Comparison of Handheld Ultrasound Devices used in Carotid and Abdominal Aortic Vascular Studies

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Background

• Point-of-Care Ultrasound (POCUS) is widely used in clinical settings.1
• Numerous devices are available with similar functions.2
• Objective: to compare the image quality of handheld POCUS devices and evaluate their use in vascular ultrasound and as educational tools.

Methods

• The Butterfly IQ+, GE Vscan Air, and Phillips Lumify transducers were evaluated.
• COMIRB: 22-0091.
• Twenty-five healthy subjects (convenience sample) had carotid and abdominal imaging using all devices.
• An expert panel, including a radiologist, reviewed images and completed a survey which included numerical and Likert scale assessments.
• Criteria included image quality, clinical utility, and educational value.

Results

• N = 25; one reviewer completed the survey.
• Mean participant age: 27.3 years; 48% male.
• Past surgical/medical history: 8%
• GE Vscan Air scored higher (ANOVA) for image quality on a Likert Scale for carotid (5.24, p = 0.03) and aortic (4.91, p = 0.04) exams compared to the Butterfly IQ+ and Lumify.
• All devices scored favorably for educational value with no statistical preference for transducer, χ² (2, N = 122) = 4.75, p = 0.09.

Conclusion

• The Vscan Air scored statistically higher on recommendation than the Butterfly IQ+ and the Phillips Lumify for carotid and aortic scans, respectively.
• All devices globally scored low on recommendation, potentially due to higher quality conventional scans generally available to the reviewer (a radiologist).
• The use of the tested handheld devices for educational purposes was supported, though this was not statistically significant between devices.
• Sonographers were not registered vascular technologists.
• Results underpowered due to limited data and single-rater bias. Use of healthy participants limits external validity.
• No comparisons with gold standard vascular laboratory imaging.
• Despite various commercially available POCUS devices, further studies are needed to compare the quality and utility of these devices in vascular ultrasound.

References

Figure 1: Sample carotid ultrasound studies from the same subject using the Butterfly IQ+, GE Vscan Air, and Phillips L12-4 transducers.

Figure 2: Sample aortic ultrasound studies from the same subject using the Butterfly IQ+, GE Vscan Air, and Phillips S4-1 transducers.

Figure 3: Mean score for quality of the study produced by each device p-values shown for ANOVAs; significance from post-hoc analysis shown below.