

4. The Second, Third and Fourth Years

During the second, third and fourth years of training, trainees should receive structured training in all the constituent subspecialties of clinical radiology. The phrase "fourth year of training" is not meant to be taken literally. The fourth and fifth years of training will incorporate twelve months devoted training for one or two subspecialties for those who wish to declare a specific subspecialty interest (or interests). Although this twelve-month period will usually comprise the fifth year of training, it can be distributed in a modular fashion through the fourth and fifth years.

By the end of the fourth year a trainee will usually have had the opportunity to pass the Final FFR examination. This examination provides evidence of competence as a result of broad basic training in clinical radiology, prior to further subspecialty training.

During the first three years of training, individual trainees will have had the opportunity to assess their aptitude for, and interest in, the various subspecialties, so that they are in a position to decide the most appropriate areas on which to focus their training in the fifth year.

4.1 Overview

4.1.1 The framework for the second, third and fourth years will consist of rotations which should give appropriate experience in the areas identified below.

- System-based subspecialties:
 - vascular imaging;
 - cardiac imaging;
 - chest imaging;
 - ENT/dental imaging;
 - breast imaging;
 - musculoskeletal imaging;
 - gastrointestinal imaging;
 - urology;
 - obstetric & gynaecological imaging;
 - neuroradiology.

- Technique-based subspecialties:
 - conventional radiology;
 - ultrasound;
 - radionuclide radiology;
 - computed tomography;
 - magnetic resonance;
 - interventional radiology (including angiography and minimal access therapy).

- Disease-based subspecialties:
 - oncological imaging;
 - trauma imaging.

- Age-based subspecialty:
- paediatric imaging.

4.1.2 In many training schemes it will be possible for trainees to receive training in more than one subspecialty at the same time, and there may also be opportunities to link certain subspecialties (e.g. computed tomography and oncological imaging). Because of the complexities of such rotations and the inherent differences between different training schemes, the Faculty leaves it to individual training centres to determine the order of rotations and their duration.

4.1.3. Each trainee will participate in an appropriate on-call rota in which he/she will be responsible to a named consultant. This should commence before the end of the second year of training.

4.2 Clinical Skills

4.2.1 The following sections delineate the core knowledge that will be acquired during the second, third and fourth year rotations. Where an optional category is given, practical experience is not essential but a theoretical knowledge is still required.

4.2.2 Each component of the training programme will have a clearly defined structure for the supervision of the trainee by senior colleagues (trainers), and there will be a named consultant who will assume overall responsibility for the training given during that period, including the techniques performed and reports issued by the trainee.

4.2.3 Conventional radiology

Core

- secure knowledge of the current legislation regarding radiation protection
- participation in reporting plain radiographs which are taken during the general throughput of the normal working day of a Department of Clinical Radiology
- performing of any routine radiological procedures that might be booked during a normal working day.

4.2.4 Vascular

(a) Arterial

Core

- consolidation of knowledge of vascular anatomy and clinical practice relevant to clinical radiology
- reporting of plain radiographs relevant to cardiovascular disease

- familiarity with the indications, contraindications, pre-procedure preparation (including informed consent), patient monitoring during procedures and post-procedure patient care
- familiarity with procedure and post-procedure complications and their management
- practical experience of femoral artery puncture technique, and the introduction of guide wires and catheters into the arterial system
- performing and reporting of the following procedures:
 - lower limb angiography
 - arch aortogram
 - abdominal aortogram
 - selective angiography (e.g. hepatic, renal, visceral)

Optional

- pulmonary angiography
- alternative arterial access (e.g. brachial, axillary puncture)

(b) Venous

Core

- performing and reporting of lower limb venography (contrast or ultrasound)

Optional

- portal venogram
- upper limb venogram
- superior vena cavogram
- inferior vena cavogram

