



BRIC

BRAIN RESEARCH & IMAGING CENTRE

UNIVERSITY OF
PLYMOUTH



NHS
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BRIC MRI Facility Local Rules

3T MRI Facility

Brain Research & Imaging Centre

Approval Committee	Version	Issue Date	Review Date	Document Author(s)
	1.0			Stephen Hall David Reed

Purpose

By following these Local Rules you will be able to work safely within the MR environment.

All staff who work in the MR environment should read and sign to state that they understand and will comply with these Local Rules.

Scope

These local rules have been prepared in accordance with the MRHA guidelines in order to protect all individuals from the risks associated with the MR environment.

Responsibilities

MR Responsible Person: David Reed
 MR Safety Expert: Jamie Roberts
 MR Lab Heads: Matt Roser/Nadege Bault
 BRIC Director: Stephen Hall
 DDRC Project Manager: Tim Mockridge

Procedure

1. General

- 1.1.** These Local Rules are intended to ensure compliance with the requirements of the Health and Safety at Work Act, MHRA (2015) and ICNIRP (2014).
- 1.2.** The Local Rules provide guidance for safety within the MR environment for patients, participants, students, staff and other personnel involved with the MRI equipment.
- 1.3.** Compliance with these Local Rules is the responsibility of each individual member of staff. Each member of staff whose duties involve working in the MRI unit must read and understand these local rules and must sign to agree to act in accordance with them.
- 1.4.** Due to the potential hazards associated with MRI equipment and environment it is essential that Local Rules are strictly adhered to at all times.

2. Nature of hazards

2.1. Static field

- 2.1.1.** Interference with cardiac pacemakers and other electrically, mechanically or magnetically active devices.
- 2.1.2.** Projectile hazards from ferromagnetic objects.
- 2.1.3.** Movement of embedded metal fragments, aneurysm clips or other implantable medical devices.

2.2. Time varying magnetic field gradients

- 2.2.1.** Current loops created within the body by hand clasping or crossing feet. The potential effects are peripheral nerve stimulation, muscle stimulation and acoustic noise.

2.3. Radio-frequency fields

- 2.3.1.** Heating, including around metal implants
- 2.3.2.** Heating from conductive loops from the patient's body.
- 2.3.3.** RF burns from contact with coils.

2.4. Liquid Helium

2.4.1. Spontaneous quenching resulting in the boiling off of helium liquid.

2.5. Acoustic noise

2.5.1. During scanning high levels of noise can be produced (above 80dB).

3. Definitions

3.1 MR Safe

An item that poses no known hazards resulting from exposure to any MR environment. MR Safe items are composed of materials that are electrically nonconductive, non-metallic, and non-magnetic'

3.2 MR Conditional

An item with demonstrated safety in the MR environment within defined conditions. At a minimum, address the conditions of the static magnetic field, the switched gradient magnetic field and the radiofrequency fields. Additional conditions, including specific configurations of the item, may be required.

3.3 MR Unsafe

An item which poses unacceptable risks to the patient, medical staff or other persons within the MR environment.

Responsibilities

3.4 MR Safety Expert

The MR Safety Expert should be in a position to adequately advise on the necessary engineering, scientific and administrative aspects of the safe clinical and research use of the MR devices including site planning, development of a safety framework, advising on monitoring the effectiveness of local safety procedures, procurement, adverse incident investigation and advising on specific patient examinations. Their knowledge of MR physics should enable them to advise on the risks associated with individual procedures and on methods to mitigate these risks.

MR Safety Expert: Jamie Roberts 01752 430436

3.5 MR Responsible Person

3.5.1 Ensure strict adherence to these Local Rules and the register of authorised operators and users is maintained.

3.5.2 Has overall day to day responsibility for MR safety

3.5.3 Prepare and revise Local Rules and risk assessments.

3.5.4 Report any incidents.

MR Responsible Person: David Reed 01752 437391

3.6 MR Operator

3.6.1 An MR Authorised Person who is also entitled to operate the MRI equipment.

3.7 MR Authorised Person

3.7.1 A suitably trained person that is authorised to have free access to the MRI Controlled Access Area and MRI environment.

3.8 MR Un-authorised Person

3.8.1 Includes visitors, patients, participants, hospital staff, University staff and students who do not normally work within the MRI department and have not been approved as MR Operators or MR Authorised persons.

4. Designation of areas

4.1. The MRI Controlled Access Area designates as areas immediately outside the MRI Exam room and areas inside the controlled access doors

4.2. The MRI Environment is defined locally as the area in the MRI Exam Room.

4.3. Diagram of MR department – see Appendix 1

5. Methods of safe working

- 5.1.** MRI Exam Room doors should be closed when not in use and locked when there is no supervising MR Operator in the unit.
- 5.2.** All persons must have satisfactorily completed a MRI safety questionnaire before entering into the MR Controlled Access Area
- 5.3.** All safety questionnaires must be signed by the individual, verified and countersigned by a MR Operator.
- 5.4.** Before entering the MR Controlled Access Area everyone must take the following precautions: Personnel must remove mechanical watches, credit cards, magnetic tapes, other magnetic recording media and ferromagnetic objects such as coins, pins, scissors, keys, tools, hair grips, certain spectacles that have ferromagnetic parts, etc. Lockers are provided to facilitate this.
- 5.5.** No equipment should be allowed into the MR Environment unless approved by an MR Operator.
- 5.6.** All equipment taken into the MR Environment must be either MR safe or MR conditional (provided the conditions are met) and all such equipment must be labelled or marked and not modified in any way.

