

# Sudden cardiac death and implantable cardioverter defibrillators: two modern epidemics?

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Critical analysis of the existing evidence indicates that:

- (1) In patients with documented sustained ventricular arrhythmias and/or cardiac arrest, implantable cardioverter defibrillators (ICDs) confer a survival benefit. In several clinical settings this is rather transient, and might be lost when modern medical therapy including  $\beta$ -blockers is implemented.
- (2) In patients without sustained ventricular arrhythmias or cardiac arrest, ICDs confer a significant survival benefit only in high-risk patients with ischaemic cardiomyopathy and left ventricular ejection fraction of  $\leq 35\%$  due to a remote myocardial infarction.
- (3) Left ventricular ejection fraction alone is rather unlikely to be sufficient for effective sudden cardiac death risk prediction, due to low sensitivity and specificity.
- (4) The benefits of ICDs in the elderly as well as in women are not established.
- (5) With current prices, ICDs are probably cost-effective only when used in high-risk patients without associated comorbidities that limit the life expectancy to  $< 10$  years.

Recommendations by current guidelines may result in unnecessary overuse of ICD.

**Keywords** Sudden cardiac death • Implantable cardioverter defibrillators • Primary prevention • Secondary prevention • Arrhythmic death

## Sudden cardiac death: the problem

Sudden cardiac death (SCD) is usually defined as death of cardiac origin occurring within 1 h from the onset of symptoms. Its incidence approximates 300–350 000 in the USA (0.1–0.2% of the population annually) and annually increases as a function of advancing age, being 100-fold less in adolescents and adults  $< 30$  years (0.001%) of age than it is in adults  $> 35$  years of age.<sup>1</sup> A similar incidence occurs probably in Europe.<sup>2,3</sup> Approximately 50% of all cardiac deaths are sudden and this proportion remains the same despite the overall decrease in cardiovascular mortality the last decades. The proportion of all natural deaths due to SCD is 13%, whereas if a 24 h from onset of symptoms definition is used, it becomes 18.5%.<sup>3</sup>

Ventricular tachycardia (VT) or fibrillation was thought to be the most common cause of out-of-hospital cardiac arrest, accounting for approximately three-quarters of cases, the rest 25% caused by bradyarrhythmias or asystole.<sup>4–6</sup> More recent studies suggest that the incidence of ventricular fibrillation (VF) or VT as the first recorded rhythm in out-of-hospital cardiac arrest has declined to perhaps even  $< 30\%$  in the past several decades.<sup>7–9</sup> The risk of SCD in myocardial infarction (MI) survivors has also declined significantly over the past 30 years, presumably due to early reperfusion and optimal medical therapy practices.<sup>10</sup> Recurrent ischaemia may not be significantly associated with SCD, whereas heart failure due to MI markedly increases the risk of SCD.<sup>10</sup> Interestingly, acute ischaemia is an established cause of VF and polymorphic VT,<sup>11</sup> whereas cardiac death in patients with nonischaemic dilated cardiomyopathy and functional class IV heart failure is more frequent

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