Name: MRI Screening of Patients and Other Individuals

Effective Date: 03/2017

Review / Revision History: 09/2017

Purpose: (including applicable intended audience)

Policy:

Background

This guideline establishes screening standards for patients and other individuals prior to entry into the Magnetic Resonance (MR) environment.

There are potential risks associated with the MR environment for patients as well as accompanying family members, attending health care professionals, and others.

One of the important aspects of protecting patients and other individuals from MR system-related accidents and injuries involves understanding the risks associated with various implants, devices, accessories, and other objects that may cause problems in the MR environment. This requires constant attention and diligence to obtain information and documentation about these objects in order to provide the safest MR setting possible.

Operational Definitions

MR Zoning

1. Zone I (General Public): This region includes all areas that are freely accessible to the general public. This area is typically outside the MR environment itself and is the area which patients, health care personnel, and other employees of the MR site use to access the MR environment.
2. Zone II (Unscreened MRI Patients and Other Individuals): This area is the interface between the publically accessible, uncontrolled Zone I and the strictly controlled Zone III. Movement into Zone II is restricted and is supervised by MR personnel.
3. Zone III (Screened MRI Patients and Other Individuals): This area is the region in which free access by unscreened non-MR personnel or ferromagnetic objects or equipment can result in serious injury or death as a result of interactions between the individuals or equipment
and the MR scanner's particular environment. Badge access is restricted to level 2 MR personnel and level 2 MR technologists.

4. Zone IV (Screened MRI Patients and Other Individuals under constant direct supervision of trained Level 2 MR Technologists only): This area is synonymous with the MR scanner room itself, that is, the physical confines of the room within which the MR scanner is located. Badge and/or key access is restricted to level 2 MR technologists, MR imaging engineers, and MR medical physicists.

5. Special Considerations for the iMRI Suite and MR Zoning:
   a. Zone III
      i. Area immediately outside the MR scanner room, e.g. iMRI suite hallway with garage door open and/or magnet deployed, control room, OR 42 and 43 with garage door closed.
   b. Zone IV
      i. The garage (MR scanner room) within the iMRI suite that houses the MR scanner.
      ii. OR 42 or OR 43 with garage door open and/or magnet deployed.

Non-MR Personnel and MR personnel

1. Non-MR Personnel: Those who have not completed the MR safety-training program.
2. Level 1 MR personnel: Those who have passed minimal safety educational efforts to ensure their own safety as they work within Zones III and IV.
3. Level 2 MR personnel: Those who have been more extensively trained and educated in the broader aspects of MR safety issues.
4. Level 2 MR Technologist: Those who have been extensively trained and educated in the broader aspects of MR safety issues, including, for example, MRI safety screening risk assessment of active/passive devices, implants, and foreign bodies, issues related to the potential for thermal loading or burns and direct neuromuscular excitation from rapidly changing gradients. Level 2 MR Technologists are directly responsible for the supervision and safety of all non-MR personnel, all other individuals (e.g. level 1 and 2 MR personnel), as well as their own as they work within Zones III and IV.

Responsibilities of the Magnetic Resonance Medical Director and Safety Officer

1. Magnetic Resonance Medical Director (MRMD): In conjunction with the Department of Radiology Policy Committee, establishes MR safety practices, policies, and guidelines for the site(s) and oversees decisions regarding MR site access and site access restriction decisions.
2. Magnetic Resonance Safety Officer (MRSO): Advises the MRMD and implements the MR safety practices as defined by the MRMD.

Guidelines

Screening Patients and Other Individuals

1. All non-MR personnel wishing to enter Zone III must first undergo an MR safety screening process. Only level 2 MR personnel are authorized to perform an MR safety screen before permitting non-MR personnel into Zone III and any non-iMRI case.
a. All non-MR personnel (e.g. patients, volunteers, varied site employees, and professionals) with implanted cardiac pacemakers, implantable cardioverter defibrillators (ICDs), diaphragmatic pacemakers, electromechanically activated devices, or other electrically conductive devices upon which the non-MR personnel is dependent should be precluded from the 5-Gauss line unless specifically cleared, in writing by a level 2 designated attending radiologist, MRMD, or designee.

