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REmote SOLutions for Telementoring pocus-Echocardiography The RESOLUTE study.

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BACKGROUND

- Point-of-care ultrasound (POCUS) is a powerful tool for bedside assessment of cardiac patients.
- A limitation of POCUS is the need for an expert for image acquisition and interpretation.
- Telementoring is the use of videoconferencing technology to allow an expert to instruct from a remote location.
- REACTS™ software allows instructors to interact with learners in real-time with videoconferencing augmented by image overlays and pointers.
- If psychomotor skills can be instructed remotely via telementoring, the need for on-site experts could be eliminated by extending the physical reach of the expert.

OBJECTIVE

- Determine the feasibility of telementored instruction of cardiac point-of-care ultrasound (POCUS) using videoconferencing.

METHODS

- REB approval
- 33 cardiac surgery intensive care nurses with no previous sonography training.
- CAE Healthcare VIMEDIX™ Simulator
- REACTS™ software setup per figures 1 & 2
- Single instructor guided each subject in real-time to obtain five standard POCUS views (parasternal long-axis, parasternal short-axis, apical four chamber, subxiphoid and IVC)
- The simulator was then randomized to one of 4 pre-set pathologies (anterior myocardial infarction, cardiac tamponade, dilated cardiomyopathy and ventricular fibrillation).
- The instructor then guided the subject remotely to obtain sufficient POCUS views to determine the underlying pathology. The subject, instructor and reviewing expert were blinded to the diagnosis.
- The instructional time and time to acquire the sonography video loops was recorded. Two sonography experts independently reviewed the recorded loops at a later date, and rated them using a previously validated assessment tool of POCUS image quality, part one of the RACE Tool (Figure 4) and were asked to make a diagnosis of the underlying pathology.

Good image quality, meaningful image interpretation easy	Suboptimal image quality, but basic image interpretation possible	Image quality too poor to permit meaningful interpretation	Not obtained
5	4	3	2
			1
			0

Figure 4 - RACE Tool used to score the subjects sonography images



Figure 1 – REACTS™ - Subject View

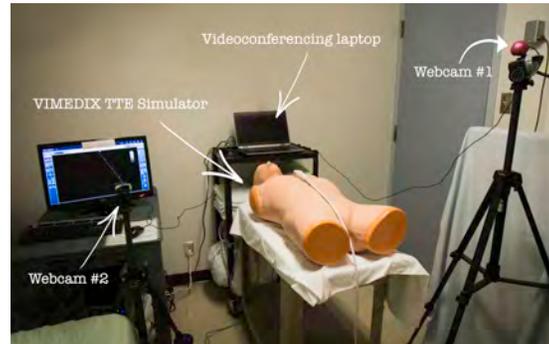


Figure 2 – Subject room setup



Figure 3 – Color-labeled VIMEDIX™ probe and instructor view.

RESULTS

- Mean instructional time was 2.37min ± 40.0sec (range 90-289).
- Mean time required to acquire 5 standard TTE views was 3.60 minutes ± 116.0 seconds (range 210-840).
- Mean time required to for instructor to guide subject through POCUS exam and obtain a diagnosis of underlying pathology was 1.42 minutes ± 49.2 seconds (range 20-217).
- Reviewer 1 scored 93.9% of images and reviewer 2 scored 92.1% of the echo loops of sufficient quality for basic interpretation (RACE score ≥3).
- The inter-rater reliability between the two reviewers' assessment of clinically acceptable echo loops was kappa = 0.580 (95%CI: 0.333, 0.827) suggesting moderate inter-rater reliability.
- Both reviewers correctly identified 32 of 33 underlying pathologies (kappa 0.919 (95%CI: 0.809, 1.029)).

DISCUSSION

Limitations

- Using a simulator instead of living subjects limits the real-world applicability
- "Learning" of the simulator facilitates instruction and diagnosis of underlying pathology.

Interpretation

- Demonstrates feasibility of remoted instruction of psychomotor skills required for POCUS.
- Extends the reach of the expert physician not only for instruction, feedback and troubleshooting of POCUS education but could bypass the need for local experts entirely.

Future Studies

- Apply telementoring principles to other areas involving challenging psychomotors skills such as regional anesthesia.

CONCLUSION

- Telementored subjects with no previous sonographic experience are able to obtain cardiac POCUS images on a high-fidelity simulator that enable accurate diagnoses. This study demonstrates the feasibility of remote instruction of the psychomotor skills necessary to perform point of care cardiac ultrasound by sonography naïve subjects.

REFERENCES

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