

EDITORIAL COMMENT

Lessons From a Population

The Limitations of Left Ventricular Ejection Fraction as the Major Determinant for Primary Prevention Implantable Cardioverter-Defibrillators*

William J. Groh, MD, MPH, FACC
Indianapolis, Indiana

In both ischemic and nonischemic heart disease the severity of left ventricular dysfunction has emerged as the key determinant affecting the decision of which patient should receive an implantable cardioverter-defibrillator (ICD) for prophylaxis against a future risk of arrhythmic sudden death (1,2). A documented ejection fraction of $\leq 35\%$ in an otherwise suitably treated patient will commonly result in an electrophysiology referral and an ICD implant. Although such treatment has yielded mortality benefit in the qualifying patient, whether it can significantly impact on overall sudden death in the general population is less clear. In the current issue of the *Journal*, Stecker et al. (3) provide population-based data that unfortunately show that only a small proportion of sudden death victims could have benefited from the current primary prevention ICD guidelines.

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They report results from the Oregon Sudden Unexpected Death Study, a rigorous collection of all sudden death cases in Multnomah County, Oregon (4). Of 714 sudden deaths occurring over a two-year period, only 121 patients had a previous assessment of left ventricular function and only 36 of these patients (5% of the total) had an ejection fraction of $\leq 35\%$.

It is not clear if the authors were (or could be) as rigorous in collecting all of the patients' medical records as they were in ascertaining all of the sudden death cases in their community. It seems probable that some of these patients would have had an assessment of left ventricular function either not known or unavailable to the investigators. What also is not clear is whether the 121 patients with assessment of left ventricular function are representative of the other 593 patients. We are informed only that other than a moderately older age in those with left ventricular functional assessment, demographic and socioeconomic data are similar between the two groups. One would expect that patients having an indication that prompted a structural cardiac

assessment would be more likely to have significant left ventricular dysfunction than those without such an indication. Thus, the unevaluated group would seemingly have even a lesser proportion meeting primary prevention ICD criteria.

The concept that only a minority of sudden deaths occur in patients previously identified as having significant left ventricular dysfunction has been previously well documented in a number of studies (5–8). The Oregon investigators should be commended for confirming the finding in a large general population.

Where does the current Oregon data, taken in context with the earlier studies, leave us regarding our ongoing efforts to combat sudden cardiac death in our communities? First, because as cardiologists we treat individual patients and not populations, we need to continue to apply the current ICD guidelines that have been shown to improve mortality in well-designed clinical trials. Although primary prevention ICD candidates are clearly a minority of those subsequently suffering an out-of-hospital arrhythmia that would have likely been fatal if not for the ICD, it remains a minority we can identify and help. We should learn more about the benefits and risks of the use of prophylactic ICDs outside the highly controlled realm of the clinical trial with the implementation of the ICD Registry, a combined effort of the American College of Cardiology, the Heart Rhythm Society, and the Centers for Medicare and Medicaid Services to collect nationwide data. Such data may help to further refine ICD guidelines over the next decade.

None of the cardiac arrest victims in the Oregon study had ICDs, and, by study design, patients needed to have the ultimate adverse outcome of death to be included in the registry. We do not know the number of patients in Multnomah County, Oregon, who had received an ICD and were prevented from having sudden death by its presence. Such a population-based analysis would provide comforting parallel data to the harsh realities of reporting sudden death.

Although we cannot help these Oregon sudden death victims, there are population-based approaches that can be applied to prevent sudden death. The majority of sudden death continues to occur in the setting of acute or chronic ischemic heart disease (9). The progress made in the U.S. over the last half-century in decreasing non-sudden coronary deaths appears to have also resulted in a similar decrease in sudden deaths (10). Early identification of coronary risk factors and primary and secondary prevention measures should continue to decrease the population vulnerable to sudden death. As well, communities need to optimize their emergency response to the cardiac arrest victim, thereby increasing the likelihood of survivability of the arrhythmias associated with sudden death (11,12).

We will remain far less than perfect at predicting at what time and for which patient the unfortunate substrates and triggers cross to result in sudden death. Despite this

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From the Department of Medicine, Krannert Institute of Cardiology, Indiana University, Indianapolis, Indiana.

shortcoming, the considerable progress we have made in preventing sudden death should not be disregarded.

Reprint requests and correspondence: Dr. William J. Groh, Krannert Institute of Cardiology, Indiana University School of Medicine, 1800 North Capitol, Room E406, Indianapolis, Indiana 46202. E-mail: wgroh@iupui.edu.

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