MRI Safety Gets an Overhaul

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Last June, the American College of Radiology Committee on MR Safety released its anticipated *ACR Manual on MR Safety,* the sixth and most significant update to safety guidelines first published in 2002 as an *American Journal of Radiology* white paper. At 146 pages, the current manual is almost 3 times larger than its previous 55-page edition published in 2020.

The 2024 manual consists of 16 chapters, 5 appendices, and multiple supporting materials such as checklists, visuals, and "key points" summaries. It also incorporates changes gleaned from among 770 comments received during the public comment period that followed an initial draft released in the spring of 2023.

Indeed, the revised manual represents a "vast improvement over previous iterations," says William Faulkner, BS, RT(R)(MR)(CT), MRSO, (MRSC), CEO of William Faulkner Associates.

Robert E. Watson Jr, MD, PhD, MRMD (MRSC), outgoing chair of the ACR Committee on MR Safety, agrees.

"We're encouraging people to use [the manual] as an educational training resource however they feel it's necessary to establish their [own MRI safety] policies and procedures," says Dr Watson, who is also a professor of radiology in the division of neuroradiology at The Mayo Clinic in Rochester, Minnesota. "[A]ccidents happen, and breakdowns and gaps in policies and procedures can let a tragic outcome get through. It's our job in MR safety to be proactive to try to plug those holes."

Radiologist Responsibility Reigns

Publication of the ACR's safety manual coincides with the release of the results of *Applied Radiology*'s annual MRI Safety Survey. According to the AR survey of 288 respondents, nearly equal numbers said responsibility for the safety of MRI patients falls on their facility's supervising radiologist (46.5%), while 44.1% said it falls on the radiological technologist. Another 8% said responsibility falls on the shoulders of the MRI safety officer, while less than 2% identified the department administrator as the primary safety overseer. Further, the survey found that only 58.1% of facilities have a specified MR Medical Director for MR Safety (MRMD).

While the ACR's revised manual recommends that each facility appoint an MR safety officer and an MR safety expert, it states that an MRMD should oversee MRI operational safety.

"Before a patient undergoes a medical procedure, if there is a safety question, the MR radiologist [must make] a risk-benefit decision," says Faulkner. "As a technologist, we don't practice medicine [or] determine safety, we implement it; a radiologist will make that safety determination. Radiologists may delegate a function, but they don't delegate responsibility in the end."

Noting that many radiologists rely on the expertise of their institution's MR safety team (Figure 1), Faulkner argues training should be mandatory for these physicians. To this end, future radiologists completing their residency will be required to undergo core MR safety education, according to Dr Watson. He says the American Board of Radiology Boards Part 1 now includes a "Non-Interpretive Skills" section, including a dedicated MRI safety section in the study syllabus.

"The MRMD is … at the top of the pyramid in terms of ensuring that the policies are in place, that the training is up to speed," he adds, recommending "a well-defined organizational structure around management of MR safety."

Asked if their facility's MR-trained radiologists undergo annual safety training, about one-third of survey respondents each answered in the affirmative or the negative (36.5% versus 33.3%, respectively), and just over 28% said they weren't sure. Nearly three-quarters of respondents (71.2%),

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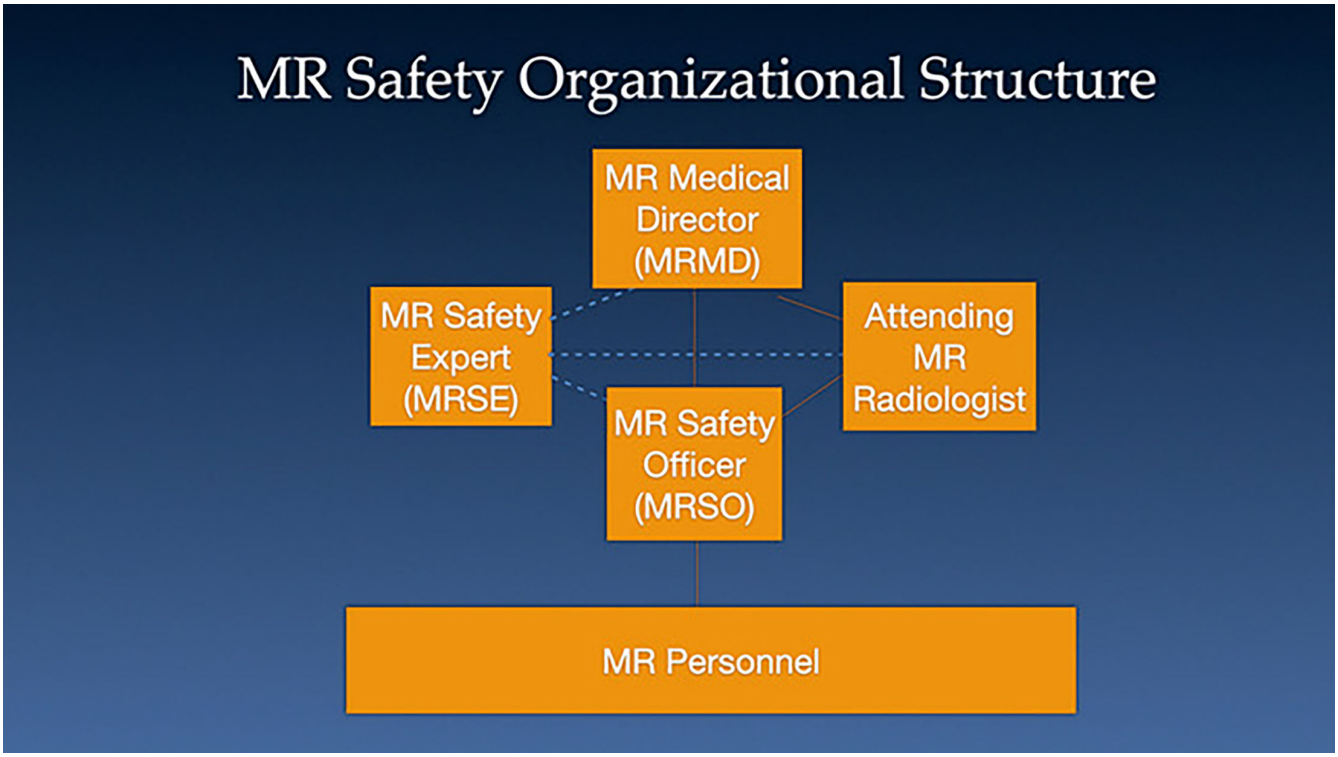
Figure 1. Facilities should maintain an organizational structure around management of MR safety. Image courtesy William Faulkner, BS, RT(R)(MR)(CT), MRSO (MRSC).



