

mortality. In the ISAR-SHOCK study, the Impella LP 2.5 device versus IABP significantly improved the primary end point of cardiac index (0.49 vs 0.11 L/min/m², respectively; $P = .01$), but mortality was similar (log-rank $P = .97$) [Seyfarth M et al. *J Am Coll Cardiol.* 2008].

The timing of mechanical support, however, may lead to improved outcomes. The preintervention placement of an IABP compared with no IABP or an IABP placed after the intervention in the CS group significantly reduced the incidence of ventricular fibrillation ($P = .02$), cardiopulmonary arrest ($P = .01$), and total events in the catheterization laboratory ($P = .0009$) [Brodie BR et al. *Am J Cardiol.* 1999]. A similar result was found in the Impella registry, stated Dr Daggubati, and the pre-intervention approach is being studied in the upcoming TandemHeart to Reduce Infarct Size Trial [TRIS Trial; NCT02164058]. Implementation of a CS protocol with quick escalation of percutaneous ventricular assist devices has been shown to reduce mortality of in-hospital CS in a small registry of 32 patients from 44% to 24%. Dr Daggubati presented these data at the Society of Cardiovascular and Angiography Interventions national meeting in May 2014.

The management of CS with circulatory support will evolve with new paradigm shifts and treatment protocols as technology evolves, but better identification of the patients most likely to benefit based on stronger clinical evidence is needed.

Stress ECHO: Strain and Speckle Tracking in Clinical Practice

Written by Mary Mosley

Stress echocardiography (ECHO) has a slightly higher specificity compared with stress nuclear testing and stress electrocardiography (ECG), according to Hossam El-Gendi, MD, Essex Cardiothoracic Centre, Essex, United Kingdom. A retrospective review that he conducted of 1000 patients showed that stress ECHO better defined the probability of coronary artery disease than exercise treadmill testing [Hopkinson SA, El-Gendi H. 2012].

Exercise ECG is no longer performed in the United Kingdom because it is seen as more harmful than beneficial, he stated. Exercise ECG compared with coronary angiography had a wide variability in its mean sensitivity (68%; range, 23 to 100) and mean specificity (77%; range, 17 to 100) in a meta-analysis of 147 consecutive studies with 24074 patients conducted in the late 1980s.

Stress ECHO is limited to wall motion analysis, which captures only 30% of myocardial function, but

determining the rate of strain between 2 points in the myocardium provides complementary data to determine the overall myocardial function. Longitudinal strain is an effective tool to evaluate the true systolic function of patients, for example in hypertrophic cardiomyopathy, which is characterized by a normal ejection fraction and decreased (by $\leq 20\%$) global longitudinal strain. Prof El-Gendi stated that speckle tissue tracking is reproducible, has less intraobserver and interobserver variability, and is a useful approach to judge ventricular function and rate of strain.

Automated function imaging, based on 2D strain technology, has been documented to quantify myocardial motion and deformation under rest conditions and is the subject of global collaborative research to determine its best use to enhance clinical decision making. Automated function imaging provides a rapid, reproducible, quantitative tool for the assessment of segmental and global wall motion, said Prof El-Gendi.

Furthermore, using speckle tissue tracking with stress ECHO is simple and can be used in daily practice to answer common clinical questions, stated Prof El-Gendi. In patients with cardiac resynchronization therapy, it provides more information about left ventricular synchrony and performance, and atrioventricular timing, to better manage hemodynamics in patients with heart failure. It can be used to assess coronary arteries, ischemia in the left anterior descending artery and inferior of the myocardium, left ventricular hypertrophy (LVH), hypertrophic obstructive cardiomyopathy, non-ischemic cardiomyopathy, and cardiac amyloid. The strain presentation in LVH is characterized by a decrease in the basal strain segments, normal apical segments, and a strain bulls-eye “donut.”

Stress ECHO with speckle tissue tracking is an emerging tool that should be used in clinical practice to master it, urged Prof El-Gendi, because it has opened the window to evaluate the myocardium from the inside to the outside.

