EDITORIAL

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Echocardiography:
Is there unseen risk in cardiac ultrasound?

The biological safety of medical ultrasound, including echocardiography is undisputed. However, the performance of medical ultrasound requires a significant amount of interpretation on the part of the operator who must be aware and continuously mindful of the many pitfalls inherent in the imaging modality and this is particularly true of echocardiography. A considerable amount of training is required to learn how to perform echocardiography at a safe, let alone high, standard. The echocardiographer requires a sound knowledge and awareness of the pitfalls of the technique and an understanding of the clinical conditions being evaluated. Often the opinion of the sonographer is final and decisions regarding patient management are all too often based on echocardiography reports only without the necessary checks and balances in place. The inherent risk is clear if one realises that the echocardiographer's opinion directly reflects his or her combined echocardiography and clinical knowledge and skill and one is invariably reminded of the mantra: "You only see what you look for". This may be impossible to assess when you only have the echocardiography report in front of you. Many deductions have already been made and the report is often presented in a neat package to the unsuspecting physician who requested it. Clinical correlation with the echocardiography report is therefore mandatory, but this may not be enough to detect important misinterpretations. Furthermore, not all clinicians have the expertise in echocardiography to personally review the study images and they necessarily rely heavily on the sonographer. This exposes patients, echocardiographers and clinicians to unnecessary risk. How do we manage this risk?

Echocardiography has come a long way since its early use as a m-mode only modality. Over the last 25 to 30 years echocardiography has established itself as the workhorse imaging modality in daily clinical cardiology and proved itself indispensable in the decision-making processes in all spheres of cardiology. Its greatest strengths lie in its dynamic, portable and non-invasive nature. Coupled with its breadth of applicability, intuitive grounding in basic cardiac anatomy, physiology and pathology, its excellence in quantification has firmly established echocardiography's use in clinical cardiology and sparked a wealth of research on the subject. The literature constituting the knowledge-base for echocardiography is now vast and includes data on many more recent techniques and technologies. This includes 3-D echocardiography, contrast echocardiography, dynamic stress echocardiography modalities for ischaemic, cardiomyopathic and valvular heart disease as well as the use of deformation parameters such as strain and strain rate derived from either tissue Doppler velocities or more lately 2-D speckle tracking.

Of even greater importance, however, has been the explosion of information regarding the use of established echocardiography modalities for different pathologies. The transformation of mitral valve surgery through the advantages offered by mitral valve repair is but one such an example. A successful repair programme relies on our ability to adequately assess valves for repair preoperatively as well as our evaluation of the success of repair during the intra-operative period. The knowledge and skill required to adequately perform these assessments has, of course, to be acquired first. The use of echocardiography in the assessment of aortic stenosis (AS) is another example where rapid knowledge expansion in the field is changing the definition of what constitutes a standard AS assessment. Assessment has had to evolve to adequately select and evaluate cohorts with severe AS but low gradients both in the setting of impaired and preserved LV systolic function. The latter category is of particular interest because recent data show this group, constituting approximately 25% of all severe AS patients, represents an advanced form of the disease that, importantly, appears to benefit from aortic valve replacement surgery.[1] The information explosion is sometimes overwhelming and a sober reminder of the importance of continued medical education (CME).

The advantages of and advances in echocardiography have not gone unnoticed in the non-cardiology arena. The interest in acquiring echocardiography skills has grown rapidly under non-cardiologist colleagues including physicians, radiologists and general practitioners. It is however the use of echocardiography by anaesthetists, intensive care specialists and emergency medicine specialists that drives the development of echocardiography outside of cardiology. Long gone are the days when echocardiography was the sole domain of the cardiologist. The use of echocardiography and specifically transoesophageal echocardiography (TOE) is now well established in the perioperative cardiothoracic setting. In fact a recent report states that in the United Kingdom 90% of TOE is currently performed by anaesthetists.[2] This raises uncomfortable questions as to where the expertise is going in core diagnostic cardiac evaluation such as valve assessment - currently still considered bread and butter cardiology.

The way that echocardiography is used in the perioperative, intensive care and emergency medicine fields are a departure from its traditional use in cardiology and its development in the different fields are all slightly divergent. Echocardiography's expansion into the field of emergency medicine has found application in the peri-arrest patient through various rapid scanning protocols such as FEEL (Focused Echo Evaluation in Life support), FATE (Focused Assessed Transthoracic Echocardiography) and FAST