(c) Interventional

Core

- familiarity with the indications, contraindications, pre-procedure preparation (including informed consent), patient monitoring during the procedure and post-procedure patient care
- familiarity with procedure and post-procedure complications and their management
- practical experience of the introduction systems, guide wires and catheters required
- assistance in the performing of the following procedures:
 - femoral angioplasty
 - iliac angioplasty

Optional

- renal angioplasty
- embolisation
- thrombolysis

- stenting
- filter insertion

(d) Other vascular imaging techniques

Core

- familiarity with the appropriate applications of the following techniques:
 - ultrasound (including Doppler)
 - intravenous digital subtraction angiography
 - computed tomography and CT angiography
 - magnetic resonance imaging and magnetic resonance angiography

4.2.5 Cardiac

Core

- knowledge of cardiac anatomy and clinical practice relevant to clinical radiology
- reporting of plain radiographs performed to show cardiac disease
- observation of the technique of echocardiography
- familiarity with the application of the following techniques:
 - echocardiography (including transoesophageal)
 - radionuclide imaging
 - computed tomography
 - magnetic resonance imaging
 - angiography

Optional

- observation of coronary angiography and other cardiac angiographic and interventional procedures
- practical experience in echocardiography

4.2.6 Chest

Core

- knowledge of respiratory anatomy and clinical practice relevant to clinical radiology
- reporting of plain radiographs performed to show chest disease
- experience in the application of radionuclide radiology to chest pathology with particular experience of reporting radionuclide lung scintigrams
- experience in performing and reporting computed tomography of the chest, including high-resolution examinations
- observation of the technique of image-guided biopsy of chest lesions
- empyema drainage

Optional

- bronchial stenting

4.2.7 ENT

Core

- knowledge of ENT anatomy and clinical practice relevant to clinical radiology
- reporting of plain radiographs performed to show ENT disease
- practical experience of relevant contrast examinations (e.g. barium studies, sialography)
- experience of performing and reporting computed tomography in ENT problems
- experience of performing and reporting magnetic resonance in ENT problems
- awareness of the proper application of other imaging techniques to this specialty (e.g. ultrasound)
- video swallows

4.2.8 Breast

Core

- understanding of the principles of current practice in breast imaging and breast cancer screening
- knowledge of breast pathology and clinical practice relevant to clinical radiology
- observing mammographic reporting sessions (screening and symptomatic)
- attendance of breast assessment clinics
- awareness of the proper application of other imaging techniques to this speciality (e.g. ultrasound, magnetic resonance imaging)
- observation of breast biopsy and localisation techniques

4.2.9 Musculoskeletal

Core

- knowledge of musculoskeletal anatomy and current clinical practice relevant to clinical radiology
- reporting of plain radiographs relevant to the diagnosis of disorders of the musculoskeletal system
- practical experience of the relevant contrast examinations (e.g. arthrography)
- experience in reporting radionuclide images of the musculoskeletal system, particularly skeletal scintigrams
- experience in performing and reporting computed tomography of the

- musculoskeletal system
- experience in performing and reporting magnetic resonance images of the musculoskeletal system
- experience in performing and reporting ultrasound of the musculoskeletal system
- Optional
- observation of discography and facet injections
- observation of techniques for image-guided bone biopsy

4.2.10 Gastrointestinal (including liver, pancreas and spleen)

Core

- knowledge of gastrointestinal anatomy and clinical practice relevant to clinical radiology
- reporting of plain radiographs performed to show gastrointestinal disease
- practical experience of the following:
 - barium swallow and meal
 - small bowel barium studies
 - barium enema
- practical experience in the following contrast medium studies:
 - cholangiography (T-tube, percutaneous)
 - sinogram
 - stomagram
- practical experience in the application of transabdominal ultrasound imaging to the gastrointestinal system
- familiarity with the current application of radionuclide imaging to the gastrointestinal tract in the following areas:
 - liver
 - biliary system
 - gastrointestinal bleeding (including Meckel's diverticulum)
 - abscess location
 - assessment of inflammatory bowel disease
- experience of performing and reporting computed tomography of the gastrointestinal system
- awareness of the application of angiography and vascular interventional techniques to this subspecialty
- familiarity with the relevant application of the following interventional procedures:
 - percutaneous biliary stenting
 - ultrasound-guided biopsy and drainage
 - computed tomography-guided biopsy and drainage
 - balloon dilatation of the oesophagus/stent insertion
- GI video studies
- the following contrast medium studies:
 - proctogram
 - pouchogram
 - sinogram

