

# Preinduction-focused Transthoracic Echocardiography by Anesthesiologists in Cardiac Surgical Patients: “Checks and Balances” Approach improves Patient Care!

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Transthoracic echocardiography (TTE) has historically been the domain of cardiologists, but physicians in other specialties, such as emergency medicine and critical care medicine started using TTE at the patient bedside to diagnose the etiology of hemodynamic instability and guide few interventions. A focused TTE examination is not meant to take the place of a cardiology-based comprehensive TTE service. Instead, it is meant to be a noninvasive tool for evaluation of perioperative clinical issues that may not be able to be detected by clinical examination or vital signs alone. Anesthesiologists caught up with the skills of using TTE for perioperative care lately are in a better position to use this tool for their patient care than other specialists because of their experience in interpretation skills in transesophageal echocardiography (TEE) during cardiac surgery. Conditions known to increase postoperative morbidity and mortality that can be diagnosed by focused TTE include ventricular systolic dysfunction (both right and left), regional wall motion abnormalities, valvular heart disease (particularly severe aortic stenosis, mitral stenosis, and mitral regurgitation), diastolic heart failure, hypovolemia, severe left ventricular hypertrophy, and pericardial and pleural effusions.

Two important roles of perioperative TTE defined by the literature included “rescue” TTE in patients with hemodynamic instability and its use as a preoperative evaluation tool. Several studies explored the role of preoperative TTE in improving patient management

and few studied patient outcomes, mostly in noncardiac surgical patients. A retrospective study done by Cowie<sup>1</sup> from Melbourne, Australia, looked at 222 TTE examinations performed by anesthesiologists to see whether the echocardiographic findings were predictors of perioperative cardiac adverse events in noncardiac surgical patients. The TTE was requested by primary anesthesiologists when they needed more information regarding their physiological states perioperatively. Patients with significant findings on TTE (pulmonary hypertension, ventricular dysfunction, and aortic stenosis) had higher incidence of adverse events. The study clearly indicated that a perioperative TTE, when indicated, provided a prognostic value over and above standard clinical assessments. Cowie<sup>2</sup> also did a prospective study that involved getting a TTE examination, mainly in the preoperative setting on the morning of surgery, on 50 consecutive patients. Indications for obtaining TTE included suspected valvular disease with or without murmur on physical examination, hemodynamic instability, ventricular function assessment, dyspnea/hypoxemia, and poor patient functional capacity. The TTE resulted in significant changes in patient management 84% of the time, mainly by the addition of invasive monitors that would otherwise not have been used. A few patients found to have severe aortic stenosis had their surgery canceled. This study showed that TTE performed by trained anesthesiologists in the perioperative period helped to avoid unnecessary delays or cancellations that occur when waiting for a formal echocardiography, and can alter management in patients for whom it is indicated. Canty and Royse<sup>3</sup> studied 77 patients who were either outpatients in preoperative clinic/same-day-admit surgical patients or inpatients who received a focused echocardiographic examination. From the preoperative clinic, 8 out of 38 patients (21%) needed cardiology referral or admission before surgery. Of 39 inpatients, 2 had their surgeries canceled due to significant findings, 2 others required interventions (pericardial/pleural drainage). Overall, 18 patients (56%) had changes in their anesthesia and hemodynamic management. Canty et al<sup>4</sup> also looked at 64 patients that received focused TTE before hip surgery. Compared with historical controls with similar risk factors but surgery done without preoperative TTE, 30-day

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and 1-year mortality decreased in the group that received focused TTE.

While these above-mentioned studies provide great endorsement for anesthesiologists performing TTE before noncardiac surgery, the diagnostic role of pre-induction quick look TTE in cardiac surgery has never been explored. In this issue of *Journal of Perioperative Echocardiography*, Banashree et al<sup>5</sup> reported a patient who was diagnosed to have aortic stenosis, mitral regurgitation, and coronary artery disease by preoperative echocardiography. Authors performed preinduction TTE and found that the aortic valve was normal and the higher gradient was caused by subaortic obstruction caused by hypertrophic cardiomyopathy. Findings were later confirmed by intraoperative TEE. This change in diagnosis was important not only for the surgeon to modify the procedure, but also for the anesthesiologist as this could have influenced their induction technique and hemodynamic management.

Focused preinduction TTE examination in cardiac surgical patients will not increase operating room time as this can be easily done while the assistant places the invasive arterial line and other monitors. However, several benefits can be derived by adopting this practice; first, patients can have worsening of lesions (deterioration in left ejection fraction, worsening of valvular stenosis, worsening of pulmonary hypertension, and new-onset right ventricular dysfunction) during the interval period between the time they had formal cardiologist performed echocardiography and scheduled date of surgery; second, as Banashree et al<sup>5</sup> indicated, few lesions can be missed or misdiagnosed by busy echocardiography clinics; third, the impact of hemodynamics on echocardiographic lesions can be appreciated by comparing preoperative echocardiography, preinduction TTE, and intraoperative TEE; fourth, these comparisons can be utilized in echocardiography research, and finally, this can be

utilized as a learning method for TTE by residents and fellows.

Checks and balances approach applies to health care practice where we have checklists so as not to cause harm to our patients, wrong site surgery, preincisional administration of antibiotics, sign-out procedures during transfer, and many others. Nothing is more important than establishing a correct diagnosis or confirmation of a previous diagnosis for a heart condition before subjecting patients to major cardiac surgery as this imposes morbidity and mortality to those patients. As expert echocardiographers in both TTE and TEE, we suggest that cardiac anesthesiologists should adopt to perform "quick look" TTE in all their cardiac surgical patients before induction of anesthesia to improve care of their surgical patients. Of course, the same rule applies to cardiac anesthesiologists in that they call for cardiologists when they need expert opinion about their new perioperative echocardiographic findings!

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