

The potential for adverse events is rising in the MR suite

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The MR world is in a bit of a conundrum. Providers are ramping up scan volumes to make up for missed exams (and missed revenue) during the lockdown phase of the pandemic, yet the U.S. is currently experiencing a shortage of technologists.

If you do a search on the internet job board Indeed for MR technologist openings in the country, almost 4,000 positions will appear. The staffing shortage is so severe that some healthcare facilities are offering sign-on bonuses of up to \$15,000 to attract experienced MR technologists.

Lisa Thornhill, a medical physicist at West Physics, a provider of diagnostic medical and health physics consulting and testing to healthcare organizations, and MR technologist at a level-one trauma center at a large hospital in Boston, is on the frontlines of this issue.

"The main thrust right now appears to be to drive volume to catch up with some of the lost revenue from last year," she explained. "All of us collectively in the MR world working as technologists, managers and observing as physicists are seeing this as a potential MR safety issue."

According to Thornhill, they collectively view this as a major MR safety issue. Many technologists left the practice last year to retire or semi-retire and in order to compensate for the shortage, facilities are aiming to increase technologists' scope of practice.

"Technologists are concerned with the clinical safety issue of being asked to monitor sedation patients when nursing personnel are not available," said Thornhill. "Both technologists and nursing staff feel that they are often physically and emotionally exhausted and therefore, very reluctant

to take on more responsibilities that could endanger patients due to limited resources and staffing."

Fortunately, there is an online network of support to help technologists with these complex cases that they may not have come into contact with before. According to Thornhill, social media has provided some of the greatest advances in MR safety to meet the needs of the moment.

Among those online communities is MRI Safety, a Facebook group founded by Tobias Gilk, former chair of the American Board of Magnetic Resonance Safety (ABMRS) and a recognized leader in MR safety, that many MR technologists have found helpful. The group is made up of 25,000 members and it's a place for technologists to ask questions and get feedback and advice from the MR community. The questions can range from

concerns about active implants to how to set up certain protocols.

New ACR requirement adds to burden

To make matters more complicated, the American College of Radiology (ACR) came out with a new requirement that puts even more of a burden on MR departments and facilities.

ACR published an update to its MR safety manual in May 2020 requiring a minimum of two technologists or one technologist and an individual with the designation "MR personnel" in the MR room.

"Facilities are having a hard time meeting that," said Keith Kopp, president of Kopp Development Inc., a company that manufactures MR safety products. "Staffing has always been a recommendation, but it's a stronger recommendation now that's requiring more people, and hospitals are reluctant to do that for a lot of reasons, like cost and availability."

In response to the MR technologist shortage, the industry is trying to recruit technologists from other modalities such as CT, ultrasound and X-ray. These technologists have to be trained in MR safety, which sometimes comes with a steep learning curve.

Some essential training can be conducted immediately by watching videos, reading articles and taking online classes. However, according to Gregg Daversa, vice president of business development at West Physics, MR safety involves a lot of learning through experience and it can take months or sometimes years for a technologist to get up to a very proficient level.

"Factors impacting MRI safety are constantly changing and the MR technologists need to constantly keep up with changes presented by the patients, medical device implants, ancillary medical equipment and physical environments," said Daversa.

One of the online classes West Physics currently offers is a 2.5-hour course for physicians, technologists and ancillary medical staff on MR level two safety training in accordance with ACR and Joint Commission requirements.

Technology can take on some of the burden

The Joint Commission requires data to be collected on incidents in which ferromagnetic objects unintentionally enter the MR room, but it is not always easy for MR technologists to comply with that mandate. As fewer technologists take on a greater scope of responsibilities, there is little time left to log these events. Kopp Development has a product called the FerrAlert Ferromagnetic Incident Log Manager (FILM) to help automate this process.

The system is located in the doorway of the MR room and works by automatically logging when a ferromagnetic object enters. It captures a sequence of images to show what led up to it entering the room and what the technologist did about it. The company has recently added features to track if the MR room door is being closed and a pause button to allow the technologist to bring in a patient monitor without setting off the alarm.

"If you have to log every time you take a patient monitor in the room, it's another

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drain on already being short-staffed," said Kopp. "We try to keep that in mind with all of our products and we try not to require any additional effort on the part of the technologist."

The system generates a series of reports that, in addition to satisfying the Joint Commission requirement, gives managers the information they need to safely and effectively oversee the MR room.

Enforcing the dress code

It's well known that certain articles of clothing may contain ferromagnetic properties, which can pose a hazard in the MR, but in recent years a new safety threat has emerged from an unlikely place. Cosmetic companies have introduced magnetic eyelashes, which are faux eyelashes with tiny magnets that attach to magnetic eyeliner.

Thankfully, the worst thing that could happen if a patient doesn't remove their magnetic eyelashes during the MR exam is image artifacts, according to **Anna Srb**, director of marketing and sales at Kopp Development. But other things like sportswear made with metallic thread could result in more serious consequences, such as burns.

When it comes to ensuring the patient is not wearing something that will react to the MR magnet, handheld detectors are especially useful. Kopp Development offers the FerrAlert Target Scanner for ensuring a patient is not wearing anything that will create problems.



Aegys Group offers two different handheld detectors. The PD240CH and PD240CH-Z4 handheld devices offer a combination of ferromagnetic and metal detectors. "That provides value for the use of handheld detectors since you can quickly screen things that you see, such as jewelry, and determine whether they're ferrous or non-ferrous," said **Joseph Barwick**, founder of Aegys.

The handheld devices produce an RF field instead of using a magnet to detect the presence of an object. Because of that, it is safe to use around the patient's face and head, and doesn't affect electrical devices.



Physical barriers

The MR suite is divided up into different safety zones, and each one can present its own safety challenges. Using physical barriers is a practical and effective way to prevent people from entering zones they are not cleared to access. Sometimes this is done with plastic chains, but that can be fatiguing for the technologist who is constantly hooking and unhooking the barrier throughout the day.

Aegys offers a caution barrier product called TechGate that acts similarly to a railroad crossing arm, but rotates down when it's not in use. A timer is set to allow the technologist to take the patient into the room and once the timer is up, the arm goes up to create a caution barrier.

As a physicist, West Physics' Thornhill goes to imaging facilities with barriers such as locked doors and keypad punches, and she has concerns about those methods. She believes that while they can be very effective for preventing unauthorized individuals from entering into Zone IV without being properly screened, they can be a challenge as well.

"The more barriers you have, the more difficult in the case of an emergency to get people there," she said. For instance, if the MR technologist is working alone in Zone IV and an emergency occurs, they would have to activate the fire alarm for the locked doors to open.

Aegys considered this when developing TechGate and equipped it with a rapid breakage capability. The arm can be pulled away from the door in the case of an emergency, which is a capability only the technologists are aware of.

According to Thornhill, the most important aspect of MR safety is proper training.

"You could have layers of doors locked and security keypads, but if nobody knows what their role is in the event of an emergency, the outcome could potentially result in harm to patients and personnel," she said.

She added that it's important for imaging facilities to run through scheduled mock drills and to "practice, practice, practice."

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