UAB MEDICINE **Radiology Policy**

Title:	*MRI Safety*				
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Endorsed:	*Kristen Porter* 10/27/21 Kristin Porter, MD Date Section Chief, MRI	Endorsed	N/A Date	Pages 1 of	5
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Approved:	*Matthew Larrison* 10/28/21 Matthew Larrison, MD Date Vice Chair Quality Improvement and Patient Safety	Approved:	N/A N/A Date	Discontinued:	

PURPOSE: To establish a process for providing a safe environment and understanding of MRI safety precautions.

SCOPE: This policy applies to all UAB Medicine Clinical Facilities as defined by the UAB Hospital Medical Staff Bylaws.

POLICY STATEMENT: It is our belief that it is necessary to follow MRI Safety guidelines to protect our patients and staff from harm and to provide a safe environment for patients and staff.

ASSOCIATED INFORMATION:

Definitions:

1. ***Compliance 360/SCR*** is the acronym for Standards and Clinical Resources, the official intranet website for publishing all documents for the University of Alabama at Birmingham (UAB) Health System.
2. ***Cryogen*** is a cooling agent, typically liquid helium, used to reduce the temperature of the magnet windings in a superconducting magnet. All cryogens have two properties in common; they are extremely cold and small amounts of liquid can expand into very large volumes of gas. Cryogenic liquids and their associated cold vapors can produce effects on the skin similar to thermal burns and can cause frostbite. Prolonged breathing of extremely cold gases may damage the lungs and in the absence of enough air or oxygen, asphyxiation and death may occur.
3. ***Cryostats*** are devices for maintaining a constant low temperature (as by means of liquid helium used in MRI). They require vacuum chambers with thermal isolation.
4. ***Quench*** is the rapid helium evaporation and loss of superconductivity of the current-carrying coil that may occur unexpectedly, or from pressing the emergency button in a superconducting magnet. As the superconductive magnet becomes resistive, heat will be released that can result in boiling of liquid helium in the cryostat. Quenching can cause total magnet failure and cannot be stopped.
5. ***Watcher*** is a designated person in the MRI areas that will monitor the behavior of the helium cloud during a magnet quench; observe and direct person(s) in the magnet room as indicated.

POLICY:

A. All patients, staff, and visitors will be screened by the Patient Safety Advocate, the MR technologist, the PET/MR coordinator, or the PET/MR technologist for any condition that might adversely affect the person's safety.

B. The screening receptionist and/or technologist will complete the MRI Patient Screening Record (refer to the SCR website).
   1. The screened person will sign the completed record.
   2. Patients and visitors will be warned about potential damage to watches, credit/bank cards, cameras, jewelry, and other personal belongings.
   3. All patients must follow the MRI personnel's instructions regarding removal of any objects or clothing that may present a safety hazard or cause problems with MRI image quality.

C. No person will be allowed to enter the MRI or PET/MR areas beyond Zone 2 without meeting MRI safety conditions and without expressed permission of authorized personnel.
   1. The technologist will accompany any person with identified safety conditions that enters the MRI or PET/MR areas beyond Zone 2.

D. If for any reason a screened patient leaves Zone 4, he/she must be wanded by a ferromagnetic detector before reentry into Zone 4.

E. Magnet room doors will remain closed, when possible, to prevent unauthorized personnel from entering the high magnetic field areas and possibly causing a hazardous situation.

F. Safety warnings about high magnetic field will be posted on magnet room doors.

G. Patients and visitors present in the magnet room during MRI data acquisition (scanning) will be required to wear earplugs or sound-muffling headphones to protect against potential hearing loss.

H. Radiographs will be taken and evaluated prior to the MRI exam if a suspicion exists that there might be a metallic object embedded within a patient's body.

I. Written documentation must be provided to identify manufacture safety guidelines of any implanted device prior to patient entering the MRI or PET/MR exam room.

