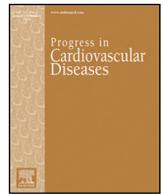




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Advances in the Risk Stratification, Prevention, and Treatment of Sudden Cardiac Death

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Sudden cardiac arrest (SCA) is an unfortunately common cause of death, resulting in up to 450,000 sudden cardiac deaths (SCD) per year in the United States. SCD risk is highest in patients with known heart disease, especially coronary artery disease (CAD) and systolic heart failure (HF). However, even though members of these groups are at high individual risk, most SCDs occur among patients with no prior diagnosis of cardiac pathology. Our ability to detect patients at high risk for SCA is improving, as is our ability to mitigate this risk – most importantly, through the use of implantable cardioverter-defibrillators (ICDs). Recent and ongoing efforts in improving our ability to screen for risk, not only through the widely used metric left ventricular ejection fraction (LVEF), but more recently through other imaging modalities, electrocardiography-based metrics, and genetic testing, are aimed at improving our ability to reduce the individual and societal impact of SCD.

However, there remains more work to be done. This issue of *Progress in Cardiovascular Diseases* (PCVD) provides a review of our knowledge of many aspects of SCD today, from epidemiology to pathophysiology, and from screening to management.

Various forms of imaging have become increasingly important, across many aspects of medical care. SCD risk stratification is no exception to this rule, as Dr. van der Bijl and colleagues summarize in our first article. Multimodality imaging techniques, including not only the common echocardiogram but also nuclear imaging and especially magnetic resonance, have great potential for our ability to detect who is at highest risk for SCD.

Several papers this month detail the particular features of SCD in certain clinical states. For example, Drs. Goff and Calkins summarize for us the current state of knowledge regarding a major cause of SCA, especially among athletes: hypertrophic cardiomyopathy. In a closely related manuscript, these same authors discuss other SCD syndromes that are especially important among physically active patients: arrhythmogenic cardiomyopathy and exercise-induced cardiomyopathy. Next, Singh and colleagues discuss long QT syndrome, Brugada syndrome, and catecholaminergic polymorphic ventricular tachycardia, which all are inherited SCD syndromes that may not have any morphologic manifestations.

While patients with ischemic cardiomyopathy are the most intensely studied in terms of SCD risk and prevention, many SCDs occur in patients with depressed LVEF but without any significant CAD. Complicating matters further, recent studies have suggested that ICD therapy may be of little benefit to those with nonischemic cardiomyopathy (NICM). To address this evolving subject, Kadakia et al. summarize the epidemiology of NICM, including emerging screening methodologies designed to improve patient selection for ICD therapy.

Once high risk for SCA has been identified, our most effective means of preventing death is the ICD. In both nonischemics and ischemics, cardiac dyssynchrony often contributes not only to HF, but also to an increased incidence of SCA/SCD. Dr. Galand and colleagues at Massachusetts General Hospital summarize the evidence for the use of cardiac resynchronization therapy as a tool for SCA risk reduction, as well as the evidence for possibly *proarrhythmic* effects from that same therapy. While most patients with elevated risk for SCA are treated with implantation of an ICD system with a transvenous lead, advancements in technology have allowed the creation of extravascular ICD technologies. In their manuscript, Drs. Pfenninger and Knight synopsise the evolution of such therapies, including the pros and cons of the absence of transvenous leads, as well as potential future developments in extravascular automated defibrillator systems.

Sometimes, such as immediately following myocardial infarction or during active infection, the implantation of an ICD is not warranted. During this time, patients may still be at elevated risk of SCA/SCD. The wearable cardioverter-defibrillator (WCD) is designed to protect such patients from potentially deadly arrhythmias until ICD implantation is possible, or is no longer needed. In this issue, Dr. Sandhu and colleagues discuss the WCD, including indications for its use, as well as evidence for and against its utility for SCD prevention.

The majority of SCD is arrhythmic in nature, but not every single SCD is due to arrhythmia. Many SCDs occur due to fulminant pathology that leads to rapid deterioration in hemodynamics and, quickly, death. In this month's issue, Dr. Bob-Manuel and colleagues catalogue the relevant causes of nonarrhythmic SCD.

When patients survive SCA, one possible sequela is neurological dysfunction due to the profound brain ischemia that occurs during the cessation of circulation. Therapeutic cooling techniques have a great effect on improving neurological outcomes in some patients. Mody et al. summarize the evidence in favor of targeted temperature management following aborted SCA, and offer guidelines for its implementation.

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Finally, two provocative papers in this issue illustrate potential SCD risk factors that have been studied less commonly than others. Dr. Pavon et al. detail the results of their meta-analysis and systematic review of the influence of cardiorespiratory fitness on SCD risk. Finally, Dr. Laukkanen summarizes his findings in an even less studied, and perhaps unexpected, arena: the beneficial effects of frequent sauna bathing in terms of SCD prevention.

As this issue's guest editors, we are delighted to present this collection. We are grateful for the superb contributions of the coauthors and for the editorial oversight of Dr. Carl "Chip" Lavie, Editor-in-Chief of *PCVD*. We hope that you find this issue to be an excellent review of many contemporary issues surrounding SCD, including effective screening and treatment.