



The radiologist and nuclear medicine

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Purpose

This paper addresses the specific issues related to radiologists working in a nuclear medicine environment. The range of radiologist input varies from ad hoc sessional reporting (for example, one-hour session per day) to committed direct clinical care (DCC) activity within a formal job plan. The purpose of this document is to guide members and Fellows of The Royal College of Radiologists (RCR), clinical and medical directors and regional specialty advisers in job planning and at appointment committees.

1 Clarification on legislative aspects

- The Ionising Radiation (Medical Exposure) Regulations 2017 and the Ionising Radiation (Medical Exposure) Regulations (Northern Ireland) 2018 (IR(ME)R) require practitioners to hold a licence so they may justify exposures involving the administration of radioactive materials.^{1,2} Applications for practitioner licences are assessed by the Administration of Radioactive Substances Advisory Committee (ARSAC), which has published guidance on the qualifications and experience expected of a practitioner.³ The degree of training required by a practitioner will vary with the nature of the procedures to be undertaken.
- Practitioners who wish to apply for a licence for a comprehensive diagnostic nuclear medicine imaging service should have satisfactorily completed a nuclear medicine training programme or a clinical radiology training programme with special interest training in radionuclide radiology (RNR) or be able to demonstrate an equivalent level of training.
- Doctors with General Medical Council specialist registration in nuclear medicine can normally expect to receive a licence that includes the majority of diagnostic nuclear medicine procedures (imaging and non-imaging) and unsealed source therapy procedures.
- Those who have successfully completed training in RNR can normally expect to be licensed for the routine diagnostic nuclear medicine procedures (imaging and non-imaging).
- Practitioners who wish to apply for a licence including therapy procedures should have completed a nuclear medicine programme (including entry from RNR) or a clinical oncology training programme.
- Practitioners who wish to justify exposures as part of a positron emission tomography-computed tomography (PET-CT) service will require training and experience additional to that required for conventional nuclear medicine procedures. Such practitioners should already hold a licence for a comprehensive range of nuclear medicine procedures.
- For those undertaking structured training programmes leading to specialist registration in nuclear medicine or clinical radiology (with radionuclide special interest training), an application for a licence for routine diagnostic PET-CT procedures is usually successful following completion of training.
- For those who have not undergone structured training that included PET-CT, additional post-qualification training and experience will be needed (see below).
- IR(ME)R states that reporting of images is an operator task. Reporting requires 'entitlement' from the employer within a protocol agreed with a licensed practitioner; therefore, a practitioner licence is not required for reporting. Individuals who do not hold a practitioner licence can report conventional nuclear medicine procedures and PET-CT scans if they are entitled to do so by their employer. The reporter must be suitably trained and experienced, and there must be appropriate clinical governance arrangements for audit of reporting and learning from discrepancies. Entitlement will depend on adequate training and should be defined in an individual's scope of practice. Maintenance of competence will require sufficient volumes of scans to be reported annually.
- To deliver an RNR service a site will require both an employer licence and a practitioner licence. These are issued by the licensing authorities after assessment by ARSAC.

2 Guidance

Detailed guidance already exists from the Royal College of Physicians (RCP) regarding all consultants who undertake substantial commitments within nuclear medicine departments.⁴ The following guidance is designed for radiology consultants working in smaller departments who have flexible commitments to nuclear medicine and those involved in larger departments that provide a wider range of services fuelled by the rapid growth in hybrid imaging (single-photon emission tomography-computed tomography [SPECT-CT], PET-CT and photon emission tomography-magnetic resonance [PET-MR]), nuclear cardiology and to a lesser extent radionuclide therapy. More detailed guidance on PET-CT is also available.⁵

These recommendations and guidance will be of value for appointment committees where there is a requirement for nuclear medicine service provision. Medical directors and clinical directors may also wish to use this guidance to develop job descriptions and job plans including dedicated nuclear medicine sessions where deemed suitable for the needs of the employer.

Radionuclide radiology specialty

RNR involves the practice of nuclear medicine combined with the interpretation of anatomical imaging. The advent of PET-CT, PET-MR and SPECT-CT require specialist interpretation and training. In addition, the role of radionuclide therapy is increasing; for example, selective internal radiotherapy with yttrium-90 microspheres for patients with inoperable liver metastases. The imaging aspects of radionuclide therapy are complex and mandate proper training and experience.⁶

The sessional radiologist

Many district general hospital departments undertaking radionuclide imaging procedures have a radiologist with a practitioner licence who justifies referrals and carries out reporting in a flexible fashion. Their job plans need to recognise the time taken in the attendant administration involved in nuclear medicine as well as the time for reporting. New appointees should have undertaken special interest training in RNR, or its equivalent.

The radiologist in a smaller, single-camera department

Many departments working at this level will be undertaking a mix of procedures in the range of 800–1,500 per year.⁴ This commitment should be recognised in the form of flexible DCC sessions; for example, combining with other reporting so that when service commitments increase this can be translated into formal sessions in a more specialist job plan. These sessions should include not only time for the reporting of studies but also for justifying and supervising investigations.

The radiologist in a larger, single-camera department

Radiologists in this category will be undertaking around 1,500–2,400 examinations per year, which is the recommended guideline for a single gamma camera.⁴ It is recommended that they have a minimum of two to three sessions of DCC and some supporting professional activity (SPA) related to radionuclide imaging. There should be a lead radionuclide radiologist with formal sessional allocation. Often, workload is divided among multiple licensed practitioners.

