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## MRI Safety

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### **MRI Safety Best Practices**

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Our 10 most important tips for MRI safety best practices to apply in your facility

The topic of MRI safety is increasing in prominence among our clients at KGHP. The increased focus by The Joint Commission (“TJC”) and the American College of Radiology (“ACR”) have pushed the issue of MRI safety to the forefront.

Given the headlines around MRI safety to date, including the tragic death of a young child in 2001,<sup>1</sup> the ACR convened several panels of experts to decide on best practices in MRI safety, most recently in 2013.<sup>2</sup> At KGHP, we have taken those best practices, combined with our experience in testing and training at over 125 MRI sites, to highlight our 10 most important tips with respect to making your MRI facility safer.

**1. Remember MRI Incidents are Largely Preventable**

Since MRI has been available as an imaging modality, the medical community has understood that many potential risks of MRI are preventable. Most incidents occur not because of malfunctioning equipment or an unknown issue with the equipment, but rather because of lack of vigilance and training of personnel in the facility. Lack of minimum standards across the healthcare industry enforced by appropriate bodies was seen as a potential cause of many of the incidents, by not holding facilities responsible for lack of training, screening and other preventative measures.<sup>3</sup> More recently, with the new TJC imaging standards and increasing focus by the ACR, facilities are now incorporating active MR safety reviews and employing MR Safety Officers in their facilities. It is important for facilities to take MRI safety seriously and put the appropriate time and resources into reducing the number of preventable incidents in their facilities.

**2. Lack of Ionizing Radiation in MRI Doesn't Mean 100% Safe**

In using magnetic fields and radio waves to produce high quality diagnostic images, MRI scanners do not emit ionizing radiation. While this is a positive in reducing exposure of patients and personnel in a medical facility, the lack of ionizing radiation does not eliminate the risk of injury, or even death, as a result of using MRI. It is imperative that all personnel coming in contact with MRI appreciate the potential risks associated with MRI. While there should not be undue fear or paranoia surrounding the use of MRI, vigilance and knowledge are important to allow doctors and patients to use MRI to diagnose disease and begin the healing process.



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**3. Follow the Signs**

Signage is a key component in informing MR and non-MR personnel of the risks, and the various zones that they are entering into surrounding the MRI machine. Signs should be clearly posted and rigorously enforced, particularly in Zone 3 (areas where enhanced screening and limits on non-MR personnel are enforced) and Zone 4 (MRI magnet room). Lack of appropriate signage was the most

1. ABC News, “Boy, 6, Killed in Freak MRI Accident.” *ABC*, July 31, 2001, <http://abcnews.go.com/US/story?id=92745&page=1>.  
2. American College of Radiology Expert Panel, “ACR guidance document on MR safe practices: 2013,” *Journal of Magnetic Resonance Imaging*, no. 37 (2013): 501-530.  
3. Tobias Gilk, M.Arch, HSDQ, “MRI safety: accidents are not inevitable.” *MedicalPhysicsWeb*, January 10, 2012, <http://medicalphysicsweb.org/cws/article/opinion/48264>.

frequent “Request for Improvement” in diagnostic imaging cited by Joint Commission surveyors between July 2015 and March 2017.<sup>4</sup> Approximately 22% (47 out of 216 items) of the RFIs related to inadequate signage. For facilities aiming for the highest standards, posting the appropriate signage in the necessary areas is a good first step in improving your MRI safety culture.

**4. Ongoing Training is the Key**

The greatest tool for enhancing a compliance and safety culture is training. While many MR professionals have appropriate training, because of high turnover and use of temporary workers in some facilities, there are often many new people coming into contact with MRI who may lack such knowledge. Additionally, repetition is key to making sure that best practices are reiterated and “shortcuts” are eliminated. Personnel who work closely with MRI may become desensitized in their day-to-day work, so training allows them to step outside of the MRI suite and to be retrained with the latest in best practices. It is also important to note that TJC cited lack of appropriate MRI training in 17% of RFIs (37 out of 216 items), making it the 2nd most cited item in diagnostic imaging after lack of appropriate MRI signage.<sup>5</sup>

**5. Safety Starts with Screening**

Screening of patients and personnel before they enter Zones 3 and 4 is a critical step in the process. Serious injuries can occur when patients who may have ferrous materials in or on their bodies enter those zones. Additional risks are presented when patients are particularly young, or cannot verbalize or remember specific details of their medical history. MR personnel should always screen patients and personnel entering the restricted zones, ideally with a well-developed



**~22%**

REQUEST FOR  
IMPROVEMENTS RELATED  
TO INADEQUATE SIGNAGE  
[JOINT COMMISSION SURVEYORS]

4. Andrea D. Browne, Ph.D., D.A.B.R. “Diagnostic Imaging Services Standards: Survey Experience, Future Directions.” Keynote, ICE 2017 Imaging Conference & Expo, Washington, DC, July 24, 2017.