- magnetic resonance imaging applied to the gastrointestinal system

Optional

techniques

- observation of ERCP and other diagnostic and therapeutic endoscopic techniques

- endoluminal ultrasound
- observation of percutaneous gastrostomy

4.2.11 Uroradiology

Core

radiology

- knowledge of urinary tract anatomy and clinical practice relevant to clinical radiology

- reporting of plain radiographs performed to show urinary tract disease
- experience of performing and reporting the following contrast medium studies:

studies:

- intravenous urogram
- retrograde pyelo-ureterography
- loopogram
- nephrostogram
- ascending urethrogram
- micturating cysto-urethrogram
- awareness of the application of angiography and vascular interventional techniques

performing:

- practical experience in percutaneous renal puncture as a prelude to performing:
- antegrade pyelo-ureterography
- nephrostomy
- familiarity with the current application of radionuclide imaging to urinary tract imaging in the following areas:

- kidney
- renal function
- vesico-ureteric reflux

- practical experience in the application of transabdominal ultrasound to imaging the urinary tract

tract

- experience in performing and reporting computed tomography of the urinary tract

- observation of the following techniques:

- urodynamics
- percutaneous ureteric stent placement
- percutaneous nephrolithotomy
- lithotripsy
- endorectal ultrasound
- magnetic resonance imaging applied to the urinary tract

4.2.12 Obstetrics and Gynaecology

Core

- knowledge of obstetric and gynaecological anatomy and clinical practice relevant to

clinical radiology

- reporting of plain radiographs performed to show obstetric and gynaecological disorders
- practical experience of the application of transabdominal and endovaginal ultrasound in:
 - obstetrics
 - gynaecology
- experience in performing and reporting computed tomography in gynaecological disorders, and to be aware of obstetric applications (e.g. assessing pelvic dimensions)
- awareness of the applications of angiography and vascular interventional techniques
- hysterosalpingogram
- magnetic resonance imaging applied to gynaecological disorders

4.2.13 Neuroradiology

Core

- knowledge of neuroanatomy and clinical practice relevant to neuroradiology
- reporting of plain radiographs in the investigation of neurological disorders
- experience in performing and reporting cranial and spinal computed tomography
- experience in performing and reporting cranial and spinal magnetic resonance imaging
- familiarity with the applications of radionuclide radiology to neuroimaging
- observation and reporting of cerebral angiograms
- familiarity with the applications of magnetic resonance angiography in imaging the cerebral vascular system
- observation of transcranial and carotid ultrasound including Doppler

Optional

- experience in performing and reporting myelograms
- performing of cerebral angiograms
- observation of interventional neuroradiological procedures
- observation of magnetic resonance spectroscopy

4.2.14 Ultrasound

Core

- knowledge of the technical aspects of ultrasound relevant to optimising image quality
- knowledge of the relevant cross-sectional anatomy as visualised on ultrasound
- practical experience in performing transabdominal ultrasound examination of structures in the following anatomical areas:
 - upper abdomen (including lower chest)
 - pelvis (non-obstetric)
 - general abdomen (including vessels)

- small parts (scrotum, thyroid, neck structures)
- obstetric
- familiarity with the practical applications of Doppler ultrasound imaging (e.g. leg veins, portal vein, carotid artery)
- practical experience in ultrasound-guided interventional procedures (e.g. biopsy and drainage)
- observation of the technique of echocardiography
- observation of ultrasound of the breast
- observation of ultrasound of the musculoskeletal systems

