



**BRIEF ANSWERS  
TO SPECIFIC  
CLINICAL  
QUESTIONS**

## Q: When should patients be allowed to drive after ICD implantation?

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**A:** That depends on why the patient received the device, whether he or she has had any episodes of ventricular arrhythmias since the device was implanted, and, if the patient is a commercial driver, on the law. With more patients receiving an implantable cardioverter-defibrillator (ICD) prophylactically without ever having experienced a ventricular dysrhythmia, a “one-size-fits-all” approach should be avoided.

### ■ USE OF ICDs INCREASING

ICDs effectively prevent death from malignant ventricular arrhythmias. Since more than 400,000 sudden cardiac deaths occur in the United States each year,<sup>1</sup> as many as 3 million US patients might be eligible for an ICD.<sup>2</sup>

The use of ICDs has increased steadily in the almost 20 years since the first ICD was commercially released in the United States. In 2000, more than 59,000 US patients received one.<sup>3</sup>

As the number of patients with ICDs increases, general cardiologists, internists, and general practitioners are more likely to see ICD patients<sup>4</sup> and to face questions such as “When can I start driving again?”<sup>5</sup>

### ■ CONCERNS ABOUT DRIVING

Patients with arrhythmias may suddenly lose consciousness—arrhythmias cause about 15% of syncopal episodes.<sup>6</sup> Therefore, whether a patient with an ICD should drive is a matter of both personal and public safety.

After ICD implantation, driving privileges that were taken for granted are often curtailed as a matter of patient preference, physician recommendation, or law. Epstein et al note that physicians caring for ICD patients should make recommendations that are “fair to all persons, recognizing that restrictions may limit personal freedoms, job security, and feelings of well-being.”<sup>7</sup>

### ■ IMPACT OF NOT DRIVING

Many patients with ICDs experience feelings of anxiety and helplessness, and revoking their driving privileges may worsen the psychosocial impact.<sup>8</sup> Therefore, unnecessary driving proscription should be avoided, both as a matter of fairness and to avoid diminishing the patient’s quality of life.

Simply telling all ICD patients that “doctors usually tell people like you to give up driving”<sup>9</sup> is incorrect. Furthermore, such instructions are unlikely to be followed.<sup>10</sup>

### ■ ASK WHY THE PATIENT RECEIVED THE ICD

The indications for ICD therapy have evolved rapidly over the last several years, markedly increasing the number of eligible patients.

**Symptomatic ventricular arrhythmias.** At first, ICDs were mostly used in patients who had survived an episode of symptomatic ventricular arrhythmia. This restricted use continued through much of the 1990s.

**Inducible ventricular tachyarrhythmias** on electrophysiologic testing subsequently became a reason for ICD implantation in some patients at high risk who had not yet experienced ventricular tachyarrhythmias or ventricular fibrillation, such as those with severe left ventricular systolic dysfunction.

**A “one-size-fits-all” approach should be avoided**

\*The author has indicated that he is a consultant for St. Jude Medical Inc. and is a stockholder of Medtronic Inc.

TABLE 1

### MADIT I and MADIT II: ICDs reduce mortality, even without symptomatic arrhythmias

	MADIT I	MADIT II
<b>Inclusion criteria</b>		
Prior myocardial infarction	Yes	Yes
Left ventricular ejection fraction	≤ 35%	≤ 30%
Arrhythmias	Required*	Not required
<b>Reduction in mortality†</b>		
Relative	54%	31%
Absolute	18%	5.6%

ICD = implantable cardioverter-defibrillator, MADIT = Multicenter Automatic Defibrillator Trial

\*Nonsustained ventricular tachycardia or inducible ventricular tachycardia not suppressible with intravenous procainamide

†Compared with best medical therapy without an ICD

DATA FROM MOSS AJ, ZAREBA W, HALL WJ, ET AL. PROPHYLACTIC IMPLANTATION OF A DEFIBRILLATOR IN PATIENTS WITH MYOCARDIAL INFARCTION AND REDUCED EJECTION FRACTION. *N ENGL J MED* 2002; 346:877-833 (MADIT I) AND MOSS AJ, HALL WJ, CANNOM DS, ET AL. IMPROVED SURVIVAL WITH AN IMPLANTED DEFIBRILLATOR IN PATIENTS WITH CORONARY DISEASE AT HIGH RISK FOR VENTRICULAR ARRHYTHMIA. *N ENGL J MED* 1996; 335:1933-1940 (MADIT II).

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**High risk without ventricular arrhythmias.** Most sudden cardiac deaths occur in patients with no history of arrhythmias.<sup>11</sup> Because the likelihood of surviving an out-of-hospital cardiac arrest is quite low, attention has turned to primary prevention, ie, identifying people at high risk and implanting an ICD before an event occurs.

#### MADIT I, MADIT II: ICDs in symptom-free patients

Two of the most important clinical trials supporting ICD use for primary prevention in patients at high risk who have never had symptomatic arrhythmic events are the Multicenter Automatic Defibrillator Implantation trials (MADIT I and MADIT II; TABLE 1).