5. Andrea D. Browne, Ph.D., D.A.B.R. “Diagnostic Imaging Services Standards: Survey Experience, Future Directions.” Keynote, ICE 2017 Imaging Conference & Expo, Washington, DC, July 24, 2017.

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checklist, and escalate any concerns to the MR director, usually the attending radiologist. The MR director is ultimately responsible for making a determination as to whether a patient may be scanned. It is important for facilities to balance throughput of patients with giving personnel appropriate time to conduct these screenings. Appropriate screenings save lives, eliminate unnecessary injuries and minimize potential liability for facilities.

#### **6. Projectiles are Not the Only Risks**

While the most publicized incidents included flying projectiles, they are not the only risks related to MRI. Thermal injuries from interactions with ferrous elements on or in patients, hearing injuries related to the sound of the MRI machine and adverse reactions to contrast used in MRI are other important sources of risk, and likely account for more injuries than projectiles.<sup>6</sup> MR personnel should focus on all related risks to MRI and exercise good judgment in escalating any concerns to the MR director.

#### **7. Be Hyper-Vigilant During Emergencies**

During an emergency, there is an increased likelihood of non-MR personnel (police, firefighters, etc.) coming into contact with restricted MR zones. Whether it is a patient emergency, fire or other incident, it is imperative that MR personnel are well-versed and trained on how to manage these circumstances. A flying fire axe or loaded firearm could cause significant damage or injury in an MRI suite. MR personnel should be empowered to enact pre-rehearsed protocols in such circumstances to minimize the chance of damage or injury.

#### **8. Quench or Not-to-Quench: Know the Answer**

Historically, the understood guidance in the MRI world is that “quenching the magnet” (instigating a process to demagnetize the MRI) is never advised. There are significant risks to quenching, including a delay in full demagnetization, emission of toxic gases and potential for significant damage to the MRI machine. More recently, some facilities have reviewed this guidance and determined that MR personnel should be given

6. Frank G. Shellock, Ph.D., “Missile Effect Accidents and Prevention.” *MRISafety.com*, 2016, <http://www.mrisafety.com/SafetyInfov.asp?SafetyInfoID=185>.

greater latitude in determining when to quench.<sup>7</sup> No matter what a facility decides concerning quenching policy, it is most important that the policy is thoroughly considered and that MR personnel are given clear guidance on the situations in which they are authorized to quench. This clear guidance should minimize indecision when MRI incidents occur, and potentially save patients or other personnel from serious injury.

**9. Promote a Just Culture**

The idea of a “just culture” in healthcare moves organizations away from focusing on the individual and punishing for errors, and instead focuses on systems and organizational learning that can help all employees make fewer errors. While just culture never excuses gross negligence or willful misconduct, it does allow that humans make mistakes. Especially in the area of MRI, where incidents are often clearly evident and very embarrassing to the facility and the individual, it is very important to focus on instituting a just culture, so that the appropriate learning and system improvements can be made. The more we learn from mistakes in MRI, the better we can work to prevent them.

**10. Periodically Review Your Entire MRI Safety Program**

The work of MRI safety is never complete. MRI safety requires constant vigilance and ongoing training to keep the MRI environment safe for patients and



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personnel. Given the changing landscape and focus on MRI safety, it is critically important that facilities periodically review their programs for potential areas of improvement. Our recommendation is that facilities conduct a program audit at least annually, with more frequent audits if there are significant past incidents or concerns. Many facilities may lack the internal expertise to conduct these audits, and should look to qualified MRI or MRI safety experts to conduct these audits. These 3rd parties have considerable experience in the MRI safety space, and can give a more objective review of your program. The results of the audits should be shared with all MR personnel and management, and used as a template for future training and program improvements. ●

For additional information related to MRI safety and to learn more about KGHP’s MRI Safety Audit service, please contact Krueger-Gilbert Health Physics at 410.339.5447 or email [info@kruegergilbert.com](mailto:info@kruegergilbert.com).

7. Liz Kowalczyk, “MRIs carry rare — but very real — hazards.” *Boston Globe*, April 8, 2017, <https://www.bostonglobe.com/metro/2017/04/08/the-tale-flying-gurney/QwkE01J33BYV4vdMX4aP/story.html>.