Optional

- observation of endoluminal ultrasound
- observation of ultrasound of the eye

4.2.15 Radionuclide radiology

Core

- secure knowledge of the relevant aspects of current legislation regarding the administration of radiopharmaceuticals
- knowledge of the technical aspects of radionuclide radiology relevant to optimising image quality
- knowledge of radiopharmaceuticals currently available for the purposes of imaging organs and locating inflammatory collections, tumours and sites of haemorrhage

A full curriculum is published in the appendix to this document. The objective is to give the trainee sufficient knowledge to understand the principles and indications of common radionuclide techniques and how these relate to other imaging modalities, in particular:

- knowledge of radionuclide imaging of the following topics:
 - skeletal disease
 - lung disease
 - gastroenterology and hepato-biliary disease
 - nephro-urology
 - endocrinology
 - oncology
- experience of reporting as many radionuclide imaging investigations as possible

NB: ideally the training in radionuclide radiology should take place during a radionuclide imaging attachment, but it may occur in part or wholly during a system-based attachment.

4.2.16 Computed tomography

Core

- knowledge of the technical aspects of performing computed tomography, including the use of contrast media
- knowledge of the relevant cross-sectional anatomy as visualised on computed tomography
- practical experience in performing and reporting computed tomography in the following anatomical sites:
 - brain, head and neck
 - chest
 - abdomen and pelvis
 - musculoskeletal

NB: these examinations may be performed during a system-based attachment, e.g. neuroradiology, or during a computed tomography attachment.

- practical experience in performing computed tomography-guided procedures, e.g. biopsy and drainage

4.2.17 Magnetic resonance

Core

- understanding of current advice regarding the safety aspects of magnetic resonance imaging
- knowledge of the basic physical principles of magnetic resonance imaging, including the use of contrast media
- knowledge of the relevant cross-sectional anatomy in orthogonal planes, and the appearance of normal structures on different pulse sequences
- experience in performing and reporting magnetic resonance imaging of the following anatomical sites:
 - brain
 - musculoskeletal

NB: this experience may have been gained during a system-based attachment, or during a magnetic resonance attachment.

- experience of magnetic resonance imaging in the following anatomical sites:
 - head and neck
 - musculoskeletal system (e.g. hips, knees and shoulders, and extremities)
 - cardiovascular system
 - abdomen and pelvis

Optional

- observation of magnetic resonance spectroscopy

4.2.18 Interventional

Core

- familiarity with the equipment and techniques used in vascular, biliary, and renal interventional techniques
 - familiarity with the indications, contraindications, pre-procedure preparation (including informed consent), patient monitoring during the procedure and post-procedure patient care
 - familiarity with procedure and post-procedure complications and their management
 - assistance in the performance of the following interventional procedures:
 - femoral angioplasty
 - iliac angioplasty
 - performing of nephrostomies
 - practical experience of ultrasound-guided interventional procedures (e.g. biopsy and drainage)
 - practical experience of computed tomography-guided interventional procedures (e.g. biopsy and drainage)
- Optional
- observation of the spectrum of interventional procedures currently performed in the following systems:
 - vascular system (including neurovascular)
 - urinary system
 - biliary system
 - gastrointestinal system musculoskeletal system

4.2.19 Oncology

Core

- knowledge of clinical practice relevant to clinical radiology
- familiarity with tumour staging nomenclature
- reporting of plain radiographs performed to assess tumours
- practical experience in transabdominal ultrasound, radionuclide imaging, computed tomography and magnetic resonance imaging and angiography, and interventional techniques in oncological staging, and monitoring the response of tumours to therapy
- familiarity with the radiological manifestations of complications which may occur in tumour management

4.2.20 Trauma

Core

- knowledge of current clinical practice relevant to clinical radiology
- knowledge of anatomical variants and normal anatomy which may mimic trauma
- reporting of plain radiographs performed to show trauma
- awareness of the proper application of other imaging techniques (e.g. computed tomography) to this subspecialty