**MADIT I** included patients with asymptomatic nonsustained ventricular tachyarrhythmias and moderately impaired systolic left ventricular function (an ejection fraction ≤ 35%) after a myocardial infarction, and in whom an electrophysiologic study revealed inducible but nonsuppressible ventricular tachyarrhythmias. The average age was 62 years.<sup>12</sup>

During an average follow-up of just over 2 years, patients in the ICD group showed an impressive 54% relative reduction and an 18% absolute reduction in all-cause mortality. Vice

President Cheney received his ICD presumably on the basis of MADIT I indications.<sup>13</sup>

**MADIT II** included patients with prior heart attacks and an ejection fraction of 30% or less, but not necessarily any history of arrhythmias.<sup>3</sup> During an average follow-up of just over 2 years, patients in the ICD group (average age 65) showed a 31% relative reduction and a 5.6% absolute reduction in all-cause mortality.

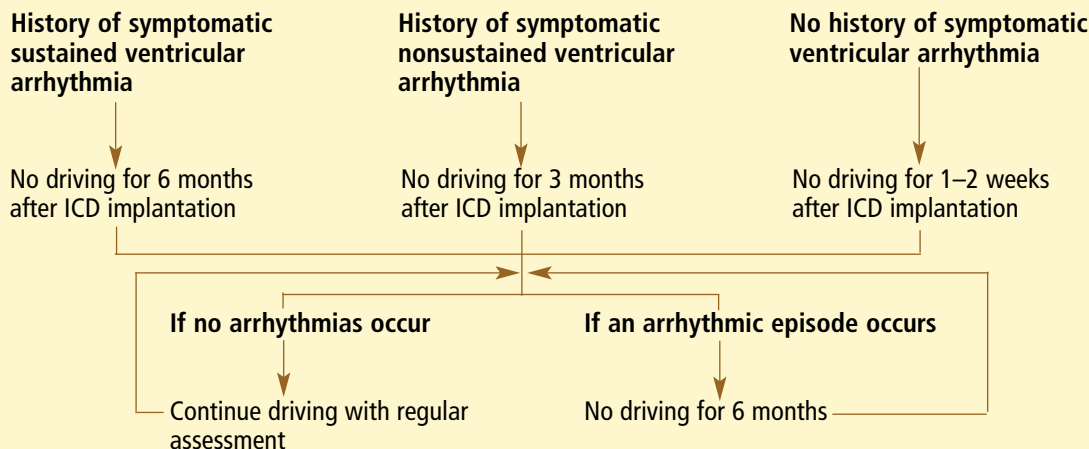
From now on, therefore, most patients who receive an ICD will *not* have had a clinical episode of symptomatic ventricular tachyarrhythmia. Indeed, the current guidelines for implantation do not require symptoms or spontaneous ventricular arrhythmias, but only a low ejection fraction (≤ 30%) due to a prior infarction, plus a slightly prolonged QRS interval.<sup>14</sup>

#### RECOMMENDATIONS

It is not the ICD that makes driving dangerous, but rather the tachyarrhythmia, which may cause unexpected and sudden dizziness or loss of consciousness. Epstein et al<sup>7</sup> contend that irrespective of the clinical circumstances leading to ICD implantation, “the available data do not support the contention that sudden cardiac death while driving is a significant



## Driving restrictions after ICD implantation



**FIGURE 1.** Driving privileges apply only to noncommercial vehicles. ICD = implantable cardioverter-defibrillator.

public safety issue.” Akiyama et al<sup>10</sup> note that overall “these patients appear to have a low risk of being in a motor vehicle accident—a risk that is not greater than that in the general driving population.”

Despite these reassurances, cardiovascular societies throughout the world have issued guidelines on driving restrictions.<sup>7,15,16</sup> The rules vary among countries (and even among US states), but the principles are in general the same (FIGURE 1).<sup>5</sup>

Patients with ICDs can be divided into two broad categories; those who have experienced symptomatic ventricular dysrhythmias and those who have not. It is not always possible to document an arrhythmia, and patients who have experienced syncope thought to be due to dysrhythmia are included in the group with documented symptomatic ventricular tachyarrhythmias or ventricular fibrillation. This group might include patients with syncope after a myocardial infarction who have inducible ventricular tachyarrhythmias on an electrophysiologic study. The syncope would be assumed to have been due to a spontaneous ventricular tachyarrhythmia that “self-terminated.”<sup>17</sup>

### No commercial driving

Recommendations are most clear for commercial driving: it is permanently prohibited,

whatever the clinical circumstances leading to ICD therapy.

### Noncommercial driving

ICD patients who have not had symptomatic ventricular dysrhythmias (ie, MADIT I and II patients) can resume driving after 1 to 2 weeks,<sup>16</sup> much like patients who receive pacemakers. As Smith<sup>18</sup> recently noted, “the guidelines regarding driving are (and should be) less restrictive for patients like Mr. Cheney who have received an ICD but have never had an episode of arrhythmia affecting consciousness.”