J. Implanted device manufacturer will be consulted as to the MR compatibility and safety of the device. The device safety information will be scanned into the medical record where possible. In the event the device cannot be identified, the radiologist will discuss the safety consideration with the referring clinician and the radiologist will make the final determination as to whether the exam will proceed.
   1. **MRI Conditional Implant Devices** will need to be placed in the appropriate MRI scanning mode by the patient, trained family member, or qualified provider prior to scanning. The technologist will not be responsible for preparing the device for scanning. The MRI Conditional Implant Device form will be completed by the technologist and scanned into the EMR.
   2. **Coronary Artery Stents** in MRI (including two or more overlapped stents) will need to follow the below guidelines:
      a. Patients with all commercially available coronary artery stents (including drug-eluting and non-drug eluting or bare metal versions) can be scanned at 1.5-Telsa/64-MHz or 3-T/128-MHz, regardless of the value of the spatial gradient magnet field.
      b. Patients with all commercially available coronary stents can undergo MRI immediately after placement of these implants.
      c. The MRI examination must be performed using the following parameters:
         - 1.5-Telsa or 3-Telsa *ONLY*
         - Whole body averaged specific absorption rate (SAR) of 2-W/kg (i.e., operating in the Normal Operating Mode for the MR system)
         - Maximum imaging time, 15 minutes per pulse sequence (multiple pulse sequences per patient are allow.
   3. **DBS (Deep Brain Stimulators)** exams will only be performed at UAB Hospital. No DBS scans will be performed in the outpatient setting.

K. Because of the imminent rise in patient's core temperature during any MRI examination, for patients with high fever, the following is recommended:

1. Use medication to bring the patient's temperature down before the MRI examination
2. Scan only in Normal operating mode (low SAR mode)
3. Limit the scan duration to a maximum of 1 hour, preferably less
4. For patients with normal thermal control mechanisms, break the examination into several sessions and wait long enough (about 2-3 hours) to allow the patient to cool off before continuing with the remaining pulse sequences
5. For patients with a fever of 104° F and higher, and/or for those with an unknown functioning status of their thermal auto regulatory mechanism, any MRI examination would be a contraindication. Therefore, patient's condition must improve before proceeding with any MRI scanning.

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Emergency Care or Code Blue:

A. Should a patient's condition become serious enough to require emergency care assistance or necessitate calling a Code Blue, the patient must be removed from the magnet room before attempting to administer emergency care. Once the patient has been removed from the magnet room, the door to the magnet room will remain closed.

B. The MRI or PET/MR technologists and staff will assist the emergency care or code team members, advise them of MRI specific safety hazards, and warn them about the dangers of entering the magnet room without adequate safety precautions.

C. GE Healthcare scanner:

1. Undock the table, unplug the Radio Frequency (RF) coil (if any tabletop model is used) and remove the patient from the magnet room by rolling the table out.

D. Phillips Medical Systems scanner:

1. Take a nonferrous (non-magnetic) stretcher into the magnet room and transfer the patient from the MRI table to the stretcher; move the stretcher out of the room.

E. Siemen's Skyra & Prisma:

1. Undock the table, unplug the Radio Frequency (RF) coil (if any tabletop model is used) and remove the patient from the magnet room by rolling the table out.

F. Siemens Symphony Systems scanner:

1. Take a nonferrous (non-magnetic) stretcher into the magnet room and transfer the patient from the MRI table to the stretcher; move the stretcher out of the room.

Metallic Object Safety:

A. Ferromagnetic objects will not be allowed into the magnet room. Such objects are strongly attracted by the MRI magnet and may become airborne, creating a serious safety hazard.

B. All metallic objects must be checked for their magnetic properties before being allowed into the magnet room.

1. The testing of metallic objects will be performed outside the magnet room using a ferromagnetic detector wand, selected by the site's supporting MRI physicist specifically for this purpose.

a. If any attraction between the object and the magnet is detected, the object MUST NOT be allowed into the magnet room.

2. Testing objects by entering the magnet room and bringing them into the proximity of the main MRI magnet is expressly FORBIDDEN.

C. Nonferrous (non-magnetic) wheelchairs and stretchers will be available for patient's transportation into and out of the magnet rooms and will be clearly identified as "MRI Safe". No other transportation equipment will be allowed into magnet rooms.

Cryogen Safety:

A. All MRI installations include venting systems designed to carry large volumes of cold gases released during a magnet quench. Even with such venting, it is common, during a magnet quench, to see some gas leakage into the magnet room space.

B. Signs of magnet quench include a low pitch rumbling noise, frosting over the magnet and attached piping, or a milky cloud of cold gaseous helium and water moisture condensate appearing close to the ceiling of the magnet room initially, then thickening and layering as it moves downward toward the floor.

C. In the event of a low oxygen alarm or any sign of a magnet quench, patients, visitors and staff will be removed from the scanner area immediately.

