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Nurse delivered focused echocardiography to determine intravascular volume status in a deployed maritime critical care unit

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Introduction

Focused echocardiography is increasingly used by clinicians in the management of critically ill patients and has been adopted by the Defence Medical Services as a tool to guide flow assessment and resuscitation in deployed critical care.

Objectives

We aimed to explore whether two focused echo techniques; Inferior Vena Cava (IVC) and Left Ventricular Outflow Tract (LVOT) Velocity Time Integer (VTi) variability could be taught to a group of critical care nurse who had no previous exposure to ultrasound imaging.

Methods

Ethical approval was waived for this service improvement study. After a five week program of training validation was carried out on healthy volunteers. The mentor, an accredited focused echo trainer, and six nurses performed a total of 48 scans on 11 volunteers. The mentor and students acquired subcostal long axis and apical five chamber windows using a high frequency linear ultrasound probe (Sonosite M Turbo, P21-51x transducer). Mean values from three measurements were obtained for IVC diameter and LVOT VTi. Minimum and maximum values were recorded for both variables across a full respiratory cycle. Echo images were saved and at least two images for each student were reviewed offline by an accredited echo training supervisor.

Results

In all cases students were able to obtain adequate echo windows. There was good correlation between values recorded by the mentor and students for both IVC diameter ($r = 0.90$, $p < 0.001$) and LVOT VTi ($r = 0.77$, $p < 0.001$). Bland Altman analysis showed good correlation with minimal bias for VTi measurements. There was, however, some increase in bias for IVC measurements below 1.2 cm.

Conclusion

We demonstrated that two focused echo techniques for assessing intravascular volume status could be acquired by specialist nurses, with no previous experience, in a relatively short time and that results were comparable to those produced by an experienced practitioner. These results will need to be replicated in a clinical setting before being adopted into practice.

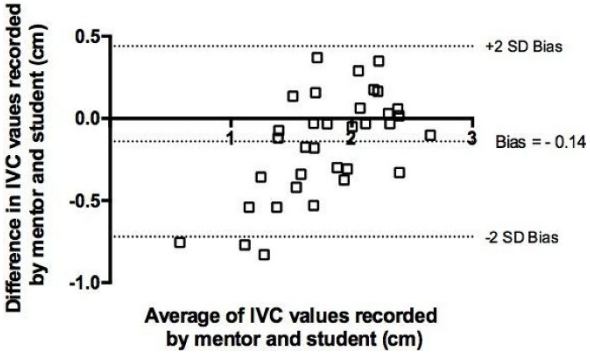

Figure 1 Bland Altman plot of measured IVC diameters.

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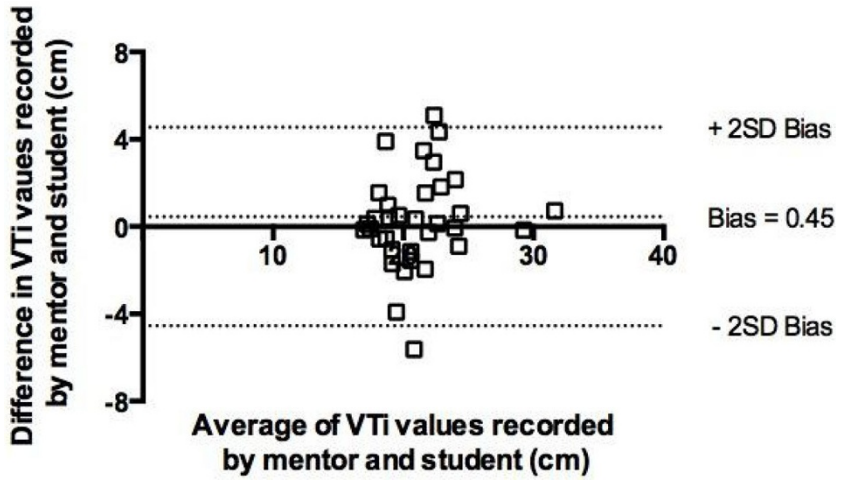

Figure 2 Bland Altman plot of LVOT VTi measurements.

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