

Policy Statement

The Role of Clinical Scientists in Magnetic Resonance

1 Introduction

Magnetic Resonance imaging (MRI) is playing an increasing role in diagnostic healthcare. Magnetic Resonance Spectroscopy (MRS) is a valuable tool in biomedical research and is also beginning to impact on clinical practice. The establishment of a core team of Radiologists, Radiographers and Clinical Scientists provides the best balance for a good clinical service at the forefront of service provision, development and research. Clinical Scientists with their unique combination of scientific expertise and awareness of clinical requirements play a major role in the development and expansion of the use of MRI and MRS into new and existing diagnostic procedures.

The Clinical Scientist's particular expertise can be applied to equipment and site specification, quality assurance, optimisation of techniques, safety, research and development and education. The Clinical Scientist needs to be continually creative in all aspects of clinical service and in staff relations.

2 Equipment and Site Specification

The complexity of equipment and of siting considerations require the specialised knowledge of an experienced Clinical Scientist, who should work closely with clinical colleagues to ensure sound purchasing and site planning decisions.

It is vital that appropriate technical performance criteria are precisely and formally specified with input from a Clinical Scientist in order to meet local diagnostic needs and targets. This is critical because the spectrum of commercially available equipment offers a wide range of performance levels at greatly varying cost. The Clinical Scientist should liaise with manufacturers and users and also to provide an objective assessment of the equipment.

Installation of MRI and MRS systems may require extensive modification of existing buildings or the design of new buildings. Clinical Scientists can ensure that site design takes into account factors such as the extent of the strong static magnetic field, effective radiofrequency electromagnetic shielding and access for liquid helium vessels.

3 Quality Assurance

The role of quality assurance has become increasingly important in the NHS with the aim of improving patient care, safety and departmental efficiency. Quality assurance

(QA) in Magnetic Resonance is essential since the technology is complex. The role of QA is even more vital where quantitative measurements using MR images of patient anatomy or physiology are being performed. The Clinical Scientist may be required to provide advice on quality issues in the following areas.

3.1 Acceptance Testing

In order to determine if newly installed equipment is of an appropriate standard for clinical use, acceptance testing should be performed by the Clinical Scientist in conjunction with the manufacturer. The baseline performance for various parts of the MR system should also be established for newly installed equipment.

3.2 Regular Monitoring of MR Equipment

The Clinical Scientist should give advice on regular monitoring of the MR equipment and the implementation of a quality assurance programme. This will allow any deterioration in performance to be rapidly identified. IPEM report 80 'Quality Control in Magnetic Resonance Imaging' provides a guide to a range of tests that may be performed as part of a QA programme.

3.3 First Line Maintenance

Clinical Scientists may liaise with service engineers in fault finding and/or perform first line maintenance. They should seek to ensure that the radiographic staff have sufficient knowledge of basic fault finding on the system.

4 Optimisation of Techniques/Clinical Applications

Each hospital has specific local needs which may not be met exactly by the range of scanning protocols and hardware and software options available from the equipment manufacturer. To use the equipment optimally and cost effectively, Clinical Scientists should customise pulse sequences, write new data analysis programs and produce new hardware, such as surface coils and patient positioning devices. This can greatly enhance the diagnostic capabilities and patient throughput of the scanner.

Clinical magnetic resonance is a rapidly evolving field and new techniques are continually being developed. The Clinical Scientist should work with clinical colleagues in determining how best to deploy these techniques. By expanding the capabilities of the equipment in this way, the useful life and efficiency of the MR system may be extended. The technical expertise of the Clinical Scientist can be invaluable in ensuring the cost effective decisions are made when purchasing the system upgrades necessarily to implement new techniques.

5 Safety

The Clinical Scientist has an important role in ensuring safety is maintained for all staff. Guidance on magnetic resonance safety in hospitals is detailed in a Medical Devices Agency document (see Bibliography). These guidelines recommend restriction of access to the equipment, the drafting and updating of local rules and

regular safety training for staff . The IPEM operates a voluntary scheme for the certification of Clinical Scientists as competent to practice and advise in Magnetic Resonance Safety.

6 Research and Development

The science, technology and clinical application of magnetic resonance continue to undergo rapid development. The Clinical Scientist should seek to develop new methods or improve existing techniques. Current areas of active research include quantification of tissue and organ function and the development of rapid and real-time imaging methods. The Clinical Scientist has an important role in determining the most suitable research projects, attracting funding for those projects to support their work from the NHS, charities and Research Councils and ensuring reliable data is produced. Post processing and networking/tele-radiology techniques continue to require support from Clinical Scientists to ensure data integrity and ease of use for users.

7 Education and Staff Development

Clinical Scientists teach the basic physical principles and application of Magnetic Resonance to a wide range of clinical and support staff in both formal and informal settings. The IPEM training scheme offers both introductory and higher training in Magnetic Resonance for Clinical Scientists. Magnetic Resonance safety and quality assurance methods are often taught by Clinical Scientists. They may also co-ordinate education programs and tutorials.

Bibliography

IPEM Report 80. 'Quality Control in Magnetic Resonance Imaging.' (1998)

Medical Devices Agency 'Guidelines for Magnetic Resonance Diagnostic Equipment in Clinical Use: with particular reference to safety.' (1993)