2. Only level 2 MR Technologists are authorized to perform an MR safety screen before permitting patients, other individuals, and non-MR personnel into Zone IV or any iMRI case.

3. The screening process for all patients, other individuals, non-MR personnel, and MR personnel must be uniformly applied.

4. Non-MR personnel should be accompanied by, or under the immediate supervision of and in visual and verbal contact with, one specifically identified level 2 MR personnel for the entirety of their duration within the Zone III restricted region.

5. Non-MR personnel and level 2 MR personnel must be accompanied by, or under the immediate supervision of and in visual and verbal contact with, one specifically identified level 2 MR Technologist for the entirety of their duration within the Zone IV restricted region. Due to their extensive training and educational background in MRI safety and systems, MRI imaging engineers and MR medical physicists are the only level 2 MR personnel allowed an exception.

6. All conscious, alert and oriented individuals shall be screened visually, verbally, and interactively to include the MRI safety screening form.

7. Any individual entering Zone IV must remove all readily removable metallic personal belongings and devices (including but not limited to watches, pagers, cell phones, body piercings [if removable], contraceptive rings, metallic drug delivery patches, cosmetics containing metallic particles, and clothing items that may contain metallic fasteners, hooks, zippers, loose metallic components, or metallic threads). Wedding and commitment rings are the ONLY exception, as they are consistently made of non-ferrous materials.

   a. General Rule on Piercings
      i. All piercings should be removed. If for some reason the jewelry cannot be removed, the following risk assessment must be performed:
         1. If the jewelry is not in the imaging volume and not attracted to the handheld magnet or detected by the ferrous detector, proceed with imaging as requested; provide the patient the squeeze ball and ask that they immediately report any burning sensation at the piercing site.
         2. If the jewelry is in the imaging volume and not attracted to the handheld magnet or detected by the ferrous detector, proceed with imaging as requested. The patient must be informed that image quality may be degraded due to artifact; provide the patient the squeeze ball and ask that they immediately report any burning sensation at the piercing site. If artifact is present and of concern consult a radiologist and determine the next course of action.
         3. If attracted to the hand held magnet, do not proceed. Reschedule the patient, inform their ordering clinician, and have the patient remove the piercing in the most reasonable way possible.

8. All individuals with a history of potential ferromagnetic foreign object penetration (e.g. bullets or shrapnel) must undergo further investigation prior to entry into Zone IV.

   a. Acceptable methods of screening include patient history, patient x-ray films, prior CT or MR studies of the questioned anatomic area, and written documentation of the type of implant or foreign object that might be present.
b. Once positive identification of the type of implant has been made, investigation must include product labeling regarding the implant or object, and if needed a review of peer-reviewed publications regarding MR conditions and MR safety testing of the make, model, and type of object.

c. All patients who have a history of orbital trauma by a potential ferromagnetic foreign body for which they sought medical attention are to have their orbits cleared by plain film x-ray or CT of the orbits.

9. The screening form may be completed by another healthcare provider with the patient prior to presenting to MRI. Prior to the entry into Zone IV, the form and its contents must be reviewed and a verbal interview conducted by level 2 MR personnel per the MRI department time out policy.

MRI Screening Form

1. The patient or designee as well as the screening MR staff member must both sign the completed form.
2. This form shall become part of the patient’s medical record and be scanned into PACS upon completion of the MR examination.
3. No empty or unknown responses will be accepted; each question must be answered with a “yes” or “no,” or specific information must be provided as requested.
4. Supporting documentation of any implant, device and/or object marked “yes” on the MRI screening form must be explained, in writing, by the MRI technologist.