D. The chief danger is that this gas will displace oxygen from the room and may cause suffocation of those whose heads become submerged.

1. Under typical conditions, there is enough time (a few minutes at least) for the patient to vacate the room.
2. Under no circumstances may anyone enter the room to assist the patient without another observer (watcher) posted outside the room.
3. At their own discretion staff may decide to enter the room and help evacuate the patient. This must be done quickly and only if the bottom of the visible cloud is high enough (6-7 feet from the floor) to ensure safety of people inside the magnet room.
4. The task of the watcher is to monitor the behavior of the helium cloud and observe/direct the people inside the magnet room.
5. Anyone inside the room must follow the directions of the watcher and vacate the room immediately if directed to do so.
6. Should any occupant of the magnet room lose consciousness, the watcher must not enter the room, but instead quickly vacate the premises and alert 911 or an emergency response team properly equipped to enter and work in an oxygen-deprived atmosphere.
7. In extremely rare cases, the magnet emergency venting system may fail; in such a case a positive pressure may develop inside the magnet room, preventing the opening of the RF door leading into the magnet room.
    a. Should this happen, an observation window will be smashed using any available object (chair, heavy book, etc). This will equilibrate pressure immediately, allowing the door to be opened.
8. Upon exiting the premises, close all doors to slow down the leaking of released gases into surrounding areas.
9. Notify the following:
    a. Radiology Manager.
    b. MRI Safety Officer.
    c. UAB Safety Officer.
    d. UAB Chemical Safety Officer.
    e. MRI manufacturer and service engineers
10. No one will be permitted to enter the area until it has been declared safe to do so by authorized personnel (the 911 or emergency response team, UAB Safety Officer, Chemical Safety Officer, or MRI manufacturer's response team).
11. Complete an incident report in Trend Tracker.

Scan Room Access

A. MRI scan room doors including PET/MR will be kept locked except during regular operating hours. B. Keys to the scan room doors will be secured in a lockbox in the MRI and PET/MR department. The following people have approved access to the scan rooms during and after operating hours:

1. MRI Managers, MRI Supervisors, PET/MR Managers, and PET/MR Coordinators
2. MR and PET Physicist.
3. UAB Service Engineers, GE, Philips, and Siemens field engineers.
4. UAB/TKC Security Office and UAB/TKC Maintenance only when escorted by MRI safety trained personnel

C. Anyone other than those listed above must have the approval of the Imaging Manager, MRI Supervisor, PET Imaging Manager, and/or PET/MR coordinator before being granted after hour's access to the MRI or PET/MR scan rooms.

D. UAB or TKC Security will be notified when access to the scan rooms has been granted. (i.e., outside service engineers, contractors, etc.)

E. If a person requests access to the MRI or PET/MR scan rooms and does not have prior approval, security will contact the Imaging Managers or PET/MR coordinator for approval before access is granted.

1. If unable to contact the Imaging Manager, the MRI Supervisor will be contacted for approval for TKC and Leeds and PET Imaging Manager for PET/MR.

F. Contact the MRI Manager/Supervisor on call or PET Imaging Manager if needed.

G. Security personnel must complete and verify MRI Safety Training. This is accomplished by viewing the MRI Safety video during initial orientation.

...**REFERENCES:**			
None			
		TJCH:	EC
NFPA Ref #			
Cross-References (CR):			
**Patient Screening Record (kfkra1265) (CR)*	**Management of Medical Emergencies (TKC) (CR)* **Incident Reporting Program (CR)* **MRI: Cardiac Implantable Electronic Device (CR)*		

ATTACHMENTS: None.

INTERDISCIPLINARY COLLABORATION

None	
Physician / Medical Committees	Endorsement Date
None	
Committees / Councils	Endorsement Date
None	
Department(s)	Endorsement Date

Supersedes:	Combined Quench Evacuation, TKC Rad #015, 10/99 and MRI Safety, TKC-Rad #007, 05/99, MRI Safety, KRA#012 04/28/03, kra12r 02/05/07, kra12r2 04/05/10, MRI Safety R#31; 10/07/13, 11/18/15; 2/2/17, 5/1/18,4/22/20
File Name:	MRI Safety, R# 31r6
REVISIONS: Consistent with Joint Commission Standards, this policy is to be reviewed at least every 3 years and/or as practice changes.	