6. Implants

- 6.1.** The MR environment can cause interference with implants, both non-active and active implants.
- 6.2.** The MR environment can cause movement of ferromagnetic foreign material within the body, associated heat generation with large non-ferromagnetic implants.
- 6.3.** If a patient is unable to complete the safety questionnaire, previous imaging must be reviewed by a consultant radiologist to check for implants or metallic foreign bodies.

6.4. The referrer should provide all relevant details when a patient has a known implant.

6.5. The compatibility of the implant should be checked prior to appointment by an Authorised Person such as the MR Safety Expert.

7. Training requirements

7.1. All personnel associated with MR equipment must undergo adequate training to prevent accidents.

7.2. Training is required for all categories of staff prior to commissioning of the equipment and for all new staff subsequent to commissioning.

7.3. The MR responsible person and MR Lab Heads, following agreement with the BRIC Director, have authority to remove an individual's certification as an Authorised Person or to determine that refresher training is required.

7.4. The training of all appropriate staff in terms of their normal duties and those in the event of an emergency are essential.

7.5. Details of the training requirements can be found in the MRI training Program.

8. Maintenance

8.1. The MR Environment will be formally handed over to service engineers for maintenance and repair works.

8.2. On completion of such work the MR Environment and MRI scanner will be formally handed back with a written statement specifying any factors that may affect the ongoing safe operation of the scanner.

8.3. All maintenance, servicing, QC and QA should be kept up to date.

9. Contingency plans

9.1. In the event of an emergency, access to the MR Environment must only be given under the supervision of an MR Authorised Person.

9.2. MR Operators and other MR Authorised Personnel must be familiar with the location and consequences of activating the Emergency Off buttons (scan table), electrical isolation switches and magnetic quench buttons.

9.3. Cardiac Arrest

The patient must be removed from the MRI Environment IMMEDIATELY and the cardiac arrest team called using the emergency call button. An ambulance should be called by **dialing 999**. Under no circumstances should resuscitation equipment or cardiac arrest team personnel be allowed into the MRI Environment. The duty MO at BRIC should be informed if not in attendance at resuscitation.

9.4. Fire

The procedures documented in the BRIC-DDRC Fire Policy must be followed, with specific attention to MR specific guidance. All MR Operators and Authorised Persons must have read and understood this policy.

9.5. Self-Quench

9.5.1. In the event of a magnet self-quench, the following actions must be taken.

9.5.2. Patients must be removed from the MRI Environment and the controlled area evacuated immediately.

9.5.3. The door to the MRI Environment must be fixed open.

9.5.4. The emergency off buttons should be activated.

9.5.5. The MR Responsible Person, MR Lab Heads/BRIC Director and MR manufacturer must be informed.

9.5.6. Personnel must not return to the MR suite until clearance is given by the MR Responsible Person, MR Lead radiographer and MR Manufacturer.

9.6. Metal Objects

9.6.1. If a ferromagnetic object enters the magnet bore, the MR manufacturer must be contacted for advice. NO attempt must be made to remove the object until advice has been sought. DO NOT QUENCH THE MAGNET unless advised to by the MR manufacturer.

9.6.2. If a patient becomes injured or trapped, medical assistance should be sought immediately. The patient should be removed to safety for treatment. If there is an immediate danger to life, the magnet should be quenched.

9.7. Flood

9.7.1. If water leaks into the Equipment Room, activate the electrical isolator switch, evacuate the MR Facility and contact the DDRC Project Manager. DO NOT QUENCH THE MAGNET.

10. Specific information regarding 3T Scanner Suite / local area

Please be aware the strength of the 3T magnet is twice as powerful as the 1.5T magnets. The same safety precautions must be followed with an awareness that metal items can become projectiles further from the scanner than with a 1.5 scanner. Ear plugs and ear defenders/ Siemens audio headphones must be worn for all patients undergoing MRI at 3T.

11. References

MHRA. Safety Guidelines for Magnetic Resonance Imaging Equipment in Clinical Use. March 2015.

Society of Radiographers. Safety in Magnetic Resonance Imaging. March 2013.

Monitoring

This document and protocol will be reviewed quarterly as a standing item at the BRIC MR Management meeting. The document will be updated following: changes to operation of the facility of centre, new guidance or legislation and recommendations for improvement to best practice at BRIC.

Version History

Version	Date	Author(s)	Section	Principle Amendment Changes
1.0		Stephen Hall David Reed		

Appendices

Appendix 1: Diagram of BRIC MRI Facility