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(Focused Assessed Sonography in Trauma). Most agree that emergency echocardiography protocols are and should be limited to the peri-arrest setting. Here they are used in conjunction with resuscitation protocols as rapid, highly formalised scans that utilise a few key echo views to inform the emergency physician of limited but specific information useful in the peri-arrest setting. This includes information on the presence or absence of pericardial effusions and tamponade (and in FAST also haemoperitoneum and pleural effusion) and qualitative information on ventricular morphology and function. Importantly these scans do not constitute standard echocardiograms and the general use of "quick look", abbreviated or focused echocardiograms are actively discouraged outside the peri-arrest setting. The British society of echocardiography (BSE) has published guidelines on what constitutes a standard echocardiogram in terms of the minimum dataset that should be acquired during a transthoracic study.[3] The minimum dataset is only applicable in patients with normal echocardiograms and should be expanded in those where abnormalities are detected. In the intensive care unit (ICU) and perioperative setting however echocardiography is often used for rapid diagnosis in the hypotensive, shocked or otherwise haemodynamically unstable patient and it is often used as an haemodynamic monitor once a diagnosis has been made. This setting may well require a different, more goal-orientated approach to the use of echocardiography which would constitute a clear departure from the view that all echocardiograms are either standard or emergency but should not lie somewhere in-between. At present there is no broad consensus on the optimal use of echocardiography in these circumstances and training and broadly accepted practice guidelines for intensive care echocardiography are still lacking.[4]

However, the question that arises is: How do we ensure that echocardiography is performed at a high enough standard amongst a diverse group of practitioners with different goals and backgrounds and ensure that our patients receive a safe and high quality echocardiography service? This brings us to the questions of training, accreditation and reaccreditation in echocardiography.

Training in echocardiography is an integral part of any cardiology training programme. It typically entails demonstrating both competency in the theoretical framework necessary to understand and use the modality and requires demonstration of competence in the practical application of echocardiography. The latter requirement is often indirectly assessed through logbook keeping by the trainee. This ensures a set number of echocardiograms have been undertaken and indirectly assumes a minimum time has been spent practicing echocardiography. This system however allows for widely different training programmes with widely varying input into echocardiography training that produce cardiologists with potentially very different levels of competency in performance. Trainees are unfortunately often left to their own devices when it comes to training in non-invasive modalities such as echocardiography. Many of us learned a significant amount of our echocardiography from a busy but willing technologist. Unfortunately this leaves much to be desired from the viewpoint of standardising echocardiography training for either cardiologists or technologists. Under these circumstances the performance of a set number of studies does not necessarily translate into the reaching of a minimum standard of performance competency. Obtaining training in echocardiography for any person not in a cardiology programme or technologist training post is nearly impossible in South Africa at present. This contributes much to the variance in skill level under non-cardiologists practicing echocardiography in this country.

Clearly most expertise in echocardiography currently resides in cardiology. Few cardiologists are however actively involved in the training needed to support the expansion of echocardiography into allied fields. Cardiologists are not always available to assess mitral valves after repair in the cardiothoracic theatre. If cardiologists are not available in a particular centre to make difficult decisions after a repair operation, should this be left to the anaesthetist and if so, what additional training is required by him or her? Similarly even fewer cardiologists are available to do emergency echo protocols in casualty or assess the fluid responsiveness of every patient in ICU before and after each intervention.

Clearly echocardiography knowledge needs to be disseminated efficiently amongst the important role players outside cardiology:

- Who should take responsibility for overseeing this expansion in echocardiography?
- How do we accommodate the training of individuals outside of cardiology who want to learn echocardiography;
- How do we insure quality control under all circumstances: what works best for one hospital may not be universally applicable; and
- Should accreditation be voluntary and if not, should grandfathering into the system be made provision for?

The British society of echocardiography (BSE) and the European association of echocardiography (EAE) run voluntary accreditation programmes both for individuals and echocardiography laboratories with the aim of raising standards all round. In this copy of SA Heart, John Chambers, past president of the BSE, and a man who has been instrumental in the process of developing training programs and accreditation in echocardiography, discusses the evolution of accreditation and development of standards of care in echocardiography in the UK and Europe.[5]

How best to go about solving these problems for South Africa will require debating some thorny issues. How do we go about improving echocardiography training in South Africa under all practitioners of echo? The aim of accreditation should always be to lift standards and ensure a minimum level of competency in order to protect patients and practitioners. If we want to improve our echocardiography services we need to address the issues of training, accreditation and reaccreditation for the South African setting. An imaging group for the SA Heart Association is currently in the making and they will certainly inherit the task of debating and addressing these questions. A much needed step to ensure we remove as much of the unseen risk in echocardiography as possible.

REFERENCES

1. Dumesnil JG, Pibarot P, Carabello B. European Heart Journal 2010;31:281-289.
2. Price S, Via G, Sloth E, et al. Echocardiography practice, training and accreditation in the intensive care: document for the World Interactive Network Focused on Critical ultrasound (WINFOCUS). Cardiovascular Ultrasound 2008;6:49.
3. Chambers J, Masani N, Hancock J, et al. BSE Education Committee. October 2005 www.bse.org.
4. On behalf of a Collaborative Working Group of the British Society of Echocardiography. A position statement: echocardiography in the critically ill. JICS 2008;9:197-198.
5. Chambers J. Accreditation in Echocardiography. SA Heart Autumn 2010;7:90-92.