



Clinical  
Radiology

The Royal College of Radiologists

# Interventional Radiology Specialty Training Curriculum

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## 1 Introduction

### 1.1 The purpose of the curriculum

**The interventional radiology curriculum expands on the diagnostic training in the clinical radiology curriculum and assumes that trainees will meet the generic and specialty-specific capabilities in practice (CiPs 1-12) outlined in the clinical radiology curriculum.**

It aims to meet patient and service need by ensuring that trainees develop the capabilities necessary to sub-specialise in general interventional radiology or diagnostic and interventional neuroradiology. The curriculum provides a training framework, describing the standard required to achieve sub-specialty CCT and the expected levels of progress at critical progression points during higher training.

Interventional radiology is the sub-specialty encompassing the diagnosis, investigation and image guided therapeutic management of a wide range of conditions. Patients are referred to interventional radiologists for assistance in diagnosis, deciding on the best management of a patient's condition and for image guided, minimally invasive, procedures where this is judged the best treatment option. Interventional radiology and interventional neuroradiology services are provided 24 hours a day. Interventional radiologists provide support for major trauma, gastrointestinal and obstetric haemorrhage in addition to management of haemorrhage in other territories, control of sepsis and relief of life or limb threatening vascular occlusion and other luminal obstruction. Interventional neuroradiologists provide support for neurovascular emergencies including stroke.

The interventional radiology curriculum builds on the diagnostic training in the clinical radiology curriculum, which includes the use and interpretation of all imaging modalities. Interventional radiologists are also trained in a range of minimally invasive techniques which rely on the use of radiological image guidance to precisely target therapy within the body. Interventional radiology techniques are now utilised in almost all branches of hospital medicine, providing life saving care both in and out of hours.

Interventional radiologists operate in and across a wide number of settings from more general roles in small acute hospitals to providing specialised services in tertiary centres. The curriculum aims to produce interventional radiologists who are appropriately trained but also flexible and adaptable enough to ensure essential emergency cover is available for the whole population, e.g. via networks when appropriate.

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### 1.2 The need for the curriculum

The clinical radiology curriculum has been developed in response to patient, population, professional, workforce and service needs.

Interventional radiology plays a pivotal role in diagnosis and treatment of emergency conditions, with the reduced risks of minimally invasive techniques improving patient outcomes and reducing length of stay. The use of minimally invasive techniques serves patient need by providing less pain, less recovery time and often lower risk in comparison to open surgery.

Patients also require access to non-acute services, such as angioplasty, stenting and treatment of vascular malformations. Interventional radiology also supports cancer services,

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for example by performing lung, liver and kidney tumour ablation and providing central venous access for the delivery of chemotherapy. The NHS Five Year Forward update plan published in 2017<sup>1</sup> identified improving cancer services and outcomes for patients as one of the four major priorities for the health service going forward. In line with this, a number of key reviews including the National Cancer Strategy<sup>2</sup> and the HEE Cancer Workforce Strategy<sup>3</sup> clearly identified a need for more clinical and interventional radiologists to provide diagnostic and interventional services.

In the field of neuroradiology, interventional neuroradiologists are essential for the provision of life saving treatments such as cerebral aneurysm coiling for sub-arachnoid haemorrhage and mechanical thrombectomy for large vessel occlusion, which have largely replaced much more invasive neurosurgical operations.

Interventional radiologists take primary clinical responsibility for the patients they treat, contributing to and leading multidisciplinary teams to enhance patient management. Interventional radiologists with leadership, management and education skills are required to support the training of other practitioners, for example in the multi-disciplinary credential in interventional neuro-radiology for acute stroke that is currently under development.

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### 1.3 Scope of training

Sub-specialty training in interventional radiology consists of training in clinical radiology in addition to higher training in interventional radiology. Clinical radiology training includes exposure to all imaging modalities, body systems and patient groups with the objective of producing radiologists who at the time of CCT will be equipped to deliver a general, acute and emergency service. Interventional radiology training will focus on either general interventional radiology or diagnostic and interventional neuroradiology.

Patients who require access to specialist diagnostic and interventional services require radiologists with advanced skills who can deliver specialist imaging and image guided, minimally invasive procedures, in addition to general radiology. The interventional radiology curriculum allows for the development of interventional radiology-specific skills and knowledge. Trainees will also maintain the general radiology capabilities defined in the parent clinical radiology curriculum, which underpin and guide performance of therapeutic procedures as well as being essential to the diagnostic work that interventional radiologists carry out in addition to therapeutic procedures. This ensures that trainees will maintain the skills and flexibility required to adapt to the needs of the local service at the time and in the future.