Health Care Quality Improvement Measures: Perspective From the Cath Lab

Written by Mary Mosley

Although operator proficiency is important in the catheterization laboratory (cath lab), regular monitoring and assessment of other indicators are important to ensure quality health care delivery. Hany Eteiba, MD, Glasgow Royal Infirmary, Glasgow, Scotland, outlined 5 types of quality indicators encompassing the measurement and



improvement of quality in terms of delivery of health care, specifically for interventional cardiologic care: data collection and benchmarking, appropriate use indicators, process of care indicators, clinical privilege indicators, and clinical outcomes indicators.

For data collection and benchmarking, a patient-specific data collection system should be used that enables consistent data collection from all patients. From this, parameters such as number of specific procedures, number of complications, or time elapsed can be tracked, graphed, and reviewed against a comparison population. Outlier values can be opportunities to learn, because they can represent a particularly complex case, or they may represent areas in which improvement is needed to move the outlier value closer to the median.

The appropriate use of a procedure was guided by experience and intuition about 30 years ago, and in turn it became guided by professional society guidelines about 20 years ago [Stone GW, Moses JW. *Nat Rev Cardiol.* 2011]. Today, Prof Eteiba indicated that appropriate use criteria should be used. For example, the appropriate use criteria for coronary revascularization support the use of clinical judgment and experience, and allow for the assessment of use patterns for procedures (eg, that which was defined in data collection and benchmarking), yet do not eliminate the challenge of decision making. Appropriateness is typically classified within 3 ranges: 1 to 3 represents inappropriate use, because the procedure is unlikely to improve health outcomes or survival; 4 to 6 represents uncertain use, because it is not clear if the procedure would improve outcomes or survival; and 7 to 9 represents appropriate use, because the procedure would likely improve outcomes or survival [Patel MR et al. *J Am Coll Cardiol.* 2009].

For process of care indicators, it is important to look at the entire process leading up to, during, and after the procedure. For example, protective measures such as renal and radiation protection are important to track. In addition, process efficiency and transport times are particularly important in revascularization, because door-to-balloon time is critical. Prof Eteiba demonstrated the use of data tracking, in which the times of symptom onset, call for help, paramedical contact, first electrocardiograph, arrival, and procedure start can be documented, tracked, and assessed.

Clinical privilege indicators include staff credentialing and proficiency. Formal training requirements and competency should be reviewed, and the role of noninvasive specialties should be recognized as well. Proficiency can be maintained through various mechanisms, such as

assessment of annual caseload of a specific procedure per year, institutional measures of proficiency, attending morbidity and mortality conferences, and peer review of random cases.

Clinical outcomes indicators, such as major adverse cardiac and cerebrovascular events and percutaneous coronary intervention success rate, should be monitored on a regular basis. The data, as well as catheterization laboratory statistics, should be shared and reported in both compiled and physician-specific formats, with a focus on quality improvement.

In conclusion, Prof Eteiba stated that quality improvement begins with fostering an environment of quality and clinical governance, which requires a commitment from the entire health care system. Operator and staff proficiency are crucial in assuring quality; however, other aspects such as process, data collection and benchmarking, and outcome indicators are important to continue to provide quality health care and to enable improvement in quality.

Vascular Disease: Take a Head-to-Foot Approach

Written by Mary Mosley

Atherosclerotic disease often occurs in the vasculature beyond the heart; however, cardiologists do not always take a head-to-foot approach to identify related circulatory conditions. Khusrow Niazi, MD, Emory University, Atlanta, Georgia, USA, described the importance of a head-to-foot evaluation for vascular disease.

In patients who present with symptoms such as leg weakness, it is important to ask specific questions to learn about all associated symptoms that the patient has experienced. For example, in transient ischemic attack (TIA), many patients ignore multiple symptoms of TIA because the symptoms last for only a few seconds or minutes. For patients with suspected TIA, retinal ischemic events, or ipsilateral ischemic stroke, auscultation for carotid bruit was found in a landmark 1994 NASCET trial to detect >70% stenosis in symptomatic patients, with a sensitivity of 63% and a specificity of 61% during the clinical examination. A much more sensitive technique, however, that is easily performed by cardiologists is Duplex ultrasound with a vascular probe, which can diagnose stenosis anywhere in the vasculature.

Patients' leg pain can be broadly categorized as being due to arterial insufficiency, venous insufficiency, or other causes. Peripheral artery disease (PAD) is a common disease that affects up to 12 million individuals in the United States and is most typically a result of