

Position Statement

Scientific Safety Advice to Magnetic Resonance Imaging Units that Undertake Human Imaging

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Executive Summary

An effective framework for the provision of safety advice in Magnetic Resonance Imaging (MRI) is essential for the safety of patients, visitors and staff. This position statement is issued by the Institute of Physics and Engineering in Medicine (IPEM) to address the provision of Magnetic Resonance (MR) scientific safety advice to MR units that undertake human imaging in the UK.

The position statement recommends that all organisations that operate MR equipment for imaging of human subjects should engage the services of an MRSE who should be certificated by a scheme that assesses both knowledge and experience. IPEM administer a scheme that fulfils these requirements. It also defines typical roles and responsibilities that such a person should perform.

The MR Special Interest Group have also prepared a related policy statement 'The role of the Clinical Scientist in Magnetic Resonance Imaging' (2022), available via the IPEM website.

Overview

MRI utilises strong magnetic fields, radiofrequency electromagnetic fields, magnetic field gradients and cryogenics. These can all be hazardous unless suitable controls and safety procedures are implemented.

There are many aspects of MR safety that are technical and scientific. These include but are not limited to the interpretation of national and international guidelines and legislation, establishment of safety frameworks, site design, measurement of electromagnetic fields and assessment of patients and staff members with implants. To fully cover these aspects requires a person who has a thorough and detailed understanding of MR physics and the appropriate skills, knowledge and experience to provide safety advice. They will often need to give advice within a clinical or academic setting and will need to have an understanding of the context in which the advice is sought, and the consequences of any advice given. They will be a member of the multidisciplinary team that manages and maintains the safety and effectiveness of the MR unit alongside MR unit managers, MR radiographers and radiologists. All the members of this team play an essential and complementary role in MR safety.

In the United Kingdom, safe practice in MRI is based upon health and safety at work legislation [1] and a number of national and international standards and guidelines [2-11]. The UK Government Medicines and Healthcare products Regulatory Agency (MHRA) has published Safety Guidelines for Magnetic Resonance Imaging Equipment in Clinical Use [10]. These guidelines recommend that units should have a professional available “to adequately advise on the necessary engineering, scientific and administrative aspects of the safe clinical use of the MR devices” and this person is termed the MR Safety Expert. The MHRA states that this person will ideally be a physicist with expertise in MRI who would normally have Health and Care Professional Council (HCPC) registration or General Medical Council (GMC) specialist registration. The European Federation of Medical Physics (EFOMP) recommends [13] the provision of an MR Safety Expert to provide “high level advice on the engineering, scientific and administrative aspects of the safe clinical use of MR devices”. An international multi-society consensus statement also recommends sites have “ready access to the services and advisory assistance of an MRSE” [14].

IPEM administer an MRSE certification scheme that assesses both knowledge and experience. The knowledge component covers scientific, technical and clinical knowledge, and is evidenced by completion of the American Board of MR Safety (ABMRS) MRSE exam. Experience is demonstrated by applicants submitting a portfolio of their work. For more information on this process, please refer to the IPEM website (<https://www.ipem.ac.uk/learn/cpd-and-post-registration-learning/mrse-certificate-of-competence/>).

Recommendations

IPEM recommends that all organisations that operate MR equipment for imaging of human subjects should engage the services of an MRSE who should be certificated by a scheme that assesses both knowledge and experience. IPEM administer a scheme that fulfils these requirements. The MR Safety Expert (MRSE) will have a thorough knowledge of MR physics and adequate training, knowledge and experience of MR imaging equipment, its uses and associated requirements.

The MRSE should work closely with all professions who are responsible for maintaining the safety of the MR unit and, in particular, the individual bearing management responsibility for safety within the MR unit (referred to in the MHRA guidance [10] as the MR Responsible Person) who will ensure that appropriate safety policies and procedures are implemented.

The professional background of the MRSE will depend on the context in which they operate. For clinical units it is most appropriate for the MRSE to be regulated by a relevant body i.e., they should have HCPC registration as a clinical scientist or, HCPC registration as a radiographer or GMC specialist registration. For MRSEs who advise MR units operating for non-clinical purposes (e.g., academic units) HCPC or GMC registration may not be necessary.

Some hospitals or healthcare providers will not be in a position to incorporate general scientific support to MR imaging within their clinical service and will not have direct access to a MRSE. These units should seek to establish support from an MRSE to provide appropriate MR safety advice by other means, e.g. via a formal agreement with a third party.

Examples of specific activities falling within the role of the MRSE

Examples of specific activities falling within the role of the MRSE are to:

- Recommend solutions that enable the MR unit management team to ensure that the MR unit is safe for patients, visitors, members of the public and staff.
- Develop safe operating procedures and policies.
- Advise on or develop an appropriate governance framework for managing safety in relation to MR, including effective review processes and reporting mechanisms within the organisation.
- Advise on, prepare or review, and periodically revise the local safety rules in consultation with MR unit management colleagues.
- Advise on the local implementation of national and international MR guidelines and legislation.

- Audit MR units for compliance with national guidelines and good safe practice and monitor the effectiveness of local safety procedures.
- Provide expert scientific advice on the risks associated with individual patient examination procedures and situations for which generic safety advice is not appropriate for reasons of complexity or novelty. The MRSE will provide the radiologist or referring clinician with guidance on the risks associated with these procedures and methods to minimise them. The radiologist or referring clinician will be ultimately responsible for determining the overall benefit from the investigation and must consider the advice provided by the MRSE when determining the overall risk-benefit for a particular patient.
- Advise on safety aspects of the specification, procurement and safety testing of MR and ancillary equipment.
- Advise on site planning and the configuration of MR facilities in order to promote safety, working with, and recognising the experience of, the system vendor installation team.
- Assist with the investigation of incidents relating to MR safety.

Conclusion

Having access to scientific safety advice is essential to ensure safe practice in MRI units. Recommendations have been given as to the knowledge and experience such a person should have and the requirements necessary to demonstrate this, such as the IPEM MRSE certification scheme. Examples of the duties the MRSE is likely to fulfil have also been detailed.

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