NHS Greater Glasgow and Clyde

ID: DR-GGC-RISK-063

Risk Assessment Form

Use this form for any detailed risk assessment unless a specific form is provided. Refer to your Summary of Hazards/Risks and complete forms as required, including those that are adequately controlled but could be serious in the absence of active management. The Action Plan and reply section is to help you pursue those requiring action.

Name of Initial Assessor/Reviewer:	John McLean	**Post Held:**	MR Safety Expert
Department:	**Imaging**	**Date (Initial Review):**	**7/11/2016**

Subject of Assessment: E.g.: hazard, task, equipment, location, people

Occupational exposure to electromagnetic fields (EMF) within the MRI Unit

Hazards (Describe the harmful agent(s) and the adverse consequences they could cause)

Three types of electromagnetic field are employed in MRI, and each is associated with physiological effects.

- Exposure to strong static magnetic fields, particularly when there is rapid motion of the head, is associated with transient sensory effects such as vertigo, nausea, and a metallic taste. These effects resolve once the movement stops or the affected person is removed from the field. There are no known longer-term health consequences. These effects can only occur if an individual is very close to the magnet.
- Exposure to the switched magnetic field gradients used in MRI can result in peripheral nerve stimulation, which at sufficiently high levels of exposure can result in intolerable pain. This can only occur if an individual is inside the scanner or very close to the bore of the magnet (wthin 0.5-1 m) while imaging is taking place
- Exposure to switched magnetic fields can induce heating effects in metal implants under specific conditions.
- Exposure to RF magnetic fields can result in excessive tissue heating. In practical terms, this can only occur if an individual is inside the scanner during imaging.

Description of Risk
Describe the work that causes exposure to the hazard, and the relevant circumstances. Who is at risk? Highlight significant factors: what makes the risk more or less serious – e.g.: the time taken, how often the work is done, who does it, the work environment, anything else relevant.

This risk assessment relates to staff who have cause to work within the MRI magnet room.

The Control of Electromagnetic Fields at Work Regulations 2016 [1] places an obligation on employers to assess occupational EMF exposure, perform risk assessments, put appropriate control measures in place, and provide workers with appropriate information and training.

Published data on hazards and EMF exposure (e.g. [2]) in MRI. MHRA guidelines on safe use of MRI [3]. HSE guidance on The Control of Electromagnetic Fields at Work Regulations 2016.

The Regulations contain exposure limit values (ELVs) for occupational exposure to EMFs, but the development, testing, installation, use and maintenance of, or research related to, MRI equipment for patients in the health sector is exempted from these ELVs, subject to certain conditions. The HSE has also exempted certain MRI activities that do not fall within this definition.

The conditions that apply to the exemptions are as follows.

- The exposure of employees is reduced to the lowest level reasonably practicable*; and
- Employees are protected against the health effects and safety risks arising from their exposure to electromagnetic fields.

There is copious evidence (e.g. Capstick et al 2008) [2] to show that MR workers can exceed the

ELVs for time varying magnetic fields when they move around in the vicinity of the MR scanner and if they are close to the scanner (within 0.5-1.0 m) while images are being acquired. There may be exceptional circumstances in which the limits for exposure to RF fields may be exceeded.

*Since the transient physiological effects encountered in MRI only occur above a particular exposure threshold (although this threshold may vary somewhat between individuals), there is no need for further reduction of exposure below that level. Thus ALARP effectively only applies at exposure levels at which effects may occur, which only arise within approximately 0.5-1 m from the scanner.

[1] The Control of Electromagnetic Fields at Work Regulations 2016.

[2] Capstick M, McRobbie D, Hand J, Christ A, Kühn S, Hansson Mild K, Cabot E, Li Y, Melzer A, Papadaki A, Prüssmann K, Quest R, Rea M, Ryf S, Oberle M, Kuster N. An investigation into occupational exposure to electromagnetic fields for personnel working with and around medical magnetic resonance imaging equipment. Employment, Social Affairs and Equal Opportunities DG, European Commission, 2008. Available at: http://www.itis.ethz.ch/assets/Downloads/PapersReports/Reports/VT2007017FinalReportv04.pdf.

