

AI TOOLS
ARE ABLE TO
ANALYZE
FOCUSSED
CARDIAC
ULTRASOUND
EXAMINATION
AND PROVIDE
MORE
ADVANCED
MEASURES
WHICH MAY
OTHERWISE BE
UNACCESSIBLE.

Focussed echocardiography in Critical Care – the use of AI to bridge the Expert gap on the ICU

INTRODUCTION

The use of ultrasound including echocardiography has become ubiquitous in modern critical care practice. Rather than comprehensive examinations, multiple professional societies have advocated focussed transthoracic echocardiography (fTTE) as a core skill for intensivists. These tend to prioritise qualitative (rather than quantitative) assessments. More advanced examinations eg. Doppler and strain analysis are often inaccessible to the average ICU for a variety of personnel and logistical reasons.

In other areas of healthcare, the use of AI and machine learning in image interpretation is gaining momentum. The additional information provided includes end-diastolic/systolic area, strain analysis, ejection fraction etc (Table). Most, if not all, of these parameters **do not form** part of the fTTE competencies.

OBJECTIVES

To assess the feasibility of Artificial Intelligence in the critically ill patients, its value in training as well as a guide to the quality of image obtained in fTTE.

METHODS

A retrospective analysis of images obtained from critically ill patients in a tertiary centre who underwent comprehensive TTE examination by specialist operator (highest national TTE qualification). LViVo™ from DiA Imaging Analysis was used to analyse the images obtained.

RESULTS

50 patients underwent comprehensive TTE examination, 178 study windows obtained

All patients had images obtained of sufficient quality to allow for more advanced calculations such as LVOT VTI, end diastolic and systolic volume and ejection fraction by the expert operator.

The software was able to run a full analysis of 26/50 (52%) and 32/50 (64%) of images for the LV and RV respectively.

LV parameters	RV parameters
End Systolic Area	Fractional Area Change
End Diastolic Area	End Systolic Area
Stroke Volume	End Diastolic Area
Ejection Fraction	Free Wall Strain
Global Longitudinal Strain	Tricuspid Annular Plane Systolic Excursion
Segmental and Global LV strain	

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Conclusion

The use of fTTE in critical care is becoming well established and all practitioners at this level are trained to obtain the standard apical, parasternal and subcostal windows. There is then an **obvious gap** in capabilities at an individual and departmental level to achieve more advanced echocardiography skillsets/measurements.

Our study has shown that the use of AI technology can play a role in bridging this skill gap.

In addition, given that these AI-powered analyses are often automated and objective, they **replace subjective manual or visual analysis and provide a degree of image quality assurance.**

The **additional parameters obtained** could then be used to guide patient management on the ICU.

The fact that the software is automated has **workflow implications** for the critical care

