School of Medicine, Baltimore, MD. Dr. Mehra discussed several important questions to ask when deciding to perform heart transplantation:

- Is the patient sick enough?
- Will the patient tolerate a heart transplant?
- Are there comorbidities that will influence outcome?
- Are absolute contraindications really relative contraindications?

Dr. Mehra also noted that transplant listing should be dynamic; patients who are listed for transplantation must be re-evaluated at 3-month intervals to determine response to therapy and should be removed from the list if they have improved.

Improving Survival from Cardiac Arrest: What Can and Should be Done in 2008

The American Heart Association estimates that ~163,221 *out-of-hospital* sudden cardiac arrests occur annually in the United States with a median reported survival-to-discharge rate of 6.4% [www.americanheart.org/downloadable/heart/1136822850501OutofHosCA06.pdf]. Although rarely reported, the incidence of *in-hospital* cardiac arrest is thought to range between 1 and 5 events per 1000 annual hospital admissions, with a reported survival-to-discharge of 15% to 20% [Sandroni C et al. *Int Care Med* 2007].

However, there are wide variations in both the incidence of cardiac arrest (200%) and survival rates (500%) [Nichol G et al. *JAMA* 2008], noted Graham Nichol, MD, University of Washington, Seattle, WA. Although analyses are ongoing to identify potential reasons for these inconsistencies, Dr. Nichol speculated that the variability in incidence may be associated with regional variances in clinical risk factors, economic disadvantage, population density, primary/secondary prevention strategies, and, possibly, incomplete episode capture. Differences in survival rates may reflect differences in disease severity and comorbidities among the regions, as well as differences in acute treatment, including prehospital and hospital-based care. The wide variability, according to Dr. Nichol, is a reminder that communities need to monitor, report, and improve their response to cardiac arrest.

Bystander cardiopulmonary resuscitation (CPR) clearly saves lives, yet recent clinical trials show a relatively low rate of bystander intervention. Robert Berg, MD, University of Pennsylvania, Philadelphia, PA, suggested that this may be due to the complexity of "standard CPR." Continuous chest compression CPR (CCC-CPR) has been shown to be as effective as "standard CPR" [Sayre MR. *Circulation* 2008], and current guidelines encourage its use in certain circumstances [AHA/ILCOR. *Circulation* 2000; AHA. *Circulation* 2005]. Dr. Berg suggested that we should improve public awareness of CCC-CPR by teaching and modeling it in public service announcements, movies, and television.

Paul Chan, MD, Saint Luke's Mid America Heart Institute, Kansas City, MO, discussed the results of a recent study that show a significant variation between hospitals in the postcardiac arrest survival-to-discharge rate. According to Dr. Chan, the only factor that appeared to predict survival-to-discharge was the hospital's defibrillation time performance, whereby hospitals in the top quartile had a survival-to-discharge OR of 1.41 versus 1.18 for those in the bottom quartile [AHA Scientific Sessions 2008; Abstract 3307]. Dr. Chan recommended additional studies to identify the practices at the hospitals that have the best defibrillation time performance, followed by the development and testing of a suite of targeted interventions based on those practices.

Restoration of adequate blood flow is critical in cardiac arrest to achieve the return of spontaneous circulation (ROSC) and improve the possibility of long-term survival. Reduced blood flow can result from inadequate compression rate or compression depth, interruptions in CPR, or delays in defibrillation after pausing chest compression. Henry Halperin, MD, Johns Hopkins University School of Medicine, Baltimore, MD, suggested that the quality of CPR could be enhanced by additional focus on adequate rate and displacement and provision of feedback to improve performance [Edelson et al. *Arch Int Med* 2008].

