Magnetic Resonance Imaging & Nuclear Magnetic Resonance Safety for Service Staff

Overview

Magnetic Resonance Imaging (MRI) equipment and Nuclear Magnetic Resonance (NMR) units produce strong magnetic fields that will pull ferromagnetic objects to these machines with great force. Additionally, both MRI and NMR equipment uses cryogens for cooling the magnet and other internal components. These cryogens have the potential to be released from the system and may displace oxygen from the MRI/NMR procedure room. If not controlled, these risks associated with Magnetic Resonance Imaging have the potential to cause serious harm to anyone in the MRI/NMR procedure room. Due to these risks, employees must follow safety and operational procedures to protect the safety and health of all personnel and patients who enter the MRI rooms.

Applicability

This Update is applicable to all employees of Weill Cornell Medicine (WCM) who enter MRI/NMR areas, except staff directly involved in the operation of MRI/NMR equipment. This Update is applicable, but not limited to, Engineering & Maintenance, Security, ITS, and Environmental Health and Safety (EHS) employees.

This Update is **not** applicable to staff involved in MRI operations, including Radiologic Technologists. The safety requirements for these employees are met through job-specific safety training programs, operating procedures, and professional certifications.

The safety requirements outlined in this update are applicable to all listed locations, including but not limited to the following.

- **WCM MRI Unit Locations**:
  - Citigroup Biomedical Imaging Center - 516 E.72nd Street: 7T Animal MRI (S-174), 3T MRI (S-279, S-268)
  - Weill Greenberg Center - 1305 York Avenue 3rd Floor: 3T MRI (Y-346), 1.5T MRI (Y-345)
  - Magnetic Resonance Imaging Center – 416 E.55th Street: 1.5T MRIs (MR-0008A, MR-0007A)
  - West Side Practice – 2315 Broadway, 4th Floor: 3T MRI (WP418)
- **WCM NMR Unit Locations**:
  - S/SI Building, Citibank Imaging Center – 516 E. 72nd St, 1st Floor
  - Belfer Research Building – 413 E 69th St, B3 Level

Responsibilities

- **Weill Cornell Imaging at NewYork Presbyterian (WCINYP)/CBIC Staff**:
  - Ensure MRI Procedure Room doors are locked at all times when an MRI Technologist or other authorized person is not present to control access.
  - Ensure MRI safety signage and metal detector signage is present at MRI Procedure Room doors and at metal detector locations.
  - Oversee service contractors who need access to MRI areas.
  - Approve and escort employees who are not on the MRI Clearance List into MRI areas.
  - Review all equipment that will be used inside MRI Procedure Rooms to ensure it is MRI safe. In cases where no “MR Safe” alternative exists, screen equipment for ferrous metal to ensure safe use inside MRI areas.
  - Ensure oxygen sensors are active and receive regular service and calibration.
  - Provide immediate notification of all accidents and/or safety incidents to Environmental Health and Safety.
- **Service Staff**:
  - Attend annual MRI/NMR Safety Training (online or instructor-led) and pass the MRI/NMR Safety Test.
  - Undergo medical screening during annual physical with Workforce Health and Safety.
  - Report any changes in medical conditions that may alter MRI clearance to Workforce Health and Safety prior to entering MRI/NMR area.
  - Follow work practices described in this Update, safe work practices discussed in the annual MRI/NMR Safety Training, and job specific/position specific trainings.

Environmental Health and Safety
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  - Report immediately any concerns related to MRI/NMR equipment or areas.
- **Supervisors**:
  - Attend annual MRI/NMR Safety Training (online or instructor-led) and pass the MRI/NMR Safety Quiz.
  - Undergo medical screening during annual physical with Workforce Health and Safety.
  - Ensure employees follow the work practices described in this Update, discussed in the annual MRI/NMR Safety Training, and job or task specific training for work in MRI/NMR areas.
  - Ensure employee concerns related to MRI/NMR equipment or areas are addressed.
  - Ensure all employees working in MRI/NMR Procedure Rooms have been cleared for MRI/NMR access and received task specific training.
- **Environmental Health and Safety (EHS)**:
  - Provide annual MRI/NMR Safety Training to service employees, as required.
  - Maintain training records for all MRI/NMR Safety Training for service employees.
  - Investigate all accidents and/or safety incidents in MRI/NMR areas.
  - Update and distribute on a routine basis a list of all service employees cleared for MRI access.
  - Review this program and provide updates as needed.
- **Workforce Health and Safety (WHS)**:
  - Conduct medical screening for service employees.
  - Provide confirmation of medical clearance to EHS.
- **Service Contractors Working With Cryogenics**:
  - Provide personal O2 sensors for all work in MRI/NMR areas.
  - Follow standard company SOP's when working on equipment.

Safety Equipment

Oxygen Sensor: During MRI/NMR quench and cryogen filling operations, there is a potential for cryogens to be released into the MRI/NMR room which can displace the oxygen in the room. To alert occupants of a potential oxygen deficiency, oxygen sensors are installed in all MRI/NMR areas. Oxygen sensors must remain on at all times. Staff responsible for the supervision of the MRI/NMR equipment must ensure oxygen sensors are on and operating at all times. When oxygen sensors are malfunctioning or need to be removed for maintenance temporary oxygen sensors must be in place.

