Editor's Note

Sudden Cardiac Death—Can It Be Defined with Precision?

In August 1998, at the 20th Congress of the European Society of Cardiology in Vienna, Austria, I listened to a debate on the subject of sudden cardiac death chaired by Günter Breithardt, M.D., FESC, then President of the European Society of Cardiology and Phillip Poole-Wilson, M.D., FESC, Past President of the European Society of Cardiology. The protagonist argued that sud-

den cardiac death could be defined and the antagonist argued that it could not. This interesting session generated a tremendous amount of discussion by the participants and the audience. What follows are some thoughts on this subject.

Definitions

When broken down into its components “sudden cardiac death” is defined in the standard dictionaries in the following way:

Sudden: happening quickly and unexpectedly.

Cardiac: pertaining to the heart.

Death: the cessation of life manifested by loss of the heart-beat, by the absence of spontaneous breathing, and by cerebral death.

Sudden vs. Arrhythmic Death

Several have written on this subject. Two articles that I particularly enjoyed were a paper by Torp-Pedersen and colleagues¹ and an editorial by Roberts.² Torp-Pedersen stated that “since all death is (eventually) sudden and associated with cardiac arrhythmias, the concept of sudden death is only meaningful if it is unexpected, while arrhythmic death is only meaningful if life could have continued had the arrhythmia been prevented or terminated. Any practical classification of death being sudden or arrhythmic is highly dependent on the quality of available data to ensure that the suddenness was un-

expected and that life could have continued if the arrhythmia had been prevented or treated.”

Roberts defined sudden death as “death which is nonviolent or nontraumatic, which is unexpected, which is witnessed and which is instantaneous or occurs within a few minutes of an abrupt change in previous clinical state.” He illustrates the many causes of sudden death using case examples and makes the point that the cause of death could not have been accurately predicted if an autopsy had not been performed.

Differential Diagnosis of Sudden Death

Sudden death can be due to trauma or to nontraumatic causes. The nontraumatic causes can be cardiac or noncardiac. The nontraumatic cardiac causes of ventricular tachycardia or fibrillation leading to sudden death include left ventricular dysfunction of any etiology, evolving or recent myocardial infarction, recurrent myocardial ischemia, and circulatory collapse due to any cardiac etiology. The nontraumatic, noncardiac causes include pulmonary embolus, stroke, bleeding, ruptured aortic aneurysm, and so forth. Obviously, if death is due to unexpected trauma, for example, a gunshot wound, cause of death is fairly easy to classify. In contrast, in cases of suicide and motor vehicle accidents it may not be so easy to decide on mechanism. For example, whatever was being tested may have depressed the patient to the point of suicide, or, in the case of a motor vehicle accident, the patient may have had an episode of ventricular fibrillation resulting in unconsciousness and loss of control of the vehicle.

Clinical Trials and Sudden Death

Large-scale clinical trials usually have as a major end point all-cause mortality. Mortality and morbidity committees try to isolate those who had “sudden cardiac death” or other causes of death. It has always been a mystery to me how a committee can decide the precise mechanism of death in the patient who had an unwitnessed death, no terminal ECGs, and no autopsy data.

In any clinical trial with mortality as an end point the question can be asked, does it really matter whether the death of a patient is classified as sudden cardiac death or just death? Many argue that “dead is dead” and the mechanism of death is of no importance. Others point out that if death was due to unexpected ventricular fibrillation, occurring in a high-risk pa-

tient with known ischemic heart disease, it might have been prevented or at least delayed by treatment with beta blockers, amiodarone, an implantable defibrillator, or revascularization. In contrast, in the patient who has no known cardiac risk factors or cardiac history who dies unexpectedly from ventricular fibrillation, I doubt whether anything can be done to prevent that patient's death.

Case Example

A case that illustrates the uncertainty of mechanism of death is the recent death of a 51-year old professor of cardiology who had been riding his bicycle and was found dead on the street. He apparently had a cardiac arrest. There was no evidence of trauma nor was there any previous history of a cardiac condition. One would immediately opine that this patient suffered sudden cardiac death due to ventricular tachycardia or ventricular fibrillation and that nothing could have been done to prevent it. However, it was later learned that the patient had experienced chest discomfort for several hours prior to riding the bicycle. This piece of history now makes it likely that the patient may have been experiencing myocardial ischemia and developed a fatal arrhythmia secondary to myocardial ischemia. Later, an autopsy revealed an occluded left anterior descending artery with a large anterior myocardial infarction that was obviously evolving over several hours. This additional information now changes the etiology to a postinfarction arrhythmia, possibly even a reperfusion arrhythmia. The point is that this patient did not have primary ventricular fibrillation out of the blue, but rather secondary to an acute myocardial infarction. Aggressive early therapy with thrombolysis, beta blockers, anticoagulation, aspirin, and so forth, might have prevented this unexpected death. Another point is that if an autopsy had not been performed, the precise mechanism of death would not have been known and the death would have been

classified as a sudden cardiac arrhythmic death due to ventricular fibrillation. This illustrates the problem of precision, or rather lack of precision, in defining mechanism of death in patients in clinical trials in whom there is no information about either cardiac rhythm preceding death or autopsy later.

My Answer To The Question

The message I took away from the debate and the discussion was that it was not possible to prove sudden cardiac death in every instance and that this probably does not matter anyway since "dead is dead." The other point I took away was that if mechanism of death is uncertain, it should be stated as such. If medical evidence indicates previous or evolving myocardial infarction, recurrent angina, or heart failure, and autopsy data are available, then all that evidence should be used to determine mechanism of death. If there is no evidence, then why attempt to classify the death when any classification scheme may be incorrect.

There is no easy answer to this, but I believe the best answer is to admit that we don't really understand why every person dies and that we should say what we know and what we do not know, as was the recommendation of Phillip Poole-Wilson at this conference.

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Reference

1. Torp-Pedersen C, Kober L, Elming H, Burchart H: Classification of sudden and arrhythmic death. *Pacing Clin Electrophysiol* 1997;20: 245-252
2. Roberts W: Sudden cardiac death: Definitions and causes. *Am J Cardiol* 1986; 57:1410-1413