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### 1.4 Structure of training

**The interventional radiology curriculum builds on the clinical radiology curriculum and entry to training requires the completion of an indicative three years of clinical radiology training as a minimum.** Trainees must apply for sub-specialty training in interventional radiology and are appointed to sub-specialty training posts in open competition. The availability of training posts directs entry into the sub-specialty according to workforce need.

Trainees are required to enrol with the RCR and become trainee members prior to the commencement of their training. Trainees are required to maintain RCR membership, including the full payment of all applicable fees, throughout training for the RCR to be able to recommend them as eligible for award of a CCT.

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Throughout ST1-ST3 trainees will rotate through modality and systems-based attachments as described in the clinical radiology curriculum. At ST4 trainees begin further study in Interventional Radiology. As a guideline, we recommend that they should spend 25-30% of their time during ST4-ST6 maintaining and further developing their general radiology skills. 70-75% of their time will be spent gaining practical experience of image guided minimally invasive procedures and developing the additional skills required to evaluate and consent patients for these procedures, run specialists clinics, clinically manage patients under the care of IR throughout the patient episode from referral to discharge, and provide acute and emergency access to minimally invasive procedures. The training pathway diagram in Figure 1 illustrates this structure.

The percentage breakdown is to be viewed as a guideline only and may be adapted to fit local service need and resources, and individual training needs. We believe that a certain degree of flexibility in these indicative times is necessary in order for it to be feasible to deliver the curriculum in the wide range of training environments across the UK.

Figure 1: Training pathway for interventional radiology



### 1.5 Capabilities in Practice (CiPs)

Those following the curriculum are expected to achieve the following high level CiPs **in addition to the generic and specialty-specific CiPs detailed in the clinical radiology curriculum.**

- Clinically manage all patients undergoing interventional radiology procedures under their care.

*Consultant interventional radiologists are clinically responsible for all patients undergoing interventional procedures from referral to discharge from follow-up, including in a clinic-based and ward-based setting. They are able to prioritise patients according to their clinical status, be responsible for running the IR workload and ensure optimal and safe patient care within the current NHS structure.*

- Provide essential image guided therapy in emergency care as well as elective care in patients with complex pathology and multiple co-morbidities.

*Consultant interventional radiologists have more advanced technical skills in image guided procedures than clinical radiology colleagues and this enables them to provide*

*essential emergency cover for life threatening conditions such as haemorrhage, ischaemia and sepsis.*

*They often work in partnership with colleagues in other specialties and other professions to facilitate treatment of patients with multiple co-morbidities. In addition they are able to provide minimally invasive treatments across a wide spectrum of disorders and in patients with complex co-morbidities. In many cases these treatments can be provided on a day-case ambulatory basis, reducing the need for in-patient treatment, procedure related morbidity and time to recovery.*

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## 1.6 Flexibility of training

The curriculum supports flexibility and transferability of outcomes across related specialties and disciplines, reflecting key interdependencies between the clinical radiology curriculum and other training programmes, outlined below.

Interventional radiology gained sub-specialty status in 2010 and vascular surgery became a specialty in 2012. The Royal College of Radiologists (RCR), British Society of Interventional Radiology (BSIR) and the Vascular Society of Great Britain and Ireland (VS) worked together to ensure both curricula were mutually supportive and practical.

Vascular surgery trainees are expected to become competent in reviewing images of the vascular system in order to enable them to make appropriate initial management decisions and also to have some experience in the same endovascular procedural skills used by interventional radiologists. Training in these is delivered via mutual co-operation between vascular surgery and radiology departments and training programmes. Interventional radiologists and vascular surgeons frequently cooperate through MDT working and case based discussion, and undertake combined procedures. Therefore it is entirely appropriate for vascular surgery representatives to teach, feedback on, and assess interventional radiology trainees, and for interventional radiology trainers to reciprocate with vascular surgery trainees. The Vascular Surgery Specialty Advisory Committee has been consulted on changes to the clinical radiology and interventional radiology curricula.

