

Anesthesiologist as Perioperative Echocardiographer

¹Goverdhan Dutt Puri, ²JS Madhavan

How to cite this article: Puri GD, Madhavan JS. Anesthesiologist as Perioperative Echocardiographer. *J Perioper Echocardiogr* 2015;3(1):1-3.

Source of support: Nil

Conflict of interest: None

Advances in technology have led to new equipments being introduced into the operating room (OR) and intensive care units (ICUs). Ultrasound machine is one such equipment which plays a vital contribution to both monitoring and interventions.¹ With an array of procedures like peripheral nerve blocks (PNBs), neuraxial blocks, vascular access and transesophageal echocardiography (TEE) being routinely done by anesthesiologists using ultrasound, the understanding and the need for this equipment has increased many fold. Use of transthoracic echocardiography (TTE) by anesthesiologists is just one another facet of this technology which is still in its evolution.^{2,3}

There are many reasons as to why anesthesiologists as perioperative physicians should learn and perform this investigation. The spectrum and complexity in the surgeries being performed are gradually shifting, thanks to the increasing life expectancy. More and more sick patients are taken up for surgery, necessitating an increase in the monitoring standards to improve patient outcomes. It is not uncommon that such patients present to the OR as day care patients or subtle signs had been overlooked by the anesthesiologists and other physicians or surgeons during preoperative planning of such patients. Simple instances may occur in our day-to-day practice like a geriatric patient presenting for a hip or knee arthroplasty,⁴ wherein effort tolerance cannot be assessed optimally or a child presenting for an emergency laparotomy with a murmur.⁵ New lesions, such as aortic stenosis, mitral regurgitation, ventricular failures, pleural or pericardial effusions have been picked up on TTE

performed just before induction of anesthesia⁴ and led to change in anesthetic plans. When anesthesiologists are confounded with such situations, basic TTE can confirm or refute the presence of a cardiac pathology, provide an idea about the disease process and help decide on patient management strategies by providing vital information.

Most anesthesiologists who have taken up intensive care as their career have realized the need for basic TTE examination⁶ and lung ultrasound⁷ in their ICU and emergency room practice and have learnt to use them optimally for patient management. Such a scenario is evolving with anesthesiologists inside the OR too and hence, there is a need to learn this technique and use it for improving our quality of care.⁸ Anesthesiologists understand the pathophysiology better than anyone else and hence, they are in a position to make best use of any additional information available for patient care. Ultrasound is routinely used for PNBs and vascular access. More than 2 decades ago, no one would have thought that TEE will change the role played by anesthesiologists inside the cardiac ORs.⁹ Now, it has become a routine that cardiac anesthesiologists perform the perioperative TEE of the patients and guide the surgeon in decision-making,¹⁰ while cardiologists are called only when dilemma in decision-making arises. Some of the centers, it is a routine that most patients scheduled for cardiac surgery undergo comprehensive TTE in addition to TEE during the preoperative period.¹¹ Hence, there is little doubt that whether an anesthesiologist can learn TTE and practice this simple modality of imaging.

Ample literature is available with respect to TTE performed by anesthesiologists leading to change in anesthetic plan of patients.^{4,12,13} Now that anesthesiologists better understand the physics of ultrasound and the optimization of images with them, they can easily learn TTE and use it in his day-to-day practice. Of course, they may not be able to generate or interpret all views in all patients, but as the saying goes: 'Practice makes a man perfect'. By doing TTE routinely, they can improve their skills and gradually make difficult imaging easier. Hand-held devices have been found to be more accurate in diagnosing cardiac lesions than trained physicians with history and clinical examination.¹⁴ With proper patient consent, the noninvasive nature of this examination may make them learn TTE by doing on patients under general anesthesia. Guidelines are available for focused cardiac

¹Professor, ²Assistant Professor

^{1,2}Department of Anesthesia and Intensive Care, Postgraduate Institute of Medical Education and Research, Sector 12 Chandigarh, India

Corresponding Author: Goverdhan Dutt Puri, Professor Department of Anesthesia, Postgraduate Institute of Medical Education and Research, Sector 12, Chandigarh, India, 160012 Phone: 091-7087009509, e-mail: gdpuri007@hotmail.com

ultrasound (FCU) performed by physicians in addition to physical examination in various setting.¹⁵

These days, cost-effectiveness is of paramount importance. It will be hard to assess the cost-effectiveness of anesthesiologists doing TTE, given the expenditure incurred on learning, and equipment purchase, frequency of a new finding turning up on TTE and the further action taken may differ considerably. To begin with, basic ultrasound machines are making way into every OR for day-to-day use, such as PNB or vascular cannulation. So, TTE will just require an additional probe compatible with such equipment. The time required for training anesthesiologists may vary from person-to-person. Anesthesiologists can start learning by generating good windows in thin patients and gradually go on for color Doppler and other modalities of imaging. Of course, there is ample support in the form of online resources to learn doing and interpreting TTE. As technology advances, these machines may become cheaper and they may be available at many more places than now. Newer smart phone sized cheaper echo machines with limited technical capabilities are already available in the market.¹⁶ Other aspects of cost-effectiveness should also be considered. The burden on cardiologists could be significantly reduced if major pathologies are ruled out at the screening phase itself, more so in settings where trained cardiologists are in shortage.¹⁷ Pathologies associated with significant mortality, such as pulmonary artery hypertension and severe aortic stenosis, can be easily found at the screening level.^{18,19} It would be cost-effective to perform a TTE and gain additional information for perioperative monitoring rather than to land up in complications with undiagnosed pathology, which is being stressed in a few surgeries like arthroplasties.²⁰ It would be nearly impossible to design an appropriately designed randomized control trial for demonstrating cost-effectiveness of TTE, considering the ethical issues involved, blinding and large numbers that may be required.

