



Higher National Unit specification: general information

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

Unit code: FN6E 35

Superclass: PB

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Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This Unit develops the knowledge and skills required to undertake non-contrast MRI examinations of the internal auditory meatus (IAM), lumbar spine and knees. It is aimed at those currently working under the direct supervision of Health Professions Council registered Radiographers as Assistant Practitioners within a diagnostic service. An example would be clinical departments providing an imaging service.

On completion of the Unit the candidate should be able to:

- 1 Describe anatomy, clinical history and potential pathologies associated with MRI scanning of the IAMs, lumbar spine and knees.
- 2 Demonstrate knowledge of working safely in an MRI environment.
- 3 Describe the outline principles of the physics of MRI and how this produces the image.
- 4 Prepare the equipment for IAM, lumbar spine and knee examinations.
- 5 Undertake non-contrast MRI scans of IAMs, lumbar spines and knees to protocol.

Recommended prior knowledge and skills

It is recommended that candidates should hold an HNC or equivalent in Diagnostic Imaging and be able to demonstrate a minimum of one year post qualification in employment as an Assistant Practitioner in Radiography.

General information (cont)

Credit points and level

1 Higher National Unit credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes of this Unit specification.

There is no automatic certification of Core Skills or Core Skill components in this Unit.

Context for delivery

If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

This Unit will be delivered either as a stand-alone Unit or as part of a group. This Unit will be delivered by an HPC registered clinical radiographer currently practicing in the appropriate clinical area and with recent experience of clinical assessment.

Assessment

It is recommended that the Outcomes within this Unit are assessed holistically through formative and summative Clinical Assessment. Candidates should be asked to assess patients' safety through the Patient Safety Questionnaire, to position and prepare the patient and equipment for the MRI scan, to produce images to diagnostic standards and to critically evaluate these images.

The evidence from these Clinical Assessments must demonstrate that all Evidence Requirements for each Learning Outcome are being met.

Higher National Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe anatomy, clinical history and potential pathologies associated with MRI scanning of the IAMs, lumbar spine or knees.

Knowledge and/or Skills

- ◆ Anatomy of the inner ear, lumbar spine and knee
- ◆ Clinical history indicating the need for MRI scanning
- ◆ Referral process for MRI scans
- ◆ Types of pathology diagnosed by MRI scanning

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ describe the bony and soft tissue anatomy of the inner ear, lumbar spine and knee
- ◆ evaluate the clinical indications and patient history and discuss why the referral for MRI scanning can be justified./accepted
- ◆ describe possible referral routes for individual examinations
- ◆ critically evaluate the request with regard to clinical information and differential diagnosis and implications for the patient
- ◆ describe the potential diagnoses and implications for the patients.

Assessment Guidelines

Outcomes 1–5 will be assessed as part of a Holistic Unit Assessment through Formative and Summative Clinical Assessment, which will be based on observation of clinical practice, discussion with mentor and reflection.

Higher National Unit specification: statement of standards (cont)

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

Outcome 2

Demonstrate knowledge of working safely in an MRI environment.

Knowledge and/or Skills

- ◆ Effect of a powerful magnetic field on ferromagnetic objects
- ◆ Effect of a radiofrequency field on ferromagnetic objects
- ◆ Types of implants, medical devices and other equipment that may be ferromagnetic
- ◆ Types of equipment that can be used in the MRI scanning room
- ◆ Patient MRI safety
- ◆ Staff and environment safety

Evidence Requirements

The candidate will be required to provide evidence that he/she has the Knowledge and Skills to work safely in the MRI scanning room:

- ◆ Describe the effect of a powerful magnetic field on ferromagnetic objects.
- ◆ Describe the heating effects of a radiofrequency field on ferromagnetic objects.
- ◆ State common types of implants, medical devices and other equipment that may be ferromagnetic.
- ◆ Describing types of equipment that can be used in the MRI scanning room.
- ◆ Undertake and critically evaluate each completed MRI safety checklist to ensure Safety Compliance in discussion with the supervising radiographer.
- ◆ Describe the current safety guidelines for staff and patients on undertaking MRI scans on pregnant patients, ensuring individual compliance in each examination.
- ◆ Demonstrate an understanding of a safe working environment.

Assessment Guidelines

Outcomes 1–5 will be assessed as part of a Holistic Unit Assessment through Formative and Summative Clinical Assessment, which will be based on observation of clinical practice, discussion with mentor and reflection.

Higher National Unit specification: statement of standards (cont)

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

Outcome 3

Describe the outline principles of the physics of MRI and how this produces the image.

Knowledge and/or Skills

- ◆ Basic principles of the physics of magnetic fields and the role of hydrogen atoms in producing the image
- ◆ Relaxation times linked to grey scales
- ◆ Basic principle of image formation
- ◆ Recognise the differences between the various weighted scans
- ◆ Understand why different scan sequences are used.

