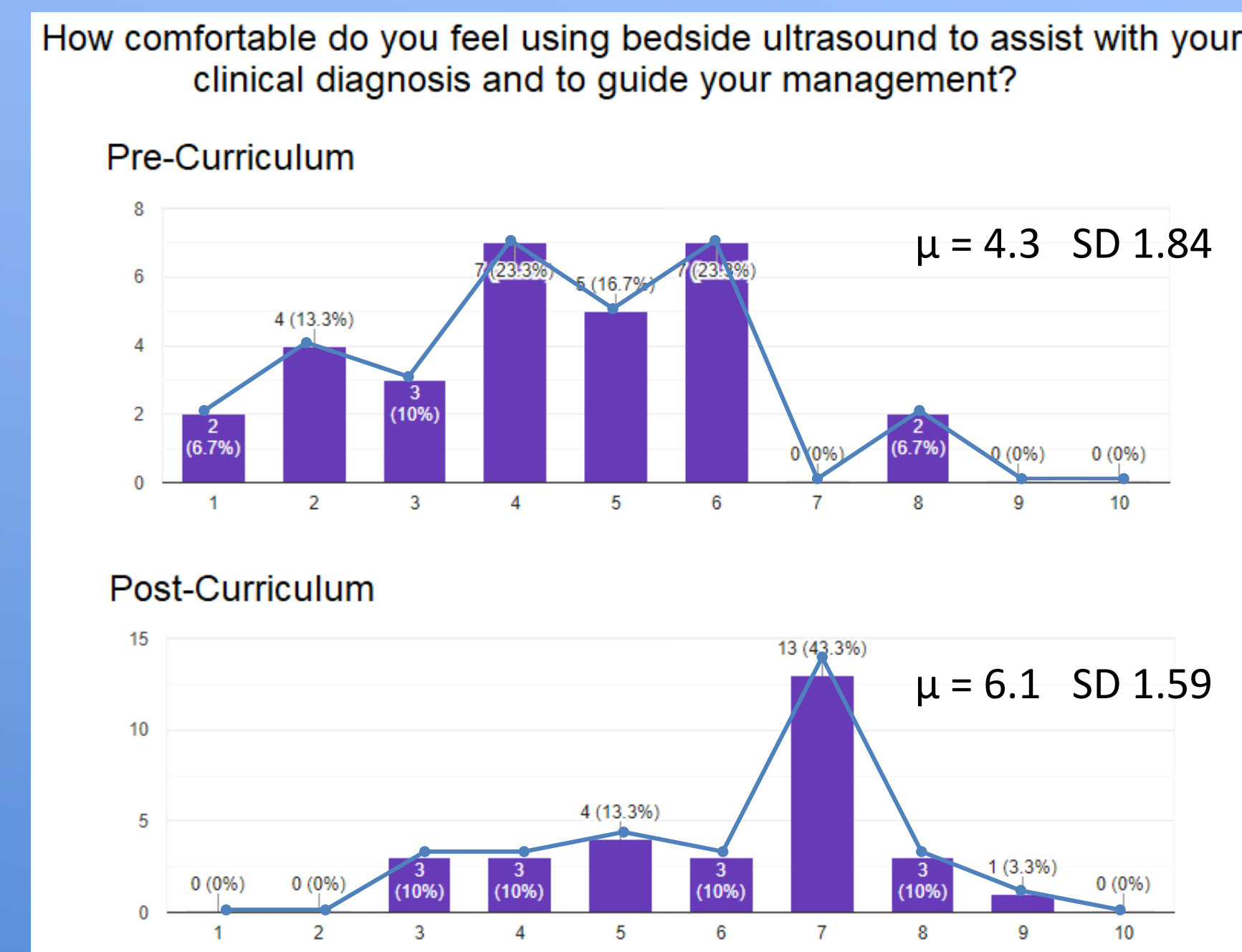
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Questions	Yes	No
Exposure to ultrasound prior to residency?	20% (6/30)	80% (24/30)
Believe ultrasound would be helpful in the inpatient IM setting?	100% (30/30)	0% (0/30)
Believe ultrasound will be helpful in the outpatient IM setting?	90% (27/30)	10% (3/30)
Would utilize ultrasound more in assisting with patient care after completing the curriculum?	76.7% (23/30)	23.3% (7/30)

**Figure 1.** Table providing proportion of internal medicine residents who have had formal ultrasound training prior to residency and their perception of the benefits to their clinical practice.