The initial objective should be to gather focused data on patient management. Gradually, as one gains experience with TTE, they can perform more and more comprehensive echo and in patients with difficult echo windows. Simple hand-held echo machines are available for use and they have been used to train interns and medical students for diagnosing cardiac pathology.¹⁴ Hence, it may not be difficult for anesthesiologists to learn and interpret with the routine machines, they use daily for doing other interventions. The noninvasive nature of TTE has distinct advantage over other forms of invasive investigations. Also, TTE can be performed in the preoperative period and in most instances in the intra- and postoperative

period as well, providing a continuous monitoring of the cardiac status of the patient.³ With increasing availability of this modality, it can also be used as a teaching aid for better understanding of perioperative physiology.

We have to realize that it may not be possible for us to do TTE in each and every patient we come across. Transthoracic echocardiography should be considered as an investigation when clinicians are facing a diagnostic dilemma or the history and clinical findings are not corroborative or when we want to troubleshoot an unexplained hemodynamic perturbation. Perioperative echocardiography is still a specialized form of monitoring in anesthesia practice.⁸ Use of ultrasound has got its own limitations and pitfalls. Data acquired should be interpreted with caution. Artifacts can occur in TTE and the attending physician should be sure to exclude them before arriving at conclusions. They should not jump into conclusions just based on a single finding and need to search for associated findings and patient's clinical condition. Mechanical ventilation may hinder optimal image generation at times. Our ultimate aim is not to assume the role of a cardiologist, but as perioperative physician, identify significant cardiac pathology when need arises, such as emergencies using TTE equipment and optimize the patient with available information or refer to cardiologist for further evaluation as situation warrants.

REFERENCES

1. Kline JP. Ultrasound guidance in anesthesia AANA J 2011; 79:209-217.
2. Cowie B. Focused cardiovascular ultrasound performed by anesthesiologists in the perioperative period: feasible and alters patient management. J Cardiothorac Vasc Anesth 2009; 23:450-456.
3. Cowie B, Kluger R. Evaluation of systolic murmurs using transthoracic echocardiography by anaesthetic trainees. Anaesthesia 2011;66:785-790.
4. Canty DJ, Royse CF. Audit of anaesthetist-performed echocardiography on perioperative management decisions for noncardiac surgery. Br J Anaesth 2009;103:352-358.
5. Bhatia N, Barber N. Dilemmas in preoperative assessment of children. Contin Educ Anaesth Crit Care Pain 2011; doi: 10.1093/bjaceaccp/mkr039.
6. Kendall JL, Hoffenberg SR, Smith RS. History of emergency and critical care ultrasound: the evolution of a new imaging paradigm. Crit Care Med 2007;35:S126-130.
7. Lichtenstein DA. Lung ultrasound in the critically ill. Ann Intensive Care 2014;4:1.
8. Ng A, Swanevelder J. Perioperative echocardiography for non-cardiac surgery: what is its role in routine haemodynamic monitoring? Br J Anaesth 2009;102:731-734.
9. Price S, Via G, Sloth E, et al. Echocardiography practice, training, accreditation in the intensive care: document for the World Interactive Network Focused on Critical Ultrasound. Cardiovasc Ultrasound 2008;6:49.

10. Eltzhig HK, Rosenberger P, Loffler M, Fox JA, Aranki SF, Shernan SK. Impact of intraoperative transesophageal echocardiography on surgical decisions in 12, 566 patients undergoing cardiac surgery. *Ann Thorac Surg* 2008;85:845-852.
11. Misra A, Madhavan JS, Ghuman BPS, Raj R, Kumar A, Dutta V, et al. Impact and cost-effectiveness of routine intraoperative transthoracic and transesophageal echocardiography on surgical decision-making in pediatric cardiac surgery. *J Perioper Echocardiogr* 2014;2:3-9.
12. Canty DJ, Royse CF, Kilpatrick D, Williams DL, Royse AG. The impact of preoperative focused transthoracic echocardiography in emergency noncardiac surgery patients with known or risk of cardiac disease. *Anaesthesia* 2012 67:714-720.
13. Canty DJ, Royse CF, Kilpatrick D, Bowman L, Royse AG. The impact of focused transthoracic echocardiography in the preoperative clinic. *Anaesthesia* 2012 67:618-625.
14. Kobal SL, Trento L, Baharami S, Tolstrup K, Naqvi TZ, et al. Comparison of effectiveness of hand-carried ultrasound to bedside cardiovascular physical examination. *Am J Cardiol* 2005 96:1002-1006.
15. Spencer KT, Kimura BJ, Korcarz CE, et al. Focused cardiac ultrasound: recommendations from the American Society of Echocardiography. *J Am Soc Echocardiogr* 2013;26:567-581.
16. Sicari R, Galderisi M, Voigt JU, Habib G, Zamorano JL, Lancellotti P, et al. The use of pocket size imaging devices: a position statement of the European Association of Echocardiography. *Eur J Echocardiogr* 2011;12:85-87.
17. O' Halloran TD, Kannam JP. Preoperative transthoracic echocardiography when is it useful? *Int Anesthesiol Clin* 2008;46:1-10.
18. Ramakrishna G, Sprung J, Ravi BS, et al. Impact of pulmonary hypertension on the outcomes of noncardiac surgery: predictors of perioperative morbidity and mortality. *J Am Coll Cardiol* 2005;45:1691-1699.
19. Christ M, Sharkova Y, Geldner G, et al. Preoperative and perioperative care for patients with suspected or established aortic stenosis facing noncardiac surgery. *Chest* 2005;128:2944-2953.
20. Heyburn G, McBrien ME. Preoperative echocardiography for hip fractures: time to make it a standard of care. *Anaesthesia* 2012;67:1189-1201.