When an oxygen sensor is in alarm:

- Notify anyone in the room and evacuate the area immediately.
- Close the door to the MRI/NMR room to contain the release.
- Notify Security of this condition.
- Do not re-enter the room.

Metal Detector (MRI Suites Only): Metal detectors are installed at the entrances to all MRI Procedure Rooms to detect any items that may have been missed during medical and personal screening. Employees must ensure they are cleared for access and have screened themselves for any ferromagnetic objects prior to entering the MRI suite. Anytime a metal detector alarms, the employee must stop immediately and check their body for ferrous metal objects and remove them before proceeding to the MRI room. Metal detectors must be operational at all times. Staff responsible for the supervision of the MRI equipment must ensure this equipment is operational and functioning properly. Metal detectors must not be shut off at the end of the work day.

Fire Extinguishers: MRI/NMR areas must contain "MRI Safe" non-ferrous fire extinguishers. These extinguishers are distinguishable by their white and blue color and "MRI Safe" sticker. Standard red fire extinguishers are not permitted in MRI/NMR areas as the may contain ferromagnetic components which will be drawn to the MRI/NMR equipment and present a hazard to staff and patients.

Security and Access Restrictions

MRI AREAS:

The following security and access restrictions must be adhered to for all MRI areas to prevent injury and property damage. Deviations from the clearance requirements will not be permitted.

Security: Unauthorized access to the MRI Procedure Rooms can result in personal injury and property damage by untrained personnel who are unaware of the hazards associated with MRI equipment. During normal operation, access to the MRI Procedure Rooms is controlled by the MRI Technologists or other authorized personnel. Prior to granting access to the MRI Procedure Room, the technologist or authorized personnel must verify that the employee's name appears on the MRI Clearance List. During off-hours or times when technologists or authorized personnel are not present to control access, the door to the MRI room must be locked. Employees requiring access to MRI Procedure Rooms during off-hours must be approved by Security. Security staff are responsible for ensuring these employees are on the MRI Clearance List prior to providing access.

Medical Screening: Workforce Health and Safety (WHS) provides medical screening for all service employees during the employee's annual health assessment. This screening will identify any medical issues which would prohibit employees from entering MRI areas. WHS provides a list of all medically cleared employees to EHS. Employees with medical issues that may alter their MRI clearance must report to WHS to undergo a new medical screening prior to performing work in an MRI area. Employees requiring medical screening must bring a copy of the MRI Screening for Non-Patient form to WHS.

Clearance: Access to MRI areas will only be granted to employees who have met the following criteria:

- Completed MRI Safety Training.
- Achieved a passing score on the MRI Safety Test.
- Received medical clearance from WHS.

Once an employee has satisfied these requirements they will be added to the MRI Clearance List. All employees who have not been cleared needing to enter an MRI area must first be approved by a representative from WCINYP/CBIC, and escorted into the MRI area. This representative will be responsible for the individual's screening.

MRI Clearance List: EHS will distribute a list of employees cleared for access to MRI areas. The MRI clearance list will be distributed to WCINYP, CBIC, Security, and Engineering & Maintenance. Only the most current list distributed by EHS may be used to grant employees access to MRI areas. Any other lists of employees may not be used to grant access and must be discarded.

NMR AREAS:

Access to NMR rooms is controlled by laboratory technologists or the Principal Investigator (PI). **Clearance**: Access to the NMR areas will only be granted to employees who have met the above criteria for MRI clearance.

Use of Equipment Inside MRI/NMR Areas

No ferrous metal or objects containing ferrous metal are permitted inside MRI areas. Only non-ferrous equipment, manufactured to be MRI Safe and with an "MRI Safe" label is permitted inside MRI/NMR areas. In cases where no MRI Safe alternative exists (e.g. plumbing, HVAC equipment) non-MRI safe equipment must be evaluated for use in MRI/NMR areas. These pieces of non-MRI safe equipment are then only permitted after being cleared by WCINYP technologists/CBIC Staff. These staff members must use established screening protocols to clear the equipment.

Signage

MRI/NMR Facilities are required to have signage that identifies the hazards associated with the MRI/NMR equipment and ferrous metal objects.

MRI/NMR Room Signage: A sign must be posted on the MRI room door warning of a strong magnetic field and prohibiting anyone with a pacemaker, metallic implants, and/or neurostimulators from entering the MRI Room. The standard MRI signage is pictured.

Labeling: Equipment considered safe for use inside an MRI/NMR room will be labeled by the manufacturer or MRI staff with a green and white "MR" logo (see right). Only tools or equipment with this logo are permitted in the MRI room.

An Example of an MRI Warning Sign.

An Example of a MRI Safe Equipment Sign.

Contractors Working with Cryogenics

Contractors and workers must be approved by the WCM MRI user group. All MRI service contractors must keep the WCM MRI user group informed of their work and the status of the system at all times. Contractors involved in cryogenic filling operations must have personal O2 sensors on at all times. Contractors will not be permitted to conduct filling operations without personal O2 sensors.

Training

Annual training is required for all service employees who need to enter an MRI room. Training will be conducted for staff in either instructor-led sessions or will be provided online. Training is provided by EHS and WCINYP.