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ describe the basic principles of the physics of magnetic fields and the strength of the magnetic field used in MRI
- ◆ describe how the hydrogen atoms in the body align in the magnetic field, how they react to a radiofrequency pulse and how the time taken to return to their original state produces the grey scale image
- ◆ describe relaxation times T1 and T2
- ◆ describe the appearance of various body tissues on differently weighted scans
- ◆ describe how tissues are better demonstrated using specific scan sequences.

Assessment Guidelines

Outcomes 1–5 will be assessed as part of a Holistic Unit Assessment through Formative and Summative Clinical Assessment, which will be based on observation of clinical practice, discussion with mentor and reflection.

Higher National Unit specification: statement of standards (cont)

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

Outcome 4

Prepare the equipment for IAM, lumbar spine and knee examinations.

Knowledge and/or skills

- ◆ Why coils are required
- ◆ Types of coils for each examination
- ◆ Use of immobilisation devices
- ◆ Use and care of pads, sheets and other items regarding infection control issues
- ◆ Use of any ancillary equipment in MRI (oxygen, wheelchairs etc)
- ◆ Safe storage of equipment

Evidence Requirements

The candidate will be required to provide evidence that he/she has the knowledge and skills to:

- ◆ evaluate which coil should be used and discuss
- ◆ describe the different coils used and how they differ for each examination
- ◆ describe infection control issues when using multi-use equipment
- ◆ evaluate local storage measures, discuss and suggest improvement options
- ◆ discuss safety implications on any ancillary equipment which may be used in MRI.

Assessment Guidelines

Outcomes 1–5 will be assessed as part of a Holistic Unit Assessment through Formative and Summative Clinical Assessment, which will be based on observation of clinical practice, discussion with mentor and reflection.

Higher National Unit specification: statement of standards (cont)

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

Outcome 5

Undertake non-contrast MRI scans of IAMs, lumbar spines and knees to protocol.

Knowledge and/or skills

- ◆ Positioning of the patient in the MRI scanner using the appropriate coils
- ◆ Patient immobilisation
- ◆ Ear protection
- ◆ Diagnostic standards
- ◆ Image evaluation

Evidence Requirements

The candidate will be required to provide evidence that he/she has the knowledge and skills to:

- ◆ successfully complete non-contrast MRI scans of IAMs, lumbar spines and knees safely and to diagnostic standards, assessed by the Supervising Radiographer. They must demonstrate an understanding of the anatomy on the final images.

Assessment Guidelines

Outcomes 1–5 will be assessed as part of a Holistic Unit Assessment through Formative and Summative Clinical Assessment, which will be based on observation of clinical practice, discussion with mentor and reflection.

Candidates may be asked to discuss the technical aspects of the examination and carry out a reflective analysis of their own performance.

Higher National Unit specification: support notes

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

The Unit is designed to prepare and support candidates for the type of role they may adopt or progress to by giving them the essential underpinning knowledge and skills.

It is expected that candidates for this Unit will be currently working in diagnostic imaging services as Assistant Practitioners.

Whilst practical clinical training is essential, simulation and role play can be used to widen the practical experience in a safe and stress free environment. Additionally, knowledge can be enhanced through tutorials, discussions, guided reading and reflective practice.

The candidates will be trained under the supervision of Health Professions Council registered Radiographers and will be expected to gain competencies in undertaking MRI scans of the IAMs, lumbar spine and knees on a range of patients with varying degrees of mobility and clinical conditions. As a result, candidates are likely to be trained and assessed predominately with live case studies.

Candidates should be aware of additional annotation to their membership of the Society and College of Radiographers (SCoR) with clear information of the extension of their skill level.

Useful information to help with this Unit can be found at the following websites:

www.sor.org
www.rcr.ac.uk
www.BIR.ac.uk

and in the following professional journals:

Synergy: Imaging and Therapy Practice
Radiography
Clinical Radiology

Higher National Unit specification: support notes (cont)

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

Guidance on the delivery and assessment of this Unit

This Unit is aimed at those currently working under the supervision of Health Professions Council registered Radiographers as Assistant Practitioners within a diagnostic service

Initially, previous knowledge will need to be refreshed, particularly in the following areas:

- ◆ Control of Infection
- ◆ Moving and Handling
- ◆ Communication skills, verbal, non verbal and written
- ◆ Departmental Radiology Information System
- ◆ Departmental Standard Operating Protocols
- ◆ Policies on Confidentiality

The delivery of this Unit will be undertaken in the clinical setting by HPC registered radiographers, who are currently practicing in MRI scanning and have experience of undertaking clinical assessments, and will encompass practical in-house training, formative and summative clinical assessment. All 5 Outcomes of this Unit will be assessed through clinical practice with appropriate questions used by the Assessing Radiographer and recorded in the log book. It is expected that various degrees of clinical complexity will be documented within the log book to demonstrate a diverse learning experience. The log book will also include reflection on practice by the candidate and feedback from the assessor; this will culminate in a detailed pathway to the competence of the candidate.