A multi-disciplinary credential in Interventional Neuroradiology (Acute Stroke) is under development. This will allow specialists in areas such as neurosurgery, neurology and stroke medicine for example to train in the delivery of aneurysm coiling and mechanical thrombectomy for the treatment of acute ischaemic stroke. The RCR is committed to working with the GMC and Curriculum Oversight Group to explore further opportunities to expand access to training in interventional radiology and interventional neuroradiology to meet future service needs.

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## 1.7 Generic professional capabilities and good medical practice

The GMC has developed the Generic professional capabilities (GPC) framework<sup>4</sup> with the Academy of Medical Royal Colleges (AoMRC) to describe the fundamental, career-long, generic capabilities required of every doctor. The framework describes the requirement to develop and maintain key professional values and behaviours, knowledge, and skills, using a common language. GPCs also represent a system-wide, regulatory response to the most common concerns about patient safety and fitness to practise within the medical profession.

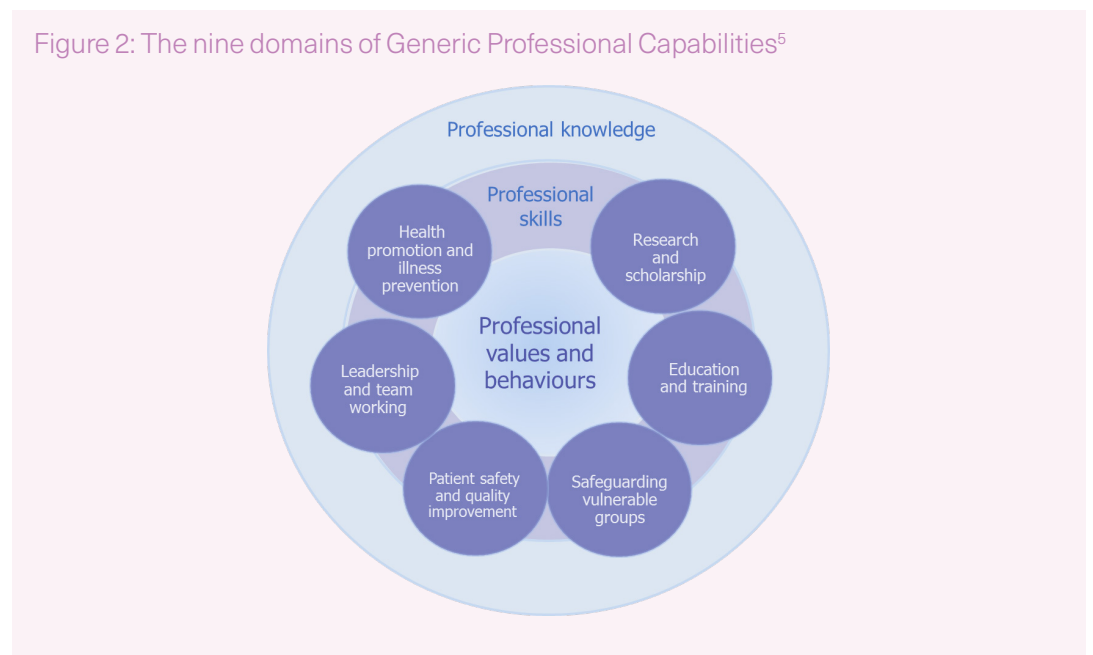
The framework will be relevant at all stages of medical education, training and practice.

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Good medical practice (GMP)<sup>5</sup> is embedded at the heart of the GPC framework. In describing the principles, duties and responsibilities of doctors, the GPC framework articulates GMP as a series of achievable educational outcomes to enable curriculum design and assessment.

The GPC framework describes nine domains with associated descriptors outlining the 'minimum common regulatory requirement' of performance and professional behaviour for those completing a CCT or its equivalent.

Figure 2: The nine domains of Generic Professional Capabilities<sup>5</sup>



The domains and subsections of the GPC framework are directly identifiable in the interventional radiology curriculum. They are mapped to each of the generic and specialty CiPs, which are in turn mapped to the assessment blueprints. This is to emphasise that they must be demonstrated at every stage of training as part of the holistic development of responsible professionals.

This approach will allow early detection of issues most likely to be associated with fitness to practise and to minimise the possibility that any deficit is identified during the final phases of training.

This purpose statement has been endorsed by the GMC's Curriculum Oversight Group and confirmed as meeting the needs of the health services of the countries of the UK.