[3] D. Grainger, “Safety Guidelines for Magnetic Resonance Imaging Equipment in Clinical Use,” Medicines and Healthcare Products Regulatory Agency, Mar. 2015.

Existing Precautions

Summarise current controls In place	Describe how they might fail to prevent adverse outcomes.
These risks are well understood by the MRI community and have been managed on a daily basis since the first clinical MRI scanners in the mid 1980s. MR staff only remain in the scanner room during imaging if it is necessary, e.g. to care for a patient or perform clinical procedures. MR staff only approach within 1 m of the magnet if it is necessary e.g. for cleaning, testing set-up or operation of the scanner or to perform clinical procedures. Sensory effects are reduced to the lowest level reasonably practicable by avoiding, where practicable, rapid head movements in close proximity to the scanner and/or being inside or in close proximity to the MRI machine bore during scanning when the gradient and RF fields are applied. Staff are protected against the health effects and safety risks posed, by inclusion of information about these risks and how to avoid them in MRI safety training. All staff are screened for anything that might put them at higher risk from exposure to EMFs and are further restricted from exposure if appropriate, for example: - pregnant staff are not allowed in the MR Environment during scanning (while the gradient magnetic fields are in operation) because of the risk of excessive acoustic noise exposure to the fetus; for this reason workers are encouraged to advise their line manager in writing if they become pregnant; - staff with contraindicated implanted medical devices are not allowed to enter the MR Environment.	Where an employee reports experiencing a health effect and that employee is believed to have been exposed to EMFs exceeding any ELV, health surveillance and medical examinations are provided as appropriate.

Level of Risk - Is the control of this risk adequate?
Give more than one risk level if the assessment covers a range of circumstances. You can use the 'matrix' to show how 'likelihood' and 'consequences' combine to give a conclusion. Also, be critical of existing measures: if you can think how they might fail, or how they could be improved, these are indications of a red or orange risk.

Risk Matrix

Likelihood	Impact/Consequences				
	Negligible	Minor	Moderate	Major	Extreme
Almost Certain	Medium	High	High	V High	V High
Likely	Medium	Medium	High	High	V High
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Low	Medium	Medium

Very High High Medium Low

Current risk level

Given the current precautions, and how effective and reliable they are, what is the current level of risk? **Green** is the target – you have thought it through critically and you have no serious worries. Devise ways of making the risk green wherever you can. **Yellow** is acceptable but with some reservations. You can achieve these levels by reducing the inherent risk and or by effective and reliable precautions.
High (Orange) or Very High (Red) risks are unacceptable and must be acted on: use the Action Plan section to summarise and communicate the problems and actions required.

Action Plan (if risk level is **High (Orange) or Very High (Red)**

Use this part of the form for risks that require action. Use it to communicate, with your Line Manager or Risk Coordinator or others if required. If using a copy of this form to notify others, they should reply on the form and return to you. Check that you do receive replies.

Describe the measures required to make the work safe. Include hardware – engineering controls, and procedures. Say what you intend to change. If proposed actions are out with your remit, identify them on the plan below but do not say who or by when; leave this to the manager with the authority to decide this and allocate the resources required.

Proposed actions to control the problem List the actions required. If action by others is required, you must send them a copy	**By Whom**	**Start date**	**Action due date**

Action by Others Required - Complete as appropriate: (please tick or enter YES, name and date where appropriate)

Report up management chain for action	
Report to Estates for action	
Contact advisers/specialists	
Alert your staff to problem, new working practice, interim solutions, etc	

Reply

If you receive this form as a manager from someone in your department, you must decide how the risk is to be managed. Update the action plan and reply with a copy to others who need to know. If appropriate, you should note additions to the Directorate / Service Risk Register.

If you receive this as an adviser or other specialist, reply to the sender and investigate further as required.

Date of last review:	As per QPulse record	**Next review date:**	As Per QPulse record