ICD patients who have had nonsustained symptomatic arrhythmias should not drive for 3 months after implantation.

Patients who received an ICD after an episode of sustained symptomatic ventricular dysrhythmias should not drive for at least 6 months.

**Episodes restart the clock.** Anytime after the initial driving restriction that the patient experiences another episode of ventricular tachycardia or ventricular fibrillation that triggers the ICD, the “clock starts over,” and the patient should abstain from driving for 6 months—long enough to adjust the medical therapy and to judge whether the new regimen is adequate.<sup>7</sup>

Thus, because driving status can change

**Patients without symptoms may drive again 2 weeks after receiving an ICD**



on the basis of the frequency of arrhythmias and their symptomatic consequences, it has been wisely suggested that “specific instructions regarding driving need to be given to the patient on a continual basis.”<sup>19</sup>

**Idiopathic ventricular tachycardia.** While most ICD patients have structural heart disease, a few have idiopathic ventricu-

lar tachycardia (normal coronary arteries, normal ventricular function) and no impairment of consciousness.<sup>7</sup> Such patients should refrain from driving a private vehicle for 3 months after implantation of the ICD. Driving of commercial vehicles remains prohibited after ICD implantation irrespective of the cause. ■

## REFERENCES

- Zheng Z-J, Croft JB, Giles WH, Mensah GA. Sudden cardiac death in the United States, 1989 to 1998. *Circulation* 2001; 104:2158–2163.
- Moss AJ, Zareba W, Hall WJ, et al. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. *N Engl J Med* 2002; 346:877–883.
- Sternberg S. Implant will help control Cheney's heart rhythm. *USA Today*, July 2, 2001. Available at [www.usatoday.com/news/washington/july01/2001-07-02-cheney-qa-usat.htm](http://www.usatoday.com/news/washington/july01/2001-07-02-cheney-qa-usat.htm). Last accessed January 14, 2004.
- Pinski SL, Trohman RG. Implantable cardioverter-defibrillator: implications for the nonelectrophysiologist. *Ann Intern Med* 1995; 122:770–777.
- Glikson M, Friedman PA. The implantable cardioverter defibrillator. *Lancet* 2001; 357:1107–1117.
- Kapoor WN. Syncope. *N Engl J Med* 2000; 343:1856–1862.
- Epstein AE, Miles WM, Benditt DG, et al. Personal and public safety issues relates to arrhythmias that may affect consciousness: implications for regulations and physician recommendations. *Circulation* 1996; 94:1147–1166.
- Sears SF, Conti JB. Understanding implantable cardioverter defibrillator shocks and storms: medical and psychosocial considerations for research and clinical care. *Clin Cardiol* 2003; 26:107–111.
- Lee TH. Ask the doctor. *Harv Heart Lett* 2003 Jan; 13(5):8.
- Akiyama T, Powell JL, Mitchell LB, et al. Resumption of driving after life-threatening ventricular tachyarrhythmia. *N Engl J Med* 2001; 345:391–397.
- Myerburg RJ, Kessler KM, Castellanos A. Sudden cardiac death. Structure, function, and time-dependence of risk. *Circulation* 1992; 85(suppl 1):2–10.
- Moss AJ, Hall WJ, Cannom DS, et al. Improved survival with an implanted defibrillator in patients with coronary disease at high risk for ventricular arrhythmia. *N Engl J Med* 1996; 335:1933–1940.
- Why Vice President Richard Cheney Has an ICD. North American Society of Electrophysiology and Pacing. Available at [www.naspe-patients.org/patients/treatments/cardiac\\_defibrillators/vp.html](http://www.naspe-patients.org/patients/treatments/cardiac_defibrillators/vp.html). Last accessed January 3, 2004.
- Gregoratos G, Abrams J, Epstein AE, et al. ACC/AHA/NASPE 2002 Guideline Update for Implantation of Cardiac Pacemakers and Antiarrhythmia Devices. Summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/NASPE Committee to Update the 1998 Pacemaker Guidelines). *Circulation* 2002; 106:2145–2161.
- Task Force Report: Driving and heart disease. *Eur Heart J* 1998; 19:1165–1177.
- The Cardiac Society of Australia and New Zealand. Cardiovascular disease and driving. Available at [www.csanz.edu.au/guidelines/practice/drivelg2002.pdf](http://www.csanz.edu.au/guidelines/practice/drivelg2002.pdf). Last accessed April 7, 2003.
- Herheim P, Olshansky B. When should an ICD be considered for syncope? *J Crit Ill* 2003; 18:84–91.
- Smith TW. Driving after ventricular arrhythmias. *N Engl J Med* 2001; 345:451–452.
- You can make a difference: chapter highlights. Medtronic, Inc. Minneapolis, MN. Available at [www.medtronic.com/tachy/clinician/tachy\\_page3.html](http://www.medtronic.com/tachy/clinician/tachy_page3.html). Last accessed April 7, 2003.

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