meanwhile, said all their MRI technologists undergo annual training.

Major Manual Updates

Rather than setting out an explicit set of directives, the manual is intended to serve as a guide for developing safety policies and procedures, as well as offer a structure for execution, Dr Watson explains. As a result, the manual includes checklists, tables, and key points summaries to help explain complex topics such as staffing scenarios, "full stop and final check" processes, heating safety risks, photos of signage, access areas, and implants or device labeling.

Among its new content, the manual highlights skills in which MR Level 1 and Level 2 personnel should be expected to demonstrate mastery. For example, while both Level 1 and 2 personnel need to know general magnetic field safety and emergency procedures, only Level 2 staff are required to understand thermal burn prevention and cryogen and quench safety processes. For the first time, the manual addresses the possibility that sites may consider additional MR safety-level stratification, says Dr Watson.

"With complex MR environments like hybrid procedural suites, it can become 'artificial' to be shoving everyone into just Level 1 and Level 2," he says, explaining that further stratification can enable facilities to better tailor safety education to the various personnel and their roles working in PET/MR or hybrid procedural interventional suites.

The ACR also recommends minimum requirements for staffing under various scenarios. For example, Dr Watson says, "No technologist should be working alone, including in emergency, off-hours situations."

Ensuring that only non-ferromagnetic objects and devices are permitted inside Zone IV (the scanner room) is arguably the most important safety consideration in MRI, which the manual covers thoroughly. In detailing the risks posed by portable objects like wheelchairs, oximetry monitors, and stretchers, the manual recommends tethering equipment to wall anchors using tether strap or cable systems, and pocketless attire for staff to prevent magnetic items from being inadvertently brought into Zone IV (Figure 2).

Figure 2. Tether MR unsafe items in Zone 3 for short-term, temporary securing. Image courtesy Robert E. Watson Jr, MD, PhD, MRMD (MRSC).

Considering these and other potential dangers, the manual also offers new emergency response guidance. It also recommends that personnel be prepared for emergencies not related to the equipment itself, such as a patient medical emergency.

"You can't run a code in the scan room if a patient has a medical emergency. You have to quickly and safely remove them from the MRI environment and secure it," says Faulkner. According to the AR safety survey, however, about half of the respondents said their facility does not practice annual "mock code" drills.

Responding to a growing trend in medical imaging, remote MR scanning, the new manual calls for institutional policies governing all remote operations. This includes staffing.

"We currently recommend there be a Level 2 technologist who is onsite to oversee [the exam]," says Dr Watson. Acknowledging that remote scanning is still evolving, he notes that the safety manual, now available online, can be updated as new data and information on clinical experience emerge.

There is an updated section on managing patients with implants, which includes plain X-ray, CT, and MR images illustrating possible MRI safety risks. In addition, there is a new appendix to help guide radiologists when there are unclear MR safety conditions associated with implanted devices.

"This is in an effort to get very challenging exams done, with the recognition that being overly cautious and simply denying a patient an MRI due to their devices can lead to failure to make an important, and potentially lifesaving, diagnosis. It can be crucial to the patient to be 'intelligently aggressive' in these situations, and take full advantage of the expertise of the MR safety team in an effort to get crucial clinically indicated MRIs done," says Dr Watson.

Developing a Culture of Safety

The *ACR Manual on MR Safety* recommends that all MRI facilities create, maintain, and review their safety policies—as well as require their Level 1 and 2 personnel to undergo annual training—at least once a year. About 46% of survey respondents to the AR survey said their practices are reviewed annually, while just under 40% said they are reviewed "as required."

"The manual has plenty of material, but you've got to do your own work," Faulkner says, even if that means going beyond the minimum standards to address the unique characteristics of a given facility. "This is not a one-size-fits-all thing."

Ultimately, the optimal safety plan requires sufficient resources and should be developed by a committee of radiologists, technologists, nurses, and clinical assistants to cover as many eventualities and scenarios as possible, Dr Watson adds.

"A working safety committee is where you can build a true culture around MRI safety, doing your best to identify … the 'predictable surprises,'" he says. "You have a culture that says, 'We have work to do on this, and it's our job to be proactive.'"