

# MRIs called magnets for injury

*More uses and power raise risk, experts say.*

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WEDNESDAY, SEPTEMBER 21, 2005

## The Philadelphia Inquirer

It's not supposed to happen, but it's well-documented: A metal object gets into a room with a magnetic resonance imaging machine, then gets pulled into the maw of the giant magnet. Chairs, intravenous drug poles, mop buckets, laundry carts, ladders, even the tines of an electric forklift.

Now, safety experts say, the chances for error are growing. More and more patients have implantable electric devices - pacemakers, defibrillators, cochlear implants, vagal nerve stimulators - that can be disrupted by an MRI. The scanners are becoming ever more powerful and are being used in new ways, such as guiding invasive treatment.

Patients are also getting fatter, making it tougher to prevent burns caused by touching the inside of the machine.

"As MRI technology advances, the potential for incidents and injury of patients and staff increases," declared ECRI, a nonprofit health services research firm in Plymouth Meeting. "How will these changes and advancements affect hospitals and health-care facilities?"

To explore that question, more than 1,300 radiologists, technicians, risk managers and insurers from 105 organizations around the country dialed into an MR safety seminar sponsored by ECRI in September.

Health professionals prize MRI for its ability to provide detailed, three-dimensional pictures of soft tissues such as the brain, without the potentially harmful effects of X-rays or nuclear scans.

Considering that the United States now has about 10,000 MRI machines that produce 20 million scans a year, the technology is remarkably safe, said radiologist Manuel Kanal, the University of Pittsburgh Medical Center's director of MR services.

On the other hand, no one knows exactly how safe.

An ECRI poll of the 105 organizations participating in the seminar found that nearly 60 percent have had MRI "incidents," including projectiles, mild burns, and interference with implanted devices.

Most such incidents are not reported to the Food and Drug Administration, because reporting is voluntary and varies - just like safety practices. An ECRI analysis of the FDA's database found 389 MRI-related incident reports from 1995 through May 2005, including eight deaths.

"I used to say [voluntary reports] are the tip of the iceberg, representing maybe 1 in 10 incidents," Kanal, who has become an MRI safety guru, told the conference. "I presently believe the percentage of accidents reported to the FDA is well, well below 10 percent."

Pennsylvania's new medical-error tracking program may be a better safety indicator because incidents must be reported, even if no injury occurs. In its first 16 months, the Pennsylvania Patient Safety Reporting System had 88 MRI incidents, although only three involved minor injuries - namely, burns.

Patients tend to dread MRIs because of the claustrophobic, full-body enclosure.

The real hazards, however, stem from the fact that the electromagnetic field - up to 50,000 times stronger than the Earth's - is continuously on. Turning it off requires the release of the all-important coolant, liquid helium, which is kept at 4 degrees above absolute zero.

A shutdown, or "quench," takes more than a minute and can be dangerous in itself. The FDA's database lists one asphyxiation death caused by breathing the ultracold vaporized helium.

Although MRI is not subject to federal safety regulations, the American College of Radiology published lengthy guidelines after a 6-year-old boy in Westchester County, N.Y., died during an MRI. An oxygen tank hurtled across the room into the scanner - and his head.

Kanal, an author of the guidelines, said they were modeled after the federal rules governing nuclear medicine, which uses radioactive materials.

A crucial recommendation: Never let anyone enter the MRI room who has not been carefully screened for iron-containing metal. For patients, that includes checking out tattoo ink, body piercings and drug-delivery patches.

Better screening would have kept a Rochester, N.Y., police officer's gun from flying out of his holster in 1999 and shooting a hole in a wall. And it would have saved an eye.

"A man went in and forgot he had a nail clipper in his pocket. When he tried to remove it, it flew out of his hand, struck him in the eye, and he went blind," Kanal said.

Another crucial recommendation: Educate everyone from executives to janitors about the restrictions.

"The problem is people ignore signs that say 'authorized personnel only.' They think, 'I work here,' " said Moriel NessAiver, a Baltimore physicist who teaches MRI safety. "That's when accidents happen."

The bottom line, experts say, is that nothing can be taken for granted. The physics are fantastically complex; an electrical implant may be fine in a low-strength magnet, but disrupted in a high-strength machine - or vice versa.

And while stents, artificial joints and surgical staples are now made of nonmagnetic metal, older ones are suspect. The FDA database includes a death caused by a brain aneurysm clip that shifted, causing a hemorrhage.

"It's very difficult to predict what's going to happen before the patient goes in," said Jason Lauders, ECRI's health devices expert.