

## It's Always Something...

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As Roseanne Rosannadanna used to say on *Saturday Night Live* to questions from Mr. Richard Feder of Fort Lee, New Jersey, “Well, Jane, it just goes to show you, it’s always something—if it ain’t one thing, it’s another.”

Magnets have been associated with pacemaker and implantable cardioverter/defibrillator (ICD) therapy since the beginnings of both therapies. Before sophisticated software-based device programmers, magnets were used to check the battery life and output of pacemakers and were also used to test ICD charge times, reform the capacitors, and inactivate and reactivate them around surgical procedures. Magnets play less of a role in our day-to-day practice of device follow-up, but are still occasionally taped over devices during surgery to prevent sensing of electromagnetic interference from cautery and delivering inappropriate shocks.

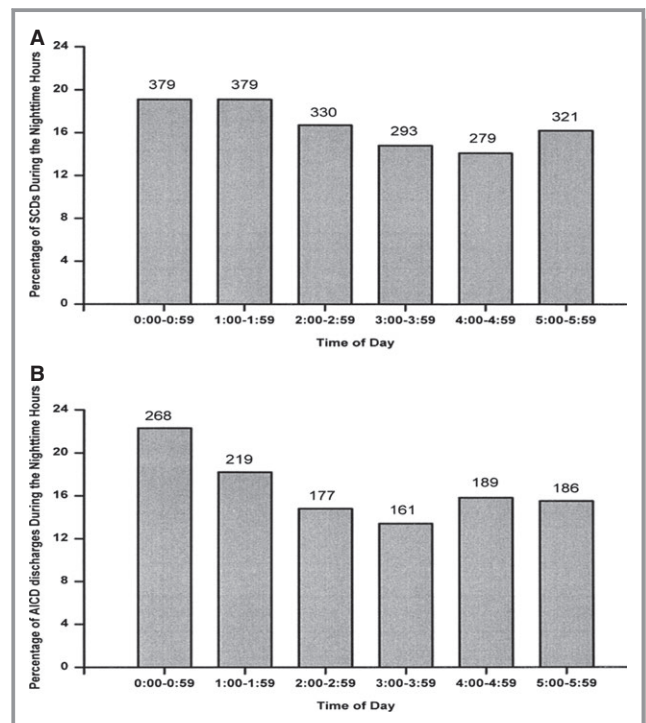
The study of Kozik et al.<sup>1</sup> evaluated the risk involved in placing the popular iPad®, which have numerous magnets in their covers, over an ICD in the chest while the patient is supine and using the device to play games, read, surf the Web, watch movies, and so on. These are now common activities that did not exist 10 years ago when people fell asleep reading a book or watching a television set that was across the room.

Although their study was small—27 patients—and did not include all device manufacturers, they did, in fact, show that, in a significant number of patients studied, the devices were affected by the magnets on the iPad®. Nine (33%) devices were inhibited from sensing and treating life-threatening arrhythmias. What’s more, the devices that still had the “magnet turn-off” function were completely turned off and would be nonfunctional not just for the duration of

contact with the magnet, but potentially until the next formal device interrogation discovered the programming change. In that circumstance, the device could be nonfunctional for months.

This study was performed in adults. If children with ICDs had been included, the numbers of affected devices may have been even higher because there are still abdominally placed devices in that population. With iPad® commonly used by young people for online movie services, gaming, and school-work, one could expect significant contact between the magnetic cover and their ICD.

Verrier and Josephson reviewed the effect of sleep on arrhythmogenesis<sup>2</sup> and showed the nonuniform nighttime distribution of nocturnal sudden cardiac death. A Figure from



**Figure.** A, Hourly incidence of sudden cardiac death (SCD) onset between midnight and 5:59 AM from 12 studies enrolling 1981 patients. B, Hourly incidence of automatic implantable cardioverter-defibrillator (AICD) discharge between midnight and 5:59 AM from 7 studies. Reproduced with permission from Verrier et al.<sup>2</sup>

The opinions expressed in this article are not necessarily those of the editors or of the American Heart Association.

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their review shows the prevalence and distribution of nocturnal sudden cardiac death events. With rapid eye movement (REM) sleep, there are surges of sympathetic activity that affect heart rate, vasomotor tone, and even platelet aggregation. Similarly, patients with sleep disordered breathing have issues with nocturnal ischemia, atrial fibrillation, bradycardia, tachycardia, complex ventricular ectopy, and nonsustained ventricular tachycardia. Asystole and atrioventricular block is not uncommon during sleep in healthy individuals, but these changes in cycle length may not be benign in patients on potassium-lowering diuretics or QT-prolonging antiarrhythmic agents or in patients with LQT 2, LQT 3, or Brugada syndrome.

ICDs are placed to provide 24/7/365 protection from sudden cardiac death. Anything that potentially compromises that protection should not be taken lightly. There is currently no warning on iPad® to alert patients with cardiovascular implantable electronic devices about a possible interaction.

Using an iPad® while supine may incur risk, and routinely falling asleep while using your iPad® could potentially be a fatal habit.

It's always something!

## Disclosures

None.

## References

1. Kozik TM, Chien G, Connolly TF, Grewal GS, Liang D, Chien W. iPad2® Use in patients with implantable cardioverter defibrillators causes electromagnetic interference: The EMIT study. *J Am Heart Assoc*. 2014;3:e000746 doi: 10.1161/JAHA.113.000746.
2. Verrier RL, Josephson ME. Impact of sleep on arrhythmogenesis. *Circ Arrhythm Electrophysiol*. 2009;2:450–459.

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