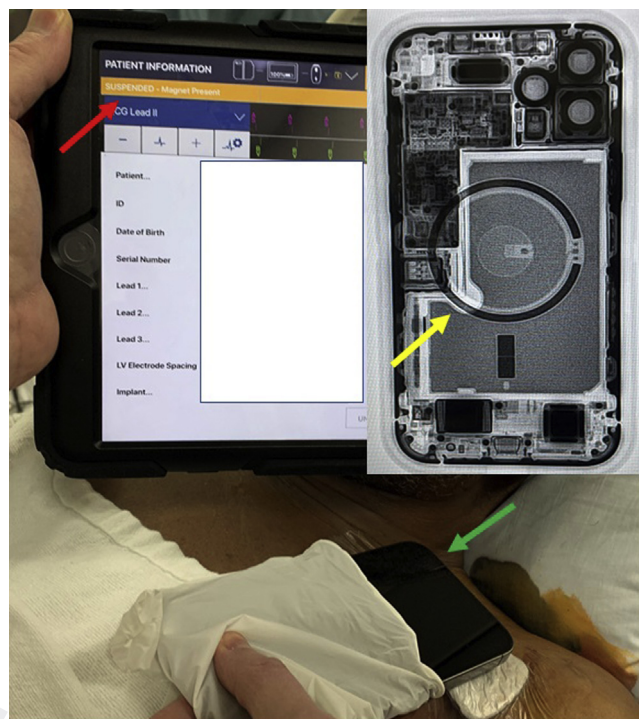


Letter to the Editor—Lifesaving Therapy  
 Inhibition by Phones Containing Magnets

The implantable cardioverter-defibrillator (ICD) remains the cornerstone therapy for the management of malignant ventricular arrhythmias in patients with high-risk cardiac conditions. An ICD system contains a battery, capacitors, and a sensing/pacing circuit together with an intracardiac or extracardiac lead. All ICDs have an in-built switch (reed switch, Hall effect sensors, giant magnetosensitive resistors or coils) that responds to an externally applied magnetic field. When an external magnet is applied to a defibrillator, high-voltage shock therapy for ventricular tachycardia and ventricular fibrillation is suspended. It has been estimated that a magnetic field stronger than 10 gauss is strong enough to activate these switches.<sup>1</sup>

Apple Inc. recently launched the iPhone 12 series, which has a circular array of magnets around a central charging coil that makes the phone compatible with MagSafe accessories. MagSafe technology contains a magnetometer and a single-coil, near-field communication (NFC) reader. The magnets aids in properly aligning the iPhone on a wireless charger and other peripheral accessories and increases wireless charging speeds (up to 15 W). The first author (JG) raised concerns regarding possible device–device interaction due to the presence of a strong magnetic array in the iPhone and MagSafe compatible cases. We thus tested this interaction on a patient with a Medtronic Inc. (Minneapolis, MN) ICD. The study was approved by the institutional review board. Once the iPhone was brought close to the ICD over the left chest area, immediate suspension of ICD therapies was noted and persisted for the duration of the test (Figure 1). This result was reproduced multiple times with different positions of the phone over the pocket.

We hereby report an important public health issue concerning the newer-generation iPhone 12, which potentially can inhibit lifesaving therapy in a patient, particularly when the phone is carried in an upper chest pocket. Contemporary studies have shown minimal risk of electromagnetic interference from ICDs and older-generation smartphones not having a magnetic array.<sup>2,3</sup> A recent case report highlighted magnetic interference from a fitness tracker wrist band that deactivated an ICD up to distances of 2.4 cm.<sup>4</sup> The Apple Inc. website does mention magnetic interference with medical devices and consultations with physicians and medical device manufacturers.<sup>5</sup> Medical device manufacturers and implanting physicians should remain vigilant about making patients



**Figure 1** Device programmer showing suspension of implantable cardioverter-defibrillator therapies (orange bar indicated red arrow) with the iPhone 12 laying over the patient's chest (green arrow) and fluoroscopy of the iPhone 12 showing the circular magnet array (yellow arrow).

aware of this significant interaction of the iPhone 12 and other smart wearables with their cardiac implantable electronic devices.

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