The Impact of Focused Transthoracic Echocardiography in Non-cardiac Anaesthesia and Surgery

by

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To Susan, Byron and Zara, 
without their understanding and support, 
this journey would not have been made.
"A new idea is first condemned as ridiculous and then dismissed as trivial, until finally, it becomes what everybody knows"

Swami Vivekananda

19th century Indian saint, philosopher
Abstract

Transthoracic echocardiography (TTE), usually performed by cardiologists, is increasingly used by physicians at the patient’s bedside. Focused TTE is an abbreviated study used as part of clinical assessment to improve diagnostic accuracy and aid clinical decision-making in real-time. Cardiac disease is a leading cause of perioperative mortality, which may be contributed to by poor preoperative cardiac assessment. The hypothesis is that focused TTE influences cardiovascular diagnosis and management by anaesthetists.

An audit of focused TTE revealed changes to anaesthetist’s management plans in 53% of 87 patients undergoing emergency surgery (75%), elective surgery (56%) and preoperative assessment clinic assessment (22%). TTE helped guide preoperative cardiology referral, anaesthetic technique, invasive monitoring and postoperative disposition. TTE was possible in 10 out of 24 patients with intraoperative haemodynamic instability, avoiding need for transoesophageal echocardiography and associated risk of oesophageal injury.

I conducted prospective observational studies of 100 patients attending the preoperative assessment clinic for elective surgery; and 99 patients requiring emergency surgery. In patients with clinically suspected cardiac disease or age ≥65 years, the anaesthetist’s management plan was compared before and after TTE performed by an independent anaesthetist.

In elective surgery, the TTE findings triaged patients to those with significant cardiac pathology leading to a step-up in care (20%), and those without, leading to a step-down in care (34%). Management was also altered in asymptomatic patients aged over 65 years (step-up in 10%, step-down in 15%). An overall reduction in hospital resource use (cardiology referral, invasive monitoring and intensive care) and improved efficiency (less delays and hospital visits) resulted.

In emergency surgery, TTE revealed significant cardiac pathology in 75%, altering preoperative assessment in 67% leading to a higher step-up (36%) than step-down (8%) in treatment. Haemodynamic treatment changes (such as fluids and invasive monitoring) were more common (30%) than changes to surgical workflow and postoperative intensive care (14%). In a retrospective cohort sub-analysis, the mortality of 64 hip fracture patients who received preoperative TTE was compared to a randomised retrospective control group with similar risk factors. Mortality was lower in the TTE group over the 30 days (4.7% v 15.2%, p=0.047) and 12 months after surgery (17.1% versus 33.3%, p=0.031). Hazard of death over 12 months was reduced after adjustment for known risk factors (hazard ratio 0.41, 95% CI 0.2 to 0.85, p=0.016).

In surgical patients at increased risk of cardiac disease, preoperative focused TTE by anaesthetists frequently changed management decisions and may reduce mortality.
Declaration

This is to certify that

This thesis comprises only original work completed by the author for the degree Doctor of Philosophy at the University of Tasmania.

1. This thesis contains no material which has been accepted for a degree or diploma by the University or any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of my knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

2. This thesis may be made available for loan and limited copying and communication in accordance with the Copyright Act 1968.

3. The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines by the Australian Government's Office of the Gene Technology Regulator and the rulings of the Safety, Ethics and Institutional Biosafety Committees of the University.

4. The thesis is less than 100,000 words in length, exclusive of tables, figure legends, bibliographies and appendices.

Dr. David Canty (candidate) Date
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Paper 2 Located in chapter 3


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Paper 5  Located in chapter 1 and 6


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