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REVIEW

# Update on sudden cardiac death: Epidemiology and risk stratification☆

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**KEYWORDS**
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**Abstract** In this article, a discussion is presented on the following aspects of sudden death, related to legal medicine. The epidemiological aspects and diseases associated with sudden death are discussed first. This is followed by presenting the chain of events leading to the final arrhythmias triggering sudden death, and the legal aspects of this.

This is a comparative study of the final arrhythmias responsible of sudden death in patients with: (1) acute myocardial infarction; (2) with no apparent heart disease; and (3) with heart failure. A comparison is also made between the incidence of ischaemic heart disease, acute coronary thrombosis, and left ventricular hypertrophy.


**PALABRAS CLAVE**
Muerte súbita;
Arritmias;
Medicina legal

**Actualización de la muerte súbita cardiaca: epidemiología y estratificación del riesgo**

**Resumen** En este artículo comentamos varios aspectos de la muerte súbita, relacionados con la medicina legal. En primer lugar, se exponen los aspectos epidemiológicos y las enfermedades asociadas a la muerte súbita. Más tarde, se discute la cadena de eventos que llevan a las arritmias finales a desencadenar la muerte súbita y sus aspectos legales.

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Se hace un estudio comparativo de las arritmias finales responsables de la muerte súbita en pacientes: 1) con infarto agudo; 2) ambulatorios sin cardiopatía evidente y 3) con insuficiencia cardiaca evidente, y también se comparan las diferencias de incidencia de cardiopatía isquémica, trombosis coronaria aguda e hipertrofia ventricular isquémica.


## Epidemiology

Sudden death (SD) probably represents the most significant challenge of modern cardiology due to the large number of cases which exist (in the USA alone there are more than 400,000/year) and due to its resulting significant social impact. However, its incidence is lower in some Mediterranean countries such as Spain.[1–6]

Although SD can even occur in infants, related to repolarisation disorders, autonomic nervous system abnormalities and increased vagal tone, it is in fact rare in the first few decades of life. In young subjects, it often occurs while doing sport.[7] In these cases, it tends to develop in the presence of inherited heart conditions (hypertrophic cardiomyopathy, arrhythmogenic right ventricular dysplasia/cardiomyopathy and channelopathies). The incidence of SD increases gradually, but significantly, from the age of 35 to 40 years, and it is particularly high in the acute phase of myocardial infarction (MI). It is also common in the chronic phase of this disease and in any heart disease, especially in the presence of heart failure (HF)[8] (Fig. 1).

## Associated diseases

As we have just stated, acute ischaemic heart disease (IHD) is frequently associated with SD in adults. In most cases of SD, aside from acute IHD and channelopathies, HF or, at least, ventricular dysfunction can be identified. HF can be associated with idiopathic cardiomyopathy, or be present in patients with chronic IHD, hypertension, cardiomyopathies of another aetiology, etc. Inherited heart conditions can cause SD at any age, but their overall impact is small (Fig. 1).

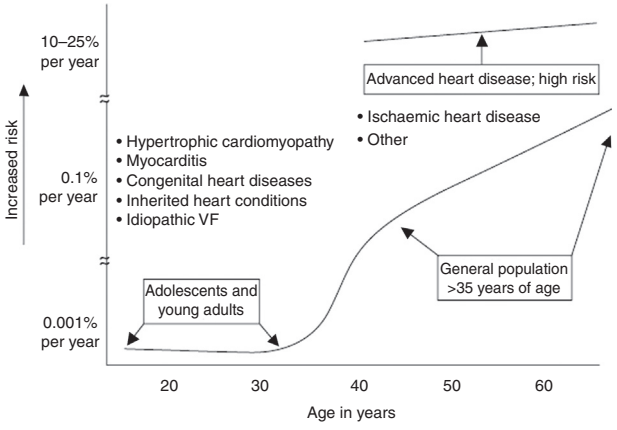


**Figure 1** Correlation between incidence of SD and age. Also note that SD is associated with different diseases throughout life.
*Source*: Taken from Myerburg RJ. Circulation. 1992; 85 Suppl 1:12.

**Table 1** Diseases associated with SD: autopsy study.

| SD victims (n = 204) | No. | % |
|---|---|---|
| *Cardiovascular diseases (n = 183)* | | |
| *Heart diseases (n = 161)* | | |
| Coronary heart disease | 119 | 58.4 |
| Hypertensive heart disease | 20 | 9.9 |
| Valve diseases | 5 | 2.4 |
| Idiopathic LVH | 4 | 1.9 |
| Dilated cardiomyopathy | 4 | 1.9 |
| Hypertrophic cardiomyopathy | 3 | 1.5 |
| Arrhythmogenic RV cardiomyopathy | 3 | 1.5 |
| Myocarditis | 1 | 0.5 |
| Congenital heart diseases | 1 | 0.5 |
| Amyloidosis | 1 | 0.5 |
| *Vascular disease (n = 22)* | | |
| Pulmonary embolism | 8 | 3.9 |
| Aortic dissection | 9 | 4.4 |
| Brain haemorrhage | 5 | 2.4 |
| *Non-cardiovascular diseases (n = 7)* | | |
| Gastrointestinal disorders | 3 | 1.5 |
| Pulmonary disorders | 4 | 1.9 |
| *No findings (n = 14)* | 14 | 6.9 |

It is worth highlighting, however, that they are responsible for many cases of SD which occur before the age of 35 years. Inherited heart conditions are more prevalent in males and can occur during physical exercise (cardiomyopathies), at rest or during sleep (channelopathies).

Our group conducted a study (EULALIA study) which included 204 cases of SD occurring in a Mediterranean region.[9] This study analysed the epidemiological, anatomical and pathological aspects of diseases associated with SD. Table 1 shows the pathological diagnosis obtained in this group of patients.

It is striking, when compared to similar studies in English-speaking countries,[10] that the incidence of cases of IHD detected in the autopsy is lower (≈80–90% vs 58%) and that, within these cases, the incidence of acute thrombosis and