4.2.21 Paediatric

Core

- knowledge of paediatric anatomy and clinical practice relevant to clinical radiology
- knowledge of disease entities specific to the paediatric age group and their clinical manifestations relevant to clinical radiology
- reporting of plain radiographs performed in the investigation of paediatric disorders
- practical experience in performing ultrasound in the paediatric age group in the following areas:
 - transabdominal
 - neonatal head
 - hips
- practical experience of routine fluoroscopic procedures in the paediatric age group, particularly:
 - contrast studies of the urinary tract
 - contrast studies of the gastrointestinal system
- familiarity with the practical management of the following paediatric emergencies:
 - neonatal gastrointestinal obstruction
 - intussusception
- practical experience in computed tomography and magnetic resonance imaging

- 4.3 The trainee will also attain an appropriate level of knowledge in:
- clinical conditions in which radiology has a role in diagnosis and/or treatment;
 - applied pathology and physiology where it contributes to a better understanding of radiological signs and methods of investigation;
 - those aspects of clinical medicine and pathology which are essential to the safe and effective conduct of interventional procedures;
 - current trends and recent advances in clinical radiology;
 - statistics and research methods.

4.4 The trainee will develop skills, as part of his/her general professional development, in:

- teaching;
- research;
- clinical audit;
- management (see Section 4.4.1 below);
- clinical standards;
- quality standards;
- communication with patients and colleagues;
- information technology and computer literacy;
- medical ethics;
- time management;
- self-awareness
- handling uncertainty;
- teamwork.

These aspects of training will require attendance at in-house and/or external meetings and courses at appropriate periods during training.

4.4.1 The necessary management skills fall under the following headings:

- contextual awareness-understanding the bigger picture and developing an ability to operate effectively at all appropriate levels in the Irish Health Care System;
- strategic thinking;
- functional and operational skills, and knowledge of the day-to-day operation of radiology and other health care units.

4.5 There will be annual assessments of all trainees as outlined in Section 2.8. These will aim to:

- verify experience and competence gained during the preceding year;
- ensure that set targets have been met;
- review clinical, technical and general professional development skills (listed in Section 4.4) - the use of standardised log books (Section 2.7) will facilitate this review;
- identify any deficiencies in expected knowledge or experience so that these may be remedied in the ensuing year;
- set targets for the forthcoming year;
- offer career guidance and counselling as appropriate.

The assessment should be formalised and completed jointly by the trainee and local and overall education co-ordinator with a copy of the assessment being reviewed at the education sub-committee.

4.6 At the end of the fourth year the trainee should:

- have substantial experience of interpreting and reporting plain radiographs in all subspecialties
- have acquired experience of performing and reporting all core procedures as defined in Sections 4.2.3 - 4.2.21;
- be able to advise clinicians on appropriate imaging algorithms for the investigation of standard clinical situations, e.g. jaundice;
- be able to perform and give a provisional interpretation of standard emergency imaging procedures, e.g. cranial computed tomography, transabdominal ultrasound, transfemoral aortography, intravenous urogram and contrast examination of the gastrointestinal tract;
- have attempted the Final FFR examination;
- have formulated a preference for their training in the fifth year (see Section 5.1.1).

4.7 The possible outcome of the assessments at the end of the second, third and fourth years will be:

- Progress into the next year of training.
- Conditional Progress into the next year of training. A specific action plan will be formulated with the trainee at the assessment to redress deficiencies in performance. Progress will be reassessed as appropriate within the next year of training.
- Fail, if the trainee is so far short of achieving the objectives of the previous year's training programme. This will only happen in exceptional circumstances, and only after consultation between the Departmental Chairman, Education Co-Ordinators and Education Sub-Committee. The precise course of action will be formulated by this Group and will depend on the individual situation, but will range from the trainee's repeating his/her training in the areas judged to be severely deficient, to the recommendation that the trainee's contract is not renewed