

Twenty Years of MRI safety: A Progress Report

Mary Beth Massat

Here we are 20 years later with no mandated reporting of safety incidents, and they continue to occur.

William H. Faulkner, BS RT(R)(MR)(CT), FSMRT

Mary Beth Massat is a freelance writer based in Crystal Lake, IL.

It's been 20 years since an MRI accident riveted the industry and a small town mourned the death of 6-year-old Michael Columbini. Michael died after a metal oxygen tank was pulled into the MRI bore, crushing his skull while he underwent an exam at Westchester Medical Center in Valhalla, NY. A post-accident analysis found a multitude of issues that contributed to the incident, including easy access to the MRI suite by non-MRI staff and communication breakdowns.¹

In 2002, the American College of Radiology (ACR) published its first set of MRI guidelines as a response to the tragic event. In 2019, the ACR published an update of its guidelines in the *Journal of Magnetic Resonance Imaging* and, subsequently, in its updated ACR Manual on MR Safety in 2020.

Yet some experts believe the guidelines don't go quite far enough.

"Here we are 20 years later with no mandated reporting of safety incidents, and they continue to occur," says William H. Faulkner, BS RT(R)(MR)(CT), FSMRT, CEO of William Faulkner & Associates, LLC, an MRI and CT education and clinical operations consulting company. Faulkner is also a founding board member of the American Board of Magnetic Resonance Safety (ABMRS).

"Mandated reporting would provide a more accurate view of the number and frequency of MRI adverse events and near misses," agrees Jeffrey Weinreb, MD, FACR, FISMRT, FSAB, a Professor of Radiology and Biomedical Imaging at Yale School of Medicine, and Chief of MRI Services at Yale New Haven Hospital, New Haven, CT.

"There is a lot of speculation on the number of actual events because it is based on limited data," says Dr Weinreb. "Even the FDA acknowledges that their own data has important shortcomings. We need a simpler, more easily verifiable way of reporting rather than the current system which, in some regards, is voluntary and cumbersome."

"I don't know the exact number of adverse events currently being reported to the FDA's MedWatch program, but given the enormous number of MRI systems in the country, the numbers are likely quite small. We don't actually know how many incidents and near-misses are occurring," he adds.

The ABMRS credentials professionals who oversee the safety of clinical and/or research MRI sites. Certifications include Magnetic Resonance Medical Director/Physician (MRMD), Magnetic Resonance Safety Officer (MRSO) and Magnetic Resonance Safety Expert (MRSE). The 10-year certification includes passing a formal examination.

"Many hospitals want to make meaningful improvements in MRI safety to mitigate the risk involved," says Kristan Harrington, MBA, RT(R)(MR) ARRT, an educator with Faulkner's consultancy and an MRI technologist at Children's Healthcare of Atlanta. Harrington is also on the board of the ABMRS. "With the credentialing, these roles are becoming integrated into the hospital environment and outpatient facilities, helping to reduce incidents [by covering] that front line of MRI safety."

Krystal Garrett, RT(R)(MR), MRSO, MRI Supervisor at Moses H Cone Memorial Hospital in Greensboro, NC, has helped spearhead MRI safety

When we have our safety courses, many if not all of the people who attend share that they had a near-miss or a safety event with a negative outcome.

Kristan Harrington, MBA, RT(R)(MR) ARRT

efforts throughout her healthcare system. Faulkner and Harrington conducted safety audits across all sites, and Garrett attended their classes/workshops and then took the MRSO certification exam.

Garrett credits the workshops with giving her more in-depth knowledge to help expand the program at Cone Health. There is one other MRSO in the healthcare system, and she expects other technologists to become certified. The goal is to have one MRSO for each of the four hospitals with MRI services.

“The support of radiology leadership and my administrators was crucial to getting this started and acquiring the certification,” Garrett adds.

According to Faulkner, more than 2,300 individuals have been certified by ABMRS as an MRMD, MRSO, or MRSE.

“When we have our safety courses, many if not all of the people who attend share that they had a near-miss or a safety event with a negative outcome,” Harrington adds. “Technologists with safety-specific education are helping to close a large gap. It’s happening slowly, but there is more attention on safety.”

The impact of ABMRS is evident in the latest *ACR Manual on MR Safety*, which uses the credentialing terminology.

“I truly believe that with the advent of the ABMRS ... and the release of the [updated] *ACR Manual on MR Safety* we are seeing a heightened focus on MR safety,” says Faulkner. “We have been performing many MRI safety risk assessments. The facilities willing to go that route and seriously look at their MRI safety practices are making good strides and greatly improving. What concerns me is that not every organization is taking this seriously enough.”

Harrington notes that many of the sites investing in safety and risk assessments are doing so

only after experiencing an incident. There are no laws or regulations mandating them, and administrators often ask if the assessments are required by law.

