EDITORIAL

Improved Programming of ICDs

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It can be simply stated that there are only two goals of most therapies: to help patients feel better or to help them live longer (or both). Implantable cardioverter–defibrillators (ICDs) have the potential to achieve both goals, but what distinguishes ICD therapy from medical therapies? Specifically, physicians can determine how an ICD is programmed to deliver therapy, but do we manage programming optimally to improve survival and reduce inappropriate shocks? This is an important question, because cardiovascular implantable electronic device therapy as a class and ICD therapy in particular appear to have inherent characteristics that are distinct in important ways from those of medical therapies. The findings by Moss and colleagues[1] now reported in the *Journal* provide some insight into this question and also into the overall value of ICD therapy.

Randomized clinical trials are designed to detect a difference between two or more strategic approaches, but what kind of strategy is defibrillator therapy? Defibrillators are designed to terminate ventricular arrhythmias by rapid pacing or high-intensity shocks. It doesn't matter if one or another manufacturer produces the device, if it is larger or smaller, or if it is implanted using venous access or epicardial access; the ICD delivers the same therapy. However, it does matter how the device is programmed, because when an ICD is programmed, its therapy is distinct — not from the defibrillator therapy of another manufacturer but from the same device immediately before reprogramming. What then determines the value of ICD therapy? Its value will depend not only on the target population and successful implantation but also specifically and dramatically on the programming of the device.

In the study by Moss et al., the value of carefully choosing tachycardia-detection parameters is demonstrated definitively. To be clear, the investigators used Food and Drug Administration–approved, standard dual-chamber ICD devices or cardiac-resynchronization devices with ICD; the devices had no special features and were implanted with standard techniques and guided by standard evidence. The trial compared ICD therapy, as previously tested in randomized clinical trials and known to prolong survival and reduce hospitalization, with identical ICDs programmed to reduce shock exposure. The investigators observed much less morbidity and improved survival. This was not a new type of ICD, but the same ICD therapy that had been available for decades. The only difference was in the programming of the parameters for arrhythmia detection and for the initiation of device-delivered therapy. Even the programming choices were not new. The programming choices or very similar ones have been available for almost two decades.

Using data from a large cohort of patients, Moss and colleagues found that two separate programs were substantially better than a standard program in reducing inappropriate ICD activations and prolonging life. The study programs were designed to ignore both slower tachyarrhythmias and those of shorter duration. For many years, with all the best intentions, physicians have programmed devices to quickly detect and treat ventricular tachycardia. This strategy has a long, undistinguished history and fared poorly when tested in the pivotal Cardiac Arrhythmia Suppression Trial (CAST).[2] Physicians then applied ICD therapy to patients with spontaneous sustained ventricular arrhythmias or increased risk of them with great success.[3,4]

However, there is a similar history of how ICD programming choices can produce harm, as shown in the Dual Chamber and VVI Implantable Defibrillator (DAVID) trial, simply by programming to pace the right ventricle.[5]

The results of the Multicenter Automatic Defibrillator Implantation Trial–Reduce Inappropriate Therapy (MADIT-RIT) should make us carefully reconsider the previously measured effects of ICD therapy on morbidity and mortality. The implication of these data is that the previous trials may have underestimated the potential beneficial effects of ICD therapy, and the new findings should clearly influence the way that ICDs are programmed. These data do not come as a surprise, although they are the first data from a randomized trial to show this large and clinically important outcome. Prior investigations used similar programming strategies — including algorithms for discrimination of supraventricular tachycardia, prolonged duration of arrhythmia detection, faster rates for tachycardia detection, and antitachycardia pacing — and support the conclusions.[6-9] The overriding principle is to be certain that there is a sustained tachyarrhythmia before treating the rhythm. Instead of favoring quick detection and therapy, physicians should adhere to the guiding principle of waiting for certainty of detection before implementing therapy. This principle will result in systematic underdetection of some important arrhythmias but will also systematically reduce overall morbidity and improve survival, as shown by Moss et al.

In conclusion, the value of ICD therapy is greatly influenced and in many ways determined by the programming choices made by the physician. A patient's unnecessary exposure to painful shocks and his or her very survival may depend on these choices. Choose wisely!

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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