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## 2 Content of learning

The practice of general interventional radiology (IR) and interventional neuroradiology (INR) requires the generic and speciality knowledge, skills and attitudes to diagnose and manage patients presenting with a wide variety of conditions aided by modern imaging modalities. It involves a particular emphasis on the use of minimally invasive percutaneous image guided techniques, including endovascular techniques, in managing a wide variety of conditions both supportive of and as an alternative to conventional surgical and medical treatment strategies. It includes diagnostic reasoning, managing uncertainty, dealing with comorbidities, and recognising when specialty opinion or care is required.

**The interventional radiology curriculum expands on the diagnostic training in the clinical radiology curriculum and the two curricula must be read in conjunction.**

Wherever possible this document avoids duplication of content which exists in the clinical radiology curriculum.

To achieve CCT in interventional radiology, trainees are expected to demonstrate the capabilities described by the generic and specialty-specific capabilities in practice (CiPs) outlined in the clinical radiology curriculum as well as the interventional radiology CiPs. Together these learning outcomes describe the professional capabilities required of a consultant interventional radiologist. Each CiP has a number of descriptors that underpin it, is mapped to the GMC's Generic Professional Capabilities and accompanied by suggested evidence that may demonstrate progress towards achieving this CiP.

The descriptors are intended to provide guidance to trainees and trainers about the range of clinical contexts which may support achievement of the CiPs, however they are not intended to be prescriptive and do not provide an exhaustive list. Trainees may demonstrate their progress against the CiPs in a variety of different ways, reflecting their strengths, areas of interest and the resources available to them, and should be encouraged to find innovative ways to achieve this. They may also complete activities that provide evidence for more than one CiP.

The level at which trainees meet each CiP is stage dependent and is expected to progress in a spiral fashion throughout training. Trainees will develop at different rates and may be able to demonstrate a higher level of progress in some CiPs compared to others. Excellent trainees may be able to evidence higher achievement at an earlier stage, provide a broader portfolio of evidence, or provide evidence that shows a deeper level of learning. The programme of assessment that forms part of this curriculum outlines the minimum expected levels of achievement at critical progression points in training, where trainees take on significantly more responsibility or where training or patient risk may potentially increase. Sign off will require clinical and educational supervisors to make entrustment decisions on the level of supervision required for each CiP or underlying activity at each critical progression point. More detail is provided in the programme of assessment section of the curriculum.

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## 2.1 Interventional Radiology CiPs

### CiP 13

Clinically manage all patients undergoing interventional radiology procedures under their care.

*Consultant interventional radiologists are clinically responsible for all patients undergoing interventional procedures from referral to discharge from follow-up, including in a clinic-based and ward-based setting. They are able to prioritise patients according to their clinical status, be responsible for running the IR workload and ensure optimal and safe patient care within the current NHS structure.*

#### Descriptors

- Understand the disease processes, associated risks, interactions (both drug and other) and treatment options of patients under their care
- Be up to date with current evidence and offer an evidence-based practice, submitting data to national registries where appropriate and available
- Inform patients of the spectrum of therapeutic options that might be provided by via Interventional Radiology
- Establish and implement appropriate treatment plans and ensure that the treatment is in the patient's best interest
- Understand and explain the indications, contraindications, limitations and expected outcomes of IR procedures including complications
- Understand alternative surgical, medical, oncological, immunological and palliative options and include details of these in the consent process
- Understand disease risk factors and implement risk factor modification
- Safely prescribe or stop related medications as appropriate, including lipid lowering agents, antiplatelets, anticoagulation, sedation and antibiotics
- Maintain an up to date knowledge of the full range of approved interventional equipment ( catheters, wires, devices)
- Provide longitudinal patient care, from outpatient pre-assessment to in patient care before, during, and after therapeutic procedures, and arrange safe patient discharge and long term follow-up to assess outcomes.

**CiP 13****Suggested evidence**

- Mini-IPX
- Rad-DOPS
- MSF
- Teaching observation
- MDT
- QIPAT
- Log-book
- Patient feedback

**Mapping to GPCs**

- Domain 1: Professional values and behaviours
- Domain 2: Professional Skills
  - Practical skills
  - Dealing with complexity and uncertainty
  - Clinical skills: History taking, diagnosis and medical management; consent; humane interventions; prescribing medicines safely
- Domain 3: Professional knowledge
  - Professional Requirements
  - National legislative requirements
- Domain 4: Capabilities in health promotion and illness prevention
- Domain 6: Capabilities in patient safety and quality improvement
  - Patient safety
- Domain 7: Capabilities in safeguarding vulnerable groups

**CiP 14**

Provide essential image guided therapy in emergency care as well as elective care in patients with complex pathology and multiple co-morbidities.

