Department of Emergency Medicine Research Program, Saint John, NB

ULTRASIM: ULtrasound in TRAuma SIMulation Does the use of ultrasound improve diagnosis during simulated trauma scenarios?

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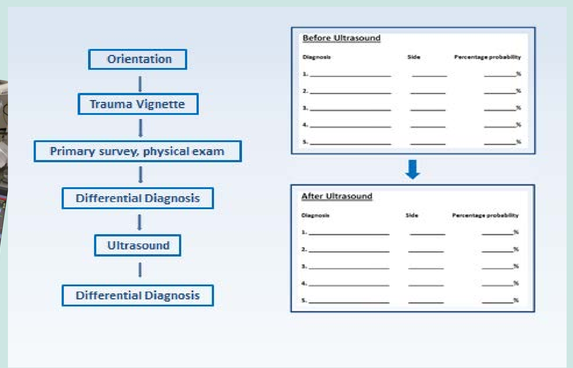
Introduction:

Point of care ultrasound (US) is a key adjunct in the management of trauma patients, in the form of the extended focussed assessment with sonography in trauma (E-FAST) scan. This study assessed the impact of adding an edus2 ultrasound simulator on the diagnostic capabilities of resident and attending physicians participating in simulated trauma scenarios.

Methods:

12 residents and 20 attending physicians participated in 114 trauma simulations utilizing a Laerdal 3G mannequin. Participants generated a ranked differential diagnosis list after a standard assessment, and again after completing a simulated US scan for each scenario. We compared reports to determine if US improved diagnostic performance over a physical exam alone. Standard statistical tests ($\chi 2$ and Student t tests) were performed. The research team was independent of the edus2 designers.



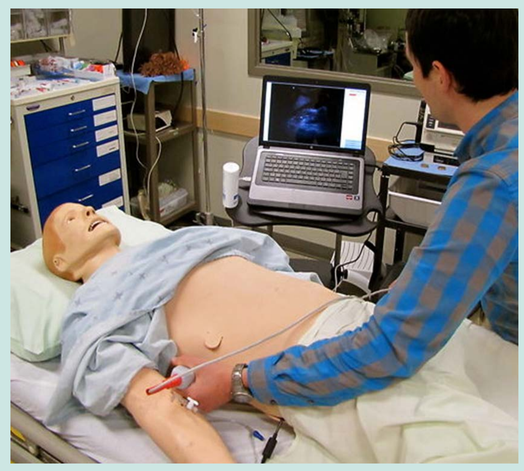


Figure 1: edus[2] ultrasound simulator and SimMan 3G mannequin simulator

Results:

Primary diagnosis improved significantly from 53 (46%) to 97 (85%) correct diagnoses with the addition of simulated US ($\chi 2 = 37.7$, 1df; $p = <0.0001$). Of the 61 scenarios where an incorrect top ranked diagnosis was given, 51 (84%) improved following US.

Participants were assigned a score from 1 to 5 based on where the correct diagnosis was ranked, with a 5 indicating a correct primary diagnosis. Median scores significantly increased from 3.8 (IQR 3, 4.9) to 5 (IQR 4.7, 5; W=219, p<0.0001).

Participants were significantly more confident in their diagnoses after using the US simulator, as shown by the increase in their mean confidence in the correct diagnosis from 53.1% (SD 22.8) to 83.5% (SD 19.1; t=9.0; p<0.0001)

Additionally, participants significantly narrowed their differential diagnosis lists from an initial medium count of 3.5 (IQR 2.9, 4.4) possible diagnoses to 2.4 (IQR 1.9, 3; *W*=-378, p<0.0001) following US.

The performance of residents was compared to that of attending physicians for each of the above analyses. No differences in performance were detected.

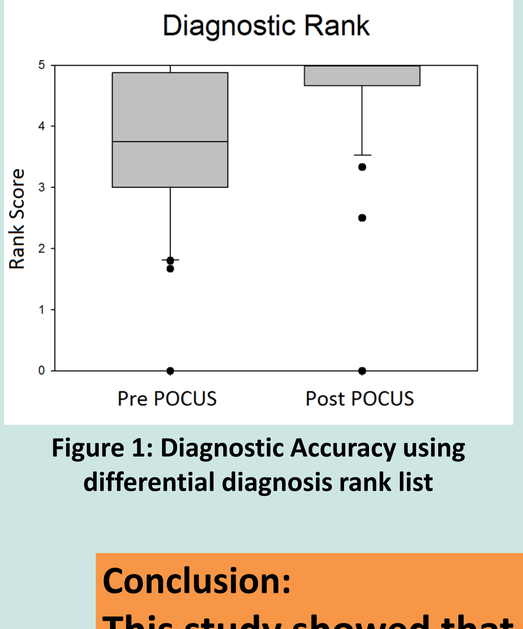


Figure 1: Diagnostic Accuracy using differential diagnosis rank list

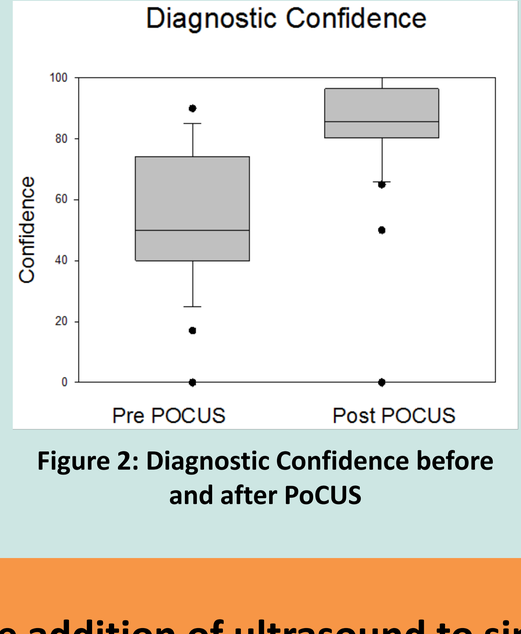


Figure 2: Diagnostic Confidence before and after PoCUS

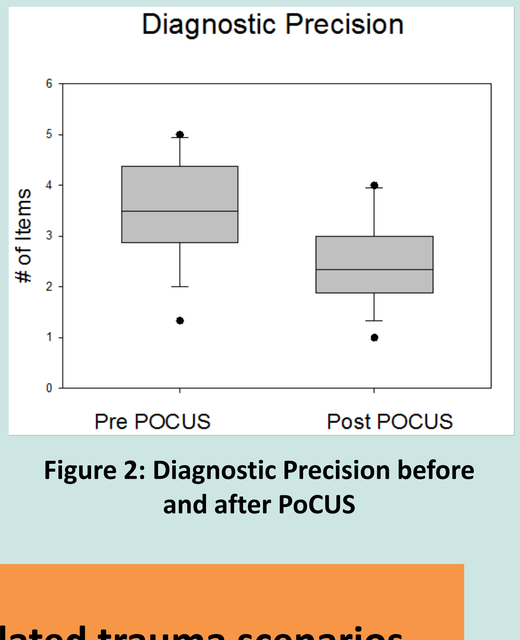


Figure 2: Diagnostic Precision before and after PoCUS

Conclusion:

This study showed that the addition of ultrasound to simulated trauma scenarios improved the diagnostic capabilities of resident and attending physicians. Specifically, participants improved in diagnostic accuracy, diagnostic confidence, and diagnostic precision. Additionally, we have shown that the edus2 simulator can be integrated into high fidelity simulation in a way that improves diagnostic performance.

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