TOP THINGS TO KNOW
Noninvasive Risk Stratification Techniques for Identifying Patients At Risk for Sudden Cardiac Death

SCD – sudden cardiac death

1. **Definition:** The International Classification of Diseases (ICD-10), Tenth Revision defines SCD as death from any cardiac disease that occurs out of hospital, in an emergency department or in an individual reported dead on arrival to a hospital. In addition, death should occur within one hour after the onset of symptoms. SCD may be due to ventricular tachycardia/fibrillation, asystole, or non-arrhythmic causes. This statement focuses on risk factors for ventricular tachycardia/fibrillation.

2. **Incidence:** The annual incidence of sudden arrhythmic deaths has been estimated between 184,000 and 462,000.

3. **Underlying heart disease:** Among patients with SCD, an overwhelming majority has some form of structural heart disease, most commonly coronary artery disease in the United States. The statement is limited to risk stratification techniques for ischemic, dilated, and hypertrophic cardiomyopathies. Although other types of structural heart disease and inherited ion channel abnormalities are also associated with a risk for SCD, the risk stratification strategies and data in these entities are diverse and are beyond the scope of this document.

4. **Risk stratification techniques and pathophysiology of SCD:** The specific techniques focus on detection of: 1) slowed ventricular conduction; 2) heterogeneities in ventricular repolarization; 3) imbalance in autonomic tone; 4) extent of myocardial damage and scar formation; 5) ventricular ectopy.

5. **Noninvasive techniques discussed in the document:** Left ventricular ejection fraction; ECG based techniques – QRS duration, QT interval/QT dispersion, signal averaged ECG, short term heart rate variability; Long term ambulatory ECG (Holter) based techniques – ventricular ectopy/nonsustained ventricular tachycardia, long term heart rate variability, heart rate turbulence; Exercise test/functional status based techniques – Exercise capacity and New York Heart Association class, heart rate recovery and recovery ventricular ectopy, T wave alternans; Baroreceptor sensitivity.

6. **Other testing, techniques, and approaches that should be considered:** Evaluation of myocardial ischemia is important, as this may serve as an important trigger for life threatening ventricular arrhythmias, either in patients with pre-existing substrate or, less commonly, as a primary cause. Electrophysiologic testing has demonstrated utility in identifying the substrate for sustained ventricular tachycardia. Newer techniques such as characterization of infarct size and/or morphology by contrast enhanced MRI could provide information on susceptibility to ventricular tachyarrhythmias. Newer approaches that encompass a more general evaluation of “vulnerability” to sudden death, including genetic profiling, serum markers, and new imaging approaches, may be developed. Finally, if risk stratification is to be applied to a population with an overall low risk of SCD to identify a subgroup with more significant risk, it is likely that multiple tests will need to be incorporated into a risk stratification strategy.

7. **Current status of risk stratification:** Multiple techniques are available with variable amounts of retrospective and prospective data in support of each technique. Even the most promising techniques (i.e. left ventricular ejection fraction) have limited sensitivity to identify the patient at risk for SCD.

8. **Patient based approach to risk stratification:** The specific goal for the individual patient should be identified. There is no consensus on the level of risk that justifies an intervention. It is important to consider the type of underlying heart disease and other factors that may have time dependent effects on risk, such as myocardial infarction or coronary artery bypass surgery.

9. **Using the risk stratification techniques to prevent SCD:** The approach to prevention of SCD is multifactorial. Maximize appropriate medical therapies – beta-blockers, ACE inhibitors/angiotensin receptor blockers. Consider implantable cardioverter defibrillator in high risk patients, as defined in prior 2006 ACC/AHA/ESC guidelines.

10. **Referral to a Specialist:** Because of a lack of clinical trial data establishing a comprehensive risk stratification strategy that can be easily applied, there is ambiguity in the evaluation of the patient for risk for sudden cardiac death. A specialist well-versed in these techniques and their relative value in various clinical scenarios may provide guidance regarding their use and interpretation.

AHA/ACCF/HRS Noninvasive Risk Stratification Techniques for Identifying Patients At Risk for Sudden Cardiac Death
http://circ.ahajournals.org/cgi/reprint/CIRCULATIONAHA.107.189375v1

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