While practical training is essential, simulation and role play can be used to widen the practical experience in a safe and stress free environment. Additionally, knowledge can be enhanced through tutorials, discussions, guided reading and reflective practice.

Candidates are expected to undertake self directed learning and are recommended to use the websites and journals listed above.

Outcome 1

Describe the anatomy, pathology and clinical criteria for MRI scanning.

The candidate should have the knowledge and skills to describe the bony and soft tissue anatomy demonstrated in MRI scanning of IAMs, lumbar spine and knees. There are various clinical conditions that require a patient to be referred for a MRI scan as opposed to other forms of imaging and the candidate should be aware of these and able to discuss the implications. MRI referrals can be made through various routes and depending on the referral route, different sequences of images need to be acquired, the candidate needs to be familiar with the referral routes and associated scan protocols. The candidate should be aware of potential pathologies identified by the scan and the implications and prognosis for the patient.

Higher National Unit specification: support notes (cont)

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

Outcome 2

Demonstrate knowledge of working safely in an MRI environment including patient safety checks.

MRI scanning utilizes strong magnetic fields, which have serious clinical contraindications and it is important that the candidate is aware of the dangers of taking patients and objects that are at risk into the MRI scanning room.

Candidates must understand that the 'pulling' effect of this powerful magnetic field can cause movement of ferromagnetic implants within the body including pacemakers, implantable cardioverter-defibrillators, cochlear implants, shrapnel, metal objects in the eye and surgical stents and implants.

The damage that can be caused to the patient and equipment must also be clearly identified. Ferromagnetic objects outwith the patient will physically be attracted to the magnet with considerable force including infusion pumps, external hearing aids, oxygen cylinders, fire extinguishers, non-compliant wheelchairs, trolleys, drip stands etc. This can be fatal if the patient is on the scanner and can cause substantial damage to the equipment. Additionally — service downtime to ramp down the magnet for removal and/or helium quench.

Equipment to be used within the area must be 'MRI compliant' (no iron content) and may be marked to clearly identify, eg taped blue and white — to ensure they are differentiated from non-compliant equipment.

Radiofrequency induction heating can cause burns, eg skin patches.

Safety checklists should be clearly understood and the number of checks understood. Although the Candidate would not determine the suitability of implants for MRI an awareness of the use of websites to check the MRI compatibility of specific devices should be made.

The principles of MRI safety can be discussed during formal and summative clinical assessments and the safety checklist mechanism demonstrated.

Outcome 3

Describe the outline principles of the physics of MRI and how this produces the image.

The candidate should be able to describe the basic physics of magnetism — a property of materials that respond at an atomic or subatomic level to an applied magnetic field. For example, the most well known form of magnetism is ferromagnetism. They should be able to describe why hydrogen atoms can be used to produce images in MRI. The influence of a strong magnetic field on the nucleus (net magnetization) should also be understood by the candidate.

Higher National Unit specification: support notes (cont)

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

They should be able to describe the alignment of the atoms within the magnetic field and the impact of introducing a pulsed radiofrequency. A broad understanding of the relationship between the 'relaxation' times and the variation in grey scales on the image.

The candidate should understand that different tissues have different T1 and T2 recovery rates (fat short, CSF long) and how this shows differentiation between them on the MRI images. The appearances of tissues on different scan sequences should be described with an understanding that the sequences are selected to maximize visualization of the areas of interest.

Outcome 4

Prepare the equipment for IAM, lumbar spine and knee examinations.

The candidate should be able to describe why coils are required in addition to the MRI scanner and give detailed information on why each examination may require a different type of coil.

MRI equipment is possibly the most expensive of all diagnostic radiology equipment and for this reason the candidate must be able to inform the assessor how coils are stored and what processes there are in place for safely storing them; this should detail why there is a need for good house-keeping as well as extended training for connecting items of equipment to the scanner. Discuss local process and procedures used in the 'home' setting.

The candidate should be able to detail all infection control issues regarding immobilisation devices and any other item of equipment which may be used for patient comfort during the process of the examination.

Having worked through this Unit the candidate should already be aware of essential ancillary equipment which may be used as part of the MRI process if a patient becomes ill. Detail what processes and procedures are in place for cardiac arrest and for patient transfers in the MRI Unit. Include in discussion aspects such as oxygen therapy and patient monitoring

Outcome 5

Undertake non-contrast MRI scans of IAMs, lumbar spines and knees to protocol.

The candidate should be able to perform a minimum of five non-contrast MRI scans of the IAMs, lumbar spines and knees, unprompted by the supervising radiographer. As part of the learning and assessing process the candidate should agree with the assessor the types of patients they want to be assessed with initially. Candidates need to demonstrate a clear understanding of patient positioning for each examination, especially for those patients who suffer from claustrophobia and or injury. Increasing degrees of difficulty should be attempted but in discussion and agreement with assessor. Use of differing coils should be discussed, explaining what additional immobilisation is required and why. Specific emphasis should be made regarding safety processes prior to, and during the scan.

Higher National Unit specification: support notes (cont)

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Upon completion of the acquisition of the scans the candidate should evaluate the image and be able to discuss with the assessing radiographer whether images are of suitable diagnostic value to be reported and whether there is any form of artefact which may render the image useless.

The supervising radiographer needs to be assured that the candidate has followed all local safety procedures to ensure a safe Outcome.

It may be useful to position the Candidate in the MRI scanner to instill an understanding of the environment that can be claustrophobic to some patients.

Candidates may be asked to discuss the technical aspects of the examination and carry out a reflective analysis of their own performance.

Assessment

The practical element of the Unit should commence with the candidate observing the Radiographers undertaking non-contrast MRI scans of the IAMs, lumbar spine and knees with post-examination discussion including evaluation of the image. This could be followed by some examination simulation so that the candidate has time to analyse and reflect on the experience and discuss with the Radiographer.

Formatively, this could then be applied practically, through Clinical Assessment, with cases selected by the Supervising Radiographer. It is expected that the patients will be fairly mobile and that no additional demands are required of the Assistant Practitioner. The Formative Clinical Assessments should be used to allow the candidate to reflect on their performance during an examination and can be used to direct the candidate towards a level of confidence for initiating the summative clinical assessments. This must be agreed by both the candidate and the Supervising Radiographer.

Although the Supervising Radiographer will check the final images, the Assistant Practitioner must be able to recognise good and substandard techniques in a comprehensive way and also assess the Outcome.

The number of Clinical Assessments completed is not critical but the candidate must demonstrate that they can work unassisted to the protocols agreed. Additionally, the candidate themselves must indicate that they feel confident in performing these examinations: if they require further summative Clinical Assessments, these will be continued until such time as the Candidate is satisfied with their own performance.

Open learning

Not applicable.

Higher National Unit specification: support notes (cont)

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Opportunities for developing Core Skills

There are no opportunities to develop Core Skills in this Unit.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

History of changes to Unit

Version	Description of change	Date

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General information for candidates

Unit title: Radiography: Magnetic Resonance Imaging (MRI) Non-Contrast Scans of Internal Auditory Meati (IAMs), Lumbar Spines and Knees for Assistant Practitioners

This Unit is designed to train and support Assistant Practitioners, working clinically in a diagnostic service, to undertake non-contrast MRI scanning of the IAMs, lumbar spine and knees.

MRI scanners use strong magnetic fields to produce the image, therefore, an understanding of the dangers and Health and Safety issues involved are key.

The candidate is required to gain competencies in undertaking MRI scans of IAMs lumbar spines and knees, on a range of patients with various degrees of mobility and clinical conditions.

MRI scanners, accessories and computing software, will be covered to ensure the candidate has a thorough knowledge and understanding of the equipment they may be expected to utilise in clinical practice.

The delivery of the Unit will be undertaken in the workplace (it is not College-based) through the Departmental staff (this may include Radiographers, Radiologists and other staff as appropriate) and will encompass practical in-house training and formative and summative clinical assessments by Radiographers registered with the Health Professions Council. All Outcomes of the Unit will be assessed through Clinical Practice with appropriate questions used by the Assessing Radiographer and recorded in a log book. The log book will also include reflection on practice by the candidate and feedback from the observer and this will culminate in a detailed pathway to competence by the candidate.

Whilst practical clinical training is essential, simulation and role-play may be used to widen the practical experience in a safe and stress-free environment. Additionally, knowledge may be enhanced through tutorials, discussions, guided reading and reflective practice.

It may be useful to position the Candidate in the MRI scanner to instill an understanding of the environment that can be claustrophobic to some patients.

Candidates are expected to undertake self-directed learning and can use the web-sites and journals listed below.

The principles of safe practice with respect to Manual Handling, Health and Safety and Infection Control will be revisited and refreshed with specific reference to the patient undergoing an MRI scan. Additionally, the key principles of effective communication will be reinforced with specific reflection to the scenarios that the candidate experiences throughout their Formative Clinical Assessments to enable functional communication for the Summative Clinical Assessments

General information for candidates (cont)

Useful information to help with this Unit can be found at the following web-sites:

www.sor.org (Society and College of Radiographers)

www.BIR.ac.uk (British Institute of Radiology)

and in the following professional journals:

Synergy: Imaging and Therapy Radiography
Radiography
Clinical Radiology