Effect of Artificial Intelligence Assistance on the Time for Novice Users to Obtain Cardiac Apical-4 Chamber and FAST Right Upper Quadrant Windows

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AI Feedback was associated with longer bedside ulrasound image acquisition time.

Introduction

- Every emergency medicine resident physician must demonstrate competency in point-of-care ultrasound (POCUS) prior to graduation [1].
- There are many barriers to US education including limited time to practice and lack of supervising physician support [2,3].
- Novel US devices with artificial intelligence (AI) software provide real-time feedback to assist learners in improving image quality and have potential to address these barriers.
- The objective of this investigation was to determine the effect of AI assistance on the time for novice users to acquire the cardiac apical 4-chamber (A4C) window and the right upper quadrant (RUQ) portion of the focused assessment with sonography in trauma (FAST).

Methods

- Twelve 1st year residents & two 4th year medical students were enrolled.
- A4C windows were performed using the EchoNous Kosmos (Figure 1A).
- RUQ windows were performed using the Butterfly iQ+ (Figure 1B).
- Participants were randomized to AI first or second groups to limit the effects of learning bias.
- Each group obtained both windows on the same three standardized patients with or without AI during two sessions, one week apart.
- The first group utilized AI during the first session and the second group during the second session.
- The time to complete each US window was recorded. All datasets were skewed rightward. The Wilcoxon Signed-Rank Test was utilized for matched-pairs comparison.
- Pre- and post-surveys were also completed by the participants.

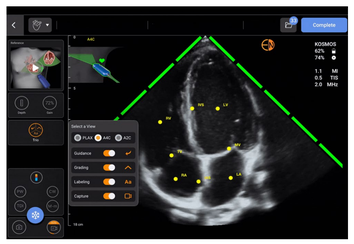

Figure 1A: EchoNous Kosmos A4C with AI feedback.

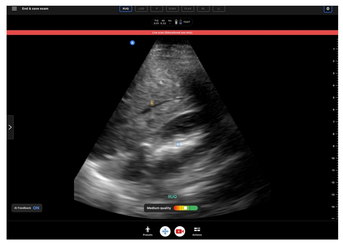

Figure 1B: Butterfly iQ+ RUQ with AI feedback.

Results

- **Median time (seconds) to obtain the RUQ window was longer with AI (89, IQR 91) than without (54, IQR 60, p<0.01, Fig 1).**
- **Median time (seconds) to obtain the A4C window was longer with AI (136, IQR 113) than without (75, IQR 67, p<0.01, Fig 1).**
- The results were consistent in subgroup analysis (Table 1).

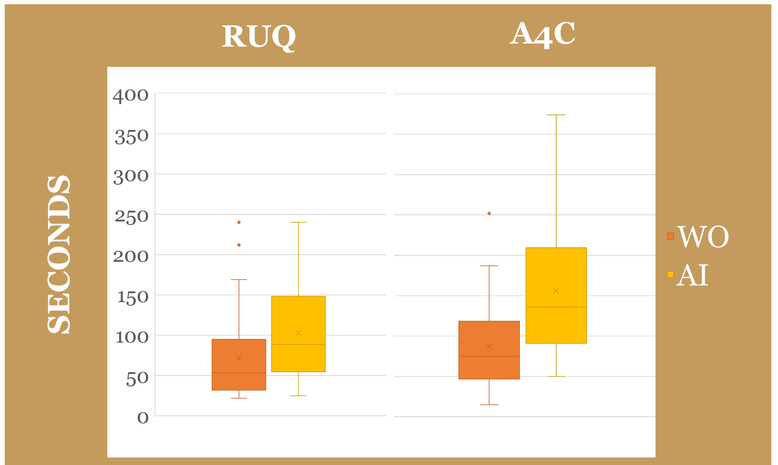

Figure 2: Time (seconds) to obtain the RUQ and A4C windows with and without AI assistance.

Right Upper Quadrant			
Subgroup	**AI**	**Median (IQR)**	**P Value**
AI First	With	88 (95)	0.03
	Without	53 (53)	
AI Second	With	89 (92)	0.03
	Without	54 (62)	

Apical 4-Chamber			
Subgroup	**AI**	**Median (IQR)**	**P Value**
AI First	With	196 (126)	<0.01
	Without	63 (74)	
AI Second	With	106 (73)	0.05
	Without	80 (73)	

Table 1: Subgroup analysis of the time (seconds) to obtain the RUQ and A4C windows with and without AI assistance.

Results Continued

Post-Survey Results:
Please rate the helpfulness of the auto-image grading and guidance tools:

1)	Not at all helpful	(14%)
2)	**Somewhat helpful**	**(36%)**
3)	**A little helpful**	**(50%)**
4)	Very helpful	(0%)

Conclusion

- Real-time feedback from the AI capable US devices was associated with longer image acquisition time, likely because users spent more time attempting to improve image quality.
- Therefore, these devices may not improve clinical efficiency but may be useful for self-teaching purposes.
- Further analysis of the collected data will investigate the effect of these devices on image quality.

Acknowledgement

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References

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