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Sudden cardiac death: A reappraisal

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ABSTRACT

Sudden cardiac death (SCD) is still among the leading causes of death in women and men, accounting for over 50% of all fatal cardiovascular events in the United States. Two arrhythmia mechanisms of SCD can be distinguished as follows: shockable rhythms (ventricular fibrillation and pulseless ventricular tachycardia) and non-shockable rhythms including asystole or pulseless electrical activity. The overall prognosis of cardiac arrest due to shockable rhythms is significantly better. While the majority of SCDs is attributed to coronary artery disease or other structural heart disease, no obvious cause can be identified in 5% of all events, and those events are labeled as sudden unexplained deaths (SUD). Those unexplained events are typically caused by rare hereditary electrical disorders or arrhythmogenic cardiomyopathies. A systematic approach to the diagnosis of cardiac arrest followed by tailored therapy based on etiology has emerged in the last 10–15 years, with significant changes of medical practice and risk management of cardiac arrest victims. The aim of this review is to summarize our contemporary understanding of SCD/SUD in adults and to discuss current concepts of management and secondary prevention in cardiac arrest victims. A full discussion of the topic of primary prevention of SCD is beyond the scope of this article.

Key words: Cardiac arrest, Sudden cardiac death, Implantable defibrillator, Genetics, Cardiopulmonary resuscitation.

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Introduction

The devastating impact of sudden cardiac death (SCD) and sudden unexplained death (SUD) on our societies and health care systems is well recognized. Over the past 10–15 years there has been an explosion of data regarding SCD, which has resulted in significant changes to community response systems, medical practice, and risk management. The aim of this review is to provide insight into our contemporary understanding of SCD/SUD in adults and to discuss current concepts of management and secondary prevention in cardiac arrest victims. A full discussion of the topic of primary prevention of SCD is beyond the scope of this article.

Epidemiology and causes of sudden cardiac death

Sudden cardiac death (SCD) is defined as unexpected death within 1 h after onset of symptoms (witnessed) or within 24 h from the moment when the decedent was last observed alive in the absence of symptoms (unwitnessed), in the absence of an obvious non-cardiac cause [1]. Despite considerable medical progress over the past decades, SCD is still among the leading causes of death, accounting for over 50% of all fatal cardiovascular events in the United States. In 2014, the annual incidence of SCD in adults in the United States was 76 per 100,000 persons (unadjusted for age and sex) corresponding to a total of ~230,000 cases [2]. The death rates of SCD (expressed per 100,000) for males and females are

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estimated to be 76 (95% uncertainty interval: 66–87) and 45 (95% uncertainty interval: 37–53) respectively, exceeding the death rates of any individual cancer in both men and women [3]. The tremendous societal burden of SCD is even better illustrated when calculating the years of potential life lost (YPLL). Sudden cardiac death is responsible for up to 40–50% of all YPLL related to cardiovascular disease resulting in 2.04 million YPLL (95% uncertainty interval: 1.86–2.23) in men and 1.29 million YPLL in women (95% uncertainty interval: 1.13–1.45) [3]. The vast majority (70–80%) of all SCD cases

occur in an out-of-hospital setting at home or in residential institutions and only 50% of events are witnessed, which has a major impact on early response feasibility and thus the overall outcome [2,4].

Table 1 displays the broad spectrum of pathologies that can result in SCD. The leading cause of SCD in North America is coronary artery disease, accounting for 75% of all SCD cases. Structural non-ischemic heart disease accounts for 10–15% and primary electrical disorders are responsible for approximately 5–10% [5]. The etiology of SCD varies between cohorts

Table 1 – Etiology of sudden cardiac death.

Coronary causes	Ischemia secondary to coronary atherosclerotic heart disease Coronary vasospasm Congenital anomalous coronary Coronary vasculitis Non-atherosclerotic coronary thrombosis (e.g., anti-phospholipid syndrome)
Cardiomyopathies	Ischemic cardiomyopathy Non-ischemic cardiomyopathy Valvular cardiomyopathy Hypertrophic cardiomyopathy Myocarditis <i>Infiltrative cardiomyopathy</i> Cardiac sarcoidosis Cardiac amyloidosis Hemochromatosis Takotsubo cardiomyopathy Congenital heart disease Left ventricular non-compaction Neuromuscular disease with cardiac manifestation (e.g., myotonic dystrophy, and, DMD-associated cardiomyopathy)
Hereditary arrhythmogenic cardiomyopathies	Arrhythmogenic right ventricular cardiomyopathy (ARVC) Phospholamban cardiomyopathy Lamin A/C cardiomyopathy Danon disease
Primary electrical disorders	Long-QT syndrome Catecholaminergic polymorphic ventricular tachycardia (CPVT) Brugada syndrome Early repolarization syndrome Idiopathic ventricular fibrillation Short-QT syndrome Wolff-Parkinson-White syndrome Hereditary progressive conduction disease
Metabolic causes	Hyperkalemia/hypokalemia Hypomagnesemia Hypocalcemia Severe hypoglycemia Severe acidosis Hypothermia
Drugs/medication overdose	Cocaine Amphetamines/ecstasy Opiates Tricyclic antidepressants SSRIs Neuroleptics Antiarrhythmic medication Digoxin
Other causes	Cardiac trauma/commotio cordis Pulmonary embolism

DMD = Duchenne muscular dystrophy; SSRIs = selective serotonin reuptake inhibitors.

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