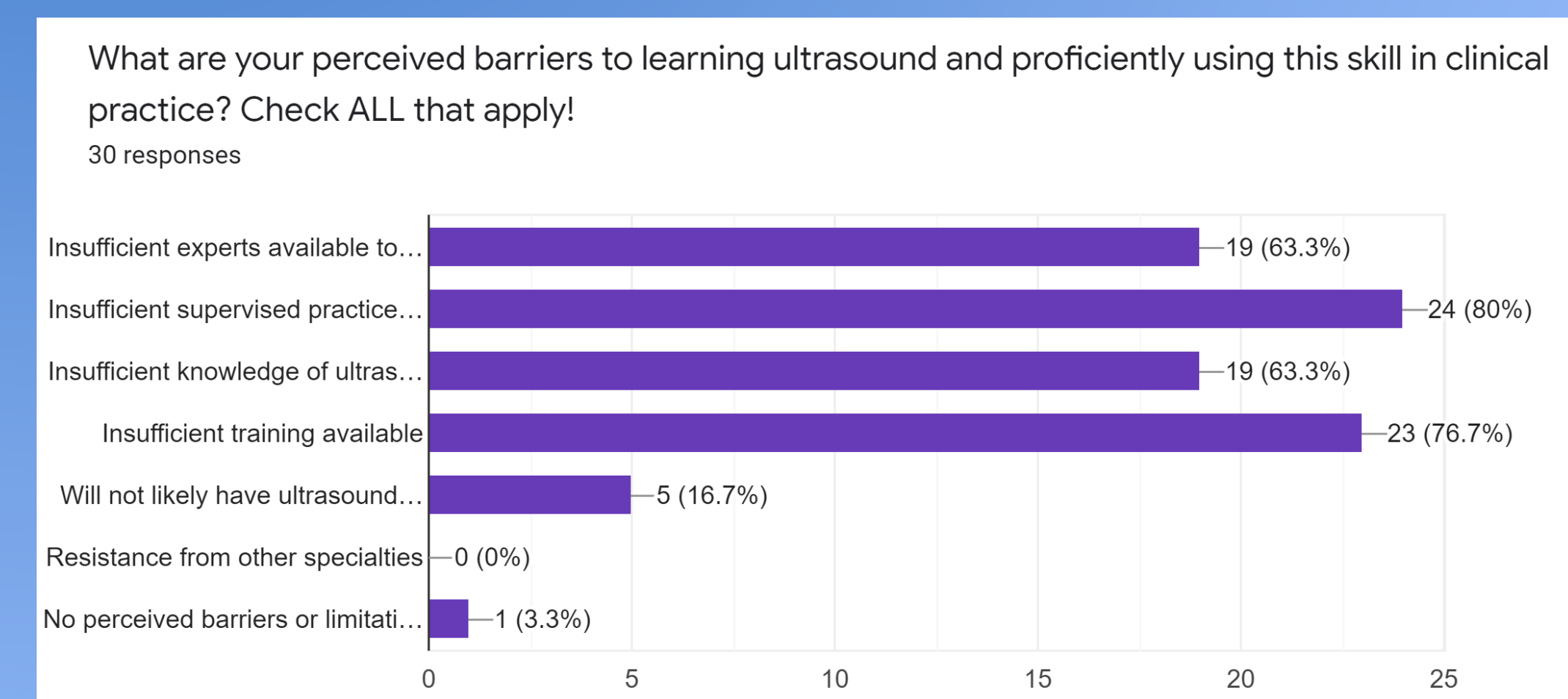


**Figure 4.** Pie chart demonstrating the progressive shift in the stages of learning from minimal knowledge and understanding indications, to integrating interpretation into clinical practice and teaching others.



**Figure 2.** (Above) Bar graph demonstrating comfort level from a scale of 1 (not comfortable) to 10 (very comfortable) in utilizing ultrasound to guide clinical diagnosis and management pre- and post-curriculum.

**Figure 3.** (Left) Bar graph demonstrating the degrees of proficiency in utilizing ultrasound in various cardiovascular, pulmonary, and critical care systems pre- and post-curriculum.



**Figure 5.** Bar graph summarizing the various perceived barriers to learning ultrasound in order to proficiently use or master these skills in clinical practice.

## RESULTS

- A total of 30 IM residents completed both the pre- and post-survey. While 100% and 90% of residents believed learning POCUS will be beneficial in the inpatient and outpatient IM setting respectively, only 20% of residents had any prior formal training on ultrasound. Additionally, 76.7% of residents would utilize ultrasound more post-curriculum (Figure 1).
- On a scale of 1-10, rating their confidence level of using ultrasound in clinical practice to guide management, the average mean score was 4.3/10 (SD 1.84) before implementation of the curriculum and 6.1/10 (SD 1.59) after implementation of the curriculum (Figure 2).
- Self-rated proficiency in obtaining and interpreting key images were poor across the board pre-curriculum, but consistently rose to average or above-average after completing the curriculum (Figure 3).
- Mastery of ultrasound skills occur in stages. There is a progressive shift from minimal knowledge and acquiring images to clinical applications and teaching others. (Figure 4).
- Interestingly, the most common perceived barrier to learning ultrasound and proficiently using these skills in clinical practice was insufficient supervised practice (24/30, 80%), insufficient training (23/30, 76.7%), and insufficient knowledge/experts available (19/30, 63.3%). This demonstrates targetable weaknesses for future improvements (Figure 5).

## CONCLUSION

- A structured POCUS curriculum focused on cardiovascular and pulmonary pathology was successfully incorporated into an IM residency program with minimal expenses and resource utilization.
- POCUS is becoming an integral part of the hospitalists' arsenal in improving efficiency and directing medical care in the inpatient setting.
- Our study demonstrated retention of knowledge, increased interest, and improved confidence in POCUS utilization among IM residents while also suggesting a need for more skilled attending IM providers who can deliver their expertise to medical trainees with a unified goal of improving patient care.
- Future directions to solidify this curriculum would be to implement an oral and written practical assessment post-curriculum to further solidify comprehension, skills, and evaluate knowledge gaps.