“I don’t understand why facilities believe they have to be required in order to have good safety practices,” says Faulkner. “Safety is not expensive, but accidents are.”

MRI Safety Victories

One big win for the MR safety cause in recent years relates to how the field has addressed the association of nephrogenic systemic fibrosis (NSF) with gadolinium-based MRI contrast agents, which was first reported in 2006.¹ NSF is a rare disorder that can occur in patients with reduced kidney function who are exposed to some types of these contrast agents.

“Once we became aware of NSF resulting from the use of gadolinium, we started seeing changes in the types and volumes of contrast agents and how patients are screened,” explains Dr Weinreb. “[NSF] has virtually disappeared, and that’s a big win in terms of MRI safety.”

He also credits the ABMRS, ACR, and manufacturers’ educational efforts for increasing awareness of safety with regard to the scanning of patients with implanted devices and other metallic items in their body.

Dr Weinreb says he’s heard from people who were denied MRI scans for such concerns as shrapnel from injuries sustained while serving in the military, and kidney issues thought to preclude the use of contrast.

“It used to be *verboten* to scan a patient with an implanted cardiac device. Today we do it routinely without adverse events,” he says.

Garrett explains that some implants are not “MR conditional” at 3T and should be scanned

It used to be *verboten* to scan a patient with an implanted cardiac device. Today we do it routinely without adverse events.

Jeffrey Weinreb,
MD, FACR,
FISMRM, FSABI

at 1.5T; the implant's MR conditional labeling determines the field strength at which it can be used without posing a hazard to patients.

Implants and other metallic items are usually either self-reported by patients during the MRI screening process or they are notated in the MRI order by the referring physician. However, they occasionally can be overlooked and not discovered until the final screening performed just before the exam.

"In an ideal world, it would be recorded in the patient's electronic medical record and that information would be accurate, up-to-date, and easily accessible. We aren't there yet," says Dr Weinreb.

"We hope in the future, and the FDA has talked about this, that any device put into a patient has a barcode that would help generate the relevant information."

Implementing a Safety Program

For Garrett, the ACR guidelines have helped hospital leadership understand the importance of MRI safety. She says the most challenging aspect of initiating safety policies was educating ancillary staff.

"We had to make sure they understood the changes we were implementing for a more secure and safe MRI environment," Garrett says. "We screen them each time they come in our department and ensure they don't take anything into the room that cannot safely be in there."

In developing her facility's MRI safety program, Garrett relied on a safety audit conducted by William Faulkner & Associates, the ACR MRI safety manual, and her own extensive experience as an MRI technologist. Opportunities for improvement were highlighted during the audit and she is working to further align their policies and procedures with the latest ACR guidance. Yale New Haven also has a safety committee that meets quarterly to discuss policy, any incidents that occurred, and new safety considerations.

As part of the Yale New Haven's Joint Commission accreditation, the hospital holds annual safety classes for MRI staff; the radiology department also issues a monthly newsletter with MR scanning and safety tips.

Faulkner and Harrington recommend that all imaging facilities follow Garrett's example.

"It's setting up an organization and structure to ensure safety and change, not just checking the boxes," says Faulkner. "A technologist is the last line of defense for patient safety. Where facilities often have issues is when they rely on the technologist to be the only line of defense."

Screening patients before they enter the MRI area is a crucial component of safety policy. It's not uncommon for a technologist to discover something that could cause a safety incident.

Even clothing can lead to a safety event. "One example of inadequate policies and procedures is not having patients change out of street clothes," says Harrington. "Significant burns have been documented to occur due to metallic fibers in clothing, even in the normal operating mode."

Another key policy is to have two fully credentialed MRI technologists present at all times, says Harrington, who works in a children's hospital.

"Technologists will learn different techniques to help the child feel safe in the MRI environment," she explains.

Faulkner adds that trained personnel must maintain control of the MRI environment at all times.

"If the site is not adequately staffed and one technologist is doing the procedure and at the same time trying to watch all the equipment and people, it is a recipe for disaster," he says.

"MRI has been incredibly safe; however, organizations need to devote resources to safety," Dr Weinreb adds. "It's not just good health care, it's a good investment."

REFERENCES

1. Kraly C. AHRA 2011: Industry Slow to Columbi MRI Lessons? Diagnostic Imaging, August 27, 2011. Available at: <https://www.diagnosticimaging.com/articles/ahra-2011-industry-slow-columbini-mri-lessons>.
2. Grobner T. Gadolinium—a specific trigger for the development of nephrogenic fibrosing dermopathy and nephrogenic systemic fibrosis? [published correction appears in *Nephrol Dial Transplant*. 2006;21(6):1745]. *Nephrol Dial Transplant*. 2006;21(4):1104–1108.