Implant, Device, and Object Clearance

1. MR safety status (unsafe, MR conditional, or safe) of an implant, device and/or object cannot be assumed if it is not clearly documented in writing. If an implant, device, and/or object has not been tested, or if MR safety status is unknown, it should not be permitted unrestricted access to Zones III or IV without consultation with the MRMD and MRSO. If an approved device must be scanned with parameters that fall outside manufacturer guidelines, it will be treated as it is a non-approved device.
   a. Final determination of whether to proceed with the scan on any given patient with any given implant, foreign body, etc., is to be made by the level 2 MR personnel-designated attending MR radiologist, MRMD, or MRSO following criteria for acceptability predetermined by the MRMD.
2. Supporting documentation must include:
   a. Manufacturer, type or model, material, lot, and serial number(s).
   b. Approved methods of device verification include:
      i. Verbal confirmation of implant, device, and/or object with identification of manufacturer, type or model, material, lot, and serial number(s).
      ii. A surgical report with supporting documentation.
      iii. Manufacturer implant, device, and/or object information card.
      v. Review and assessment by an attending radiologist. If the patient is cleared to enter Zone IV, the MR technologist will document the approving attending radiologist name and approved implant, device, and/or object to include all information listed above on the MRI screening form and scan into PACS.
Conscious, alert and oriented patients who can reliably provide a medical history

1. Conscious and alert patients are to complete a written MR safety screening form prior to entry into Zone III.
2. If questionable patient metal exposure history or no reliable history is obtained, the patient shall undergo plain film imaging of the skull and/or orbits, neck, chest, abdomen and pelvis to exclude metallic foreign objects (if recently obtained plain films, CT, or MR studies of such areas are not already available).
   a. Such imaging studies are to be ordered by clinician/service ordering the original MR examination. If this is not possible for reasons of availability and/or timeliness, they may be ordered by a radiologist from the clinical Division performing the MRI examination.

Unconscious, Unresponsive Patients and those who cannot provide reliable medical histories

1. Family or guardians of non-responsive patients or of patients who cannot reliably provide their own medical histories are to complete a written MR screening form prior to their introduction into Zone III
2. Screening of patients for whom an MR examination is deemed clinically indicated or necessary, but who are unconscious/unresponsive or cannot provide their own reliable histories regarding prior possible exposures to surgery, trauma, or metallic foreign objects, and for whom such histories cannot be reliably obtained from others:
   a. If no reliable patient metal exposure history can be obtained, and if the requested MR examination cannot reasonably wait until a reliable history might be obtained, the ordering clinician shall perform the following:
      i. Review the patient's medical record for documented history of any history of prior surgeries or procedures and mark the appropriate area(s) in sections 1 & 2 on the MRI screening form.
      ii. Ensure imaging of the skull and/or orbits, chest, abdomen and pelvis to exclude metallic foreign objects (if recently obtained plain films, CT, or MR studies of such areas are not already available). If this is not possible for reasons of availability and/or timeliness, they may be ordered by a radiologist from the clinical Division performing the MRI examination.
      iii. Perform a physical exam on the patient to evaluate for any unexplained scars or surgeries not documented in the patient’s medical record. Orders for radiographs must be placed for any additional area(s) of concern.
      iv. Document the above precautions in the patient’s medical record.
   b. The investigation described above should be made to ensure there are no potentially harmful embedded or implanted metallic foreign objects or devices.
3. Final determination of whether to proceed with the scan on any given patient with any given implant, foreign body, etc., is to be made by the level 2 MR personnel-designated attending MR radiologist, MRMD, or MRSO following criteria for acceptability predetermined by the MRMD.
   a. An attending radiologist must give approval to override the contraindication. Approval is documented and signed off by the performing level 2 MR technologist on the MRI screening form and scanned into PACS with the name of the approving Radiologist.
References


Applicable Standards:

Developed By: MRI Division
Policy Primary: Department of Radiology Policy Committee
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