More than 50% of patients who survive resuscitation after cardiac arrest will end up in a coma or persistent vegetative state; thus, "achieving ROSC is not the final step," said Romergryko Geocadin, MD, Johns Hopkins University School of Medicine, Baltimore, MD. Dr. Geocadin discussed therapeutic hypothermia, a pleiotropic intervention that has been shown to increase the rate of a favorable neurological outcome and reduce mortality in patients who have been successfully resuscitated after ventricular fibrillation-related cardiac arrest [Hypothermia after Cardiac Arrest Study Group. *N Engl J Med* 2002], as well as in coma patients after resuscitation from out-of-hospital

cardiac arrest [Bernard SA et al. *N Engl J Med* 2002]. According to Dr. Geocadin, this therapy provides hope, and the practice of early prognostication that leads to withdrawal of life support needs to be reevaluated. When the results of both hypothermia studies were pooled, the number needed to treat (n=6) was the same as for tissue plasminogen activator (TPA) in acute ischemic stroke, suggesting to Dr. Geocadin that just as the use of TPA resulted in the creation of stroke centers, a similar type of center may be warranted for cardiac arrest.

Imaging in the Management of Acute Chest Pain

In this session, presenters debated the merits of echocardiography, nuclear imaging, computed tomography (CT), and cardiac magnetic resonance (MR) in the management of patients with chest pain and suspected acute coronary syndrome (ACS).

"Echocardiography is a bedside technique and is eminently suited for risk-stratifying patients with suspected ACS," said Roxy Senior, MD, Northwick Park Hospital, Middlesex, UK. He described the benefits of different options for echocardiography. Resting echocardiography with normal function virtually excludes high-risk patients, whereas perfusion with echocardiography provides important incremental information, he said.

For patients with normal resting echocardiography but with significant risk factors, stress echocardiography improves evaluation and is feasible in the emergency department. In a trial of 147 patients who presented with acute chest pain and negative troponin levels, stress myocardial contrast echocardiography (MCE) was superior to Thrombolysis In Myocardial Infarction (TIMI) risk score and exercise electrocardiography in the assessment of risk among patients with a nondiagnostic electrocardiogram. Cardiac events in patients with abnormal MCE findings (59%) were significantly higher than those that were predicted by a high-risk TIMI score (33%; p=0.0023) and compared with those that were predicted by high-risk exercise electrocardiography (80% vs 57%; p=0.0003) [Jeetley P et al. *Am J Cardiol* 2007].

James E. Udelson, MD, Tufts Medical Center, Boston, MA, argued in favor of nuclear imaging for the management of suspected ACS. In particular, single-photon emission computed tomography myocardial perfusion imaging (SPECT MPI) requires a simple protocol that most clinicians can perform. The test provides rapid results, and widespread quality assurance tools are available to ensure that test results are accurate. Most importantly, Dr. Udelson said, SPECT MPI is the only imaging modality that is available with class I, level A evidence to support its use in the management of acute chest pain.

According to Udo Hoffmann, MD, Harvard Medical School, Boston, MA, computed tomography is the best imaging modality for use in the assessment of suspected ACS. Coronary artery disease (CAD) is the most common cause of ACS, occurring in up to 90% of cases. CT has a "nearly perfect" negative predictive value, meaning that the absence of CAD allows up to 50% of patients to be discharged early and safely from the emergency department. Therefore, CT meets important goals of emergency care, including quick turnover and the identification of patients who do not require hospital admission.

Andrew E. Arai, MD, National Heart, Lung, and Blood Institute, Bethesda, MD, stated that cardiac MR provides more than an assessment of heart function. Unlike other imaging modalities, cardiac MR provides important information about the ischemic or infarcted myocardium itself. For example, cardiac MR effectively detects and distinguishes acute from chronic MI. Cardiac MR also provides information on the extent of perfusion, heart muscle viability, area at risk, culprit vessel location, and adequacy of reperfusion.

Perfusion cardiac MR is a valuable alternative to SPECT MPI for the detection of CAD and shows evidence of superiority over SPECT (Figure 1) [Schwitter J et al. *Eur Heart J* 2008]. Overall, evidence is mounting to support the use of cardiac MR in the assessment of patients with suspected ACS, Dr. Arai concluded.

Figure 1. SPECT Versus Cardiac MR in the Detection of CAD.