*Consultant interventional radiologists have more advanced technical skills in image guided procedures than clinical radiology colleagues and this enables them to provide essential emergency cover for life threatening conditions such as haemorrhage, ischaemia and sepsis.*

*They often work in partnership with colleagues in other specialties and other professions to facilitate treatment of patients with multiple co-morbidities. In addition they are able to provide minimally invasive treatments across a wide spectrum of disorders and in patients with complex co-morbidities. In many cases these treatments can be provided on a day-case ambulatory basis, reducing the need for in-patient treatment, procedure related morbidity and time to recovery..*

**Descriptors**

- Provide all emergency interventional procedures detailed in the syllabus in order to support acute emergency care such as control of haemorrhage, ischaemia and sepsis
- Demonstrate active involvement in emergency and ward-based care including understanding of management of the acutely unwell patient, running resuscitation, understanding emergency protocols and pathways, and contacting the correct emergency support
- Prioritise patients according to their clinical needs
- Understand the roles and responsibilities of each team member and optimise their involvement in interventional procedures accordingly
- Facilitate referral to other clinical teams when appropriate
- Communicate relevant findings, follow-up plans or onward referral clearly to the referring clinician and/or primary care physician
- Communicate with the patient or where appropriate the carer and/or family throughout the process of care, fulfilling duty of candour obligations

**Suggested evidence**

- Mini-IPX
- Rad-DOPS
- MSF
- MDT
- QIPAT
- Log-book
- Patient feedback

**CiP 14****Mapping to GPCs**

- Domain 1: Professional values and behaviours
  - Domain 2: Professional Skills
    - Practical skills
    - Communication and interpersonal skills
    - Dealing with complexity and uncertainty
    - Clinical skills: History taking, diagnosis and medical management; consent; humane interventions; prescribing medicines safely; using medical devices safely; infection control and communicable disease
  - Domain 3: Professional knowledge
    - Professional Requirements
    - National legislative requirements
    - The health service and healthcare systems in the four countries
  - Domain 4: Capabilities in health promotion and illness prevention
  - Domain 5: Capabilities in leadership and teamworking
  - Domain 6: Capabilities in patient safety and quality improvement
    - Patient safety
  - Domain 7: Capabilities in safeguarding vulnerable groups
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## 2.2 Presentations and Conditions

Interventional radiology utilises a range of imaging modalities and techniques to identify, characterise and treat pathology in the body. The context in which trainees will demonstrate their achievement of the CiPs will differ for general interventional radiologists and interventional neuroradiologists.

Interventional neuroradiology (INR) is used to treat vascular conditions affecting the brain, the spinal cord, the head, neck and the spine. General interventional radiology can be used to treat all remaining body systems and anatomical regions.

**Any attempt to comprehensively list all clinical presentations, pathological conditions and imaging modalities and interventional techniques would be extensive, but inevitably incomplete, and would rapidly become out of date. Our approach is to provide general guidance and not exhaustive detail.**

The tables in sections 2.2.1 and 2.2.2 below outline **at a high level** the key clinical presentations and conditions presenting to general interventional radiology and interventional neuroradiology for diagnosis and management, as well as the key practical procedures that trainees are expected to have experience of. **These tables are not comprehensive; they must be viewed as a guide and interpreted with common sense.**

### 2.2.1 Presentations and Conditions: General Interventional Radiology

Table 1 describes presentations and conditions for which trainees should be able to develop interventional radiology management strategies, organised by body system. Particular presentations and conditions are listed either because they are common or serious. Clearly some conditions may manifest in a number of body systems and some presentations may be caused by pathology in one or more system, however for conciseness each condition and presentation appears once in the table or on a limited number of occasions.

As a guide it is expected that trainees will:

1. be familiar with the normal anatomy and tissue types in each area
2. develop knowledge of the imaging findings and IR management strategies of the pathological processes affecting each body system as outlined in the clinical radiology curriculum:
3. understand the role and implications of other forms of management in the processes outlined in the clinical radiology curriculum relative to IR
4. understand the principles of informed consent
5. understand the importance of communication skills related to all aspects of clinical practice

All interventional radiologists are expected to develop the skill set required to be able to cover an emergency, out of hours interventional radiology rota. This includes management of life threatening haemorrhage, sepsis, limb threatening vascular compromise and other luminal obstruction.