The radiologist in a twin-camera department

A formal structured job plan should be in place reflecting the precise nature of the studies, such as dedicated cardiac sessions. The radiologist may be involved in reporting PET-CT examinations and current college (RCP/RCR) guidelines should be implemented.⁵ Such departments will be carrying out in the region of 3,000–4,000 examinations per year and typically have a lead radiologist accredited in RNR.⁴

The radiologist in a large department

Activities will often be more than 4,800 patients per year with three cameras.⁴ These departments usually have an established nuclear cardiology facility and undertake SPECT-CT and PET-CT reporting. There may be a significant requirement for attendance at cancer multidisciplinary team meetings to provide specialist input on PET-CT and radionuclide therapy. Job plans for these consultants may follow the guidance for nuclear medicine physician job plans more closely.

Radionuclide radiologists can undertake the imaging component of the workload, but these departments often also require one or more dual-trained consultant(s) or nuclear medicine physician(s) if a comprehensive service including therapy is to be undertaken. New appointees should ideally have the breadth of training and experience associated with that provided by nuclear medicine physician training, or dual training in radiology and nuclear medicine or its equivalent. Departments with radionuclide radiologists, but without a consultant with suitable training in radionuclide therapy, can establish a collaborative working practice with colleagues in endocrinology and clinical oncology to provide a comprehensive therapy service.

Clinical networks

The presence of a 'hub-and-spoke' model facilitates the exchange of clinical expertise across a number of departments. This method of working can be particularly valuable in providing support, in terms of supervision by a licensed practitioner and reporting for more specialist nuclear medicine studies. Teleradiology allows such image exchange.

Pathway for an existing consultant radiologist to achieve a practitioner licence

The expected education and experience of an ARSAC practitioner licence holder

An existing consultant radiologist will need to demonstrate basic science, including radiochemistry and additional medical physics knowledge relevant to the practice of RNR. They will require evidence of reporting a significant body of radionuclide studies. For a full licence about 3,000 examinations is often the expected volume. This will include all or some of the following, depending on the breadth of licence required: *in vitro* studies, planar, SPECT, SPECT-CT and PET-CT investigations. One-third of these cases could be library cases. At least one-third should be first reported cases that are then second reported by another licensed practitioner. The remaining cases could be reported by the training radiologist under indirect supervision. Experience should not be limited to reporting alone and should include active involvement in protocol development, participation in patient selection, patient preparation and procedure justification, participation in multidisciplinary team meetings, reporting and, within the nuclear medicine facility, day-to-day running of the service and training in radiopharmaceutical administration.

Engaging in RNR continuing professional development (CPD) is expected and membership of the British Nuclear Medicine Society is recommended. This CPD will need to include the full range of expected practice (for example SPECT-CT and PET-CT).

Example training pathway

The training required for a full diagnostic practitioner licence should not be underestimated. It usually takes at least one year for radiology specialist trainees but this can potentially be reduced due to the ability of a consultant to gain the competencies more rapidly with their broader clinical experience and enhanced reporting skills. The local service requirements should be considered and if only a limited number of studies are performed then the training may be tailored to fit this. That said, a licence for PET-CT in isolation is not generally considered appropriate. This training could be undertaken on a pro rata part-time basis over a longer period. It generally takes two years (of 50% nuclear medicine [NM] training) to gain adequate knowledge and experience in general NM and PET/CT.

Training can be undertaken in the consultant's base hospital with a visiting mentor (who would be an existing consultant practising nuclear medicine/radionuclide radiology) or by attending another centre. If the mentored route is taken, some time, ideally in a block, should be spent in a regional centre.

The radiologist may require extra medical physics teaching. Please see the RCR guidance on training in RNR for more details.⁷

During additional training, individuals should document the training undertaken to include the number of procedures and their level of involvement. Good documentation is essential to ensure that the required information can be provided on the practitioner licence application form. The form can be used as a guide.

Standards

IR(ME)R requires that all procedures are carried out in accordance with written procedures and protocols, and these are usually derived from national (British Nuclear Medicine Society [BNMS]), European or American guidelines.⁸⁻¹⁰

Single-handed specialists working independently cannot easily fulfil the requirements of clinical governance. A minimum of 0.4 whole-time consultant overlap within single-handed practices is encouraged to avoid clinical isolation. In some cases, this may be achieved by ensuring that the practitioner rotates to another unit as part of their weekly commitment or another practitioner rotates in to the unit if that is more appropriate to the caseload. Collaborative links with larger regional centres offers a means of sharing experience and opinions between departments and facilitates a wider audit of performance than is possible in a single smaller department.⁴ This could theoretically involve teleradiology depending on individual circumstances.

Continuing professional development (CPD)

Radiologists should ensure that they undertake CPD accreditation in proportion to the nuclear medicine activities they supervise and report.

Radiation protection

The requirement for licensing of practitioners does not apply to other medical exposures (for example CT imaging) and is unique to those exposures involving the administration of radioactive substances. This, and practitioners' expertise in radiation protection, often requires their participation on committees such as radiation protection and research ethics.⁴

Workforce requirements

The workload of radiologists involved in the provision of radionuclide imaging and nuclear medicine covers a broad spectrum, ranging from reporting and, in multidisciplinary team meetings, providing specialist input on interpretation of radionuclide imaging, managing departments, overseeing service development, and in some cases directing radionuclide therapy. Adequate time must be incorporated into the job plan for correlative imaging. Workload estimates must balance the time element required for procedures grouped by type and allow for variations between consultants. Guidance from the RCR on reporting workload provides indicative modality-based figures for reporting activity per hour.¹¹

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