Interventional radiology requires an in depth knowledge of the disease processes, potential treatment options, imaging and interventional skills in the chosen sub-specialty area (vascular, non-vascular, interventional neuroradiology, paediatric) to enable comprehensive patient care from referral to completion of the patient episode.

Table 1: Presentations and conditions for general interventional radiology

<b>Develop an appropriate image guided clinical and therapeutic strategy for the following</b>	
Trauma Haemorrhage Sepsis Luminal stenosis/ obstruction Vascular stenosis/ occlusion Thromboembolic disease Vascular and lymphatic pathology Benign and malignant tumours Post-operative conditions Iatrogenic conditions	
<b>Specific Body System</b>	<b>Examples of relevant conditions and procedures:</b>
Gastro-Intestinal Radiology	Nutrition support–tunnelled lines, gastrostomy, jejunostomy Treatments for obstruction / perforation -oesophageal, gastroduodenal and colonic stents Dilatation of benign strictures, achalasia Drainage of fluid collections including ascites and abscess Embolisation for GI tract bleeding
Gynaecological Radiology	Post- partum haemorrhage and management of menorrhagia Treatments for pelvic pain including embolisation for fibroids, adenomyosis, endometriosis, pelvic venous congestion Infertility treatments
Hepato-Pancreato-Biliary and Spleen	Liver biopsy – percutaneous, plugged and trans-jugular Biliary obstruction – dilatations, biopsy, drainage and stents Inflammatory pathology including pancreatitis and management of it's sequelae Cirrhosis and management of portal hypertension Treatment of veno-occlusive disease Tumour ablation techniques and embolisation procedures

Specific Body System	Examples of relevant conditions and procedures:
Paediatric Radiology	Vascular access Tracheobronchial compromise Vascular and lymphatic anomalies
Thoracic Radiology	Drainage of fluid collection Biopsy Tumour ablation Treatment of pneumothorax SVC obstruction Treatment of pulmonary thromboembolism
Uro-radiology	Management of stone disease Management of urinary tract obstruction – nephrostomy and ureteric stents Embolisation for urinary tract bleeding and for benign disease e.g. Angiomyolipoma/ Benign Prostate Hyperplasia Treatments for testicular pain and infertility Tumour ablation
Vascular Radiology	Treatment of: Peripheral vascular disease – acute and chronic ischaemia Aortic and visceral aneurysms and pseudo aneurysms Arterial dissection and mural haematoma/ penetrating ulcer Acute haemorrhage Venous thrombosis Vasculopathies Vascular and lymphatic anomalies

Tables 2 and 3 outline the key interventional radiology procedures that trainees are expected to have experience of, **in addition** to those specified in the clinical radiology curriculum. The extent to which a trainee engages in these procedures will be stage-dependent and range from an awareness of the procedure to independent performance. Table 2 lists those procedures in which all trainees should acquire competency to be able to cover an emergency out of hours IR rota. Table 3 lists additional skills, a number of which the trainee should acquire, with the exact mix dependent on local circumstances and projected service need. This could include any sub-specialty or a combination of sub-specialties dependent on workforce requirements. As with the previous table, these procedures are described at a high level and the table is not intended to provide an exhaustive list of procedures that trainees will encounter or have experience of.

Table 2: Practical procedures for all general interventional radiologists

<b>Perform the following interventional procedures</b>
Haemorrhage control (embolisation, stent grafting)
Drainage of sepsis (including image guided nephrostomy, percutaneous cholangiostomy and drainage, pleural drainage, trans-visceral drainage)
Management of acute and chronic thromboembolic disease including thrombolysis (mechanical and pharmacological)
Management of vascular and non-vascular luminal stenosis/ obstruction with stricturoplasty (including angio/venoplasty) & stent insertion
Complex biopsy (including coaxial/plugged/ transjugular/ trans-visceral)
Use of vascular closure devices
Vascular access: tunnelled line and port insertion
IVC filter placement
Retrieval of intravascular foreign bodies



Table 3: Additional practical procedures for general interventional radiology, dependent on service need

<b>Perform the following interventional procedures</b>
Complex vascular intervention – including correct and appropriate use of modern technologies
Treatment of benign and malignant tumours with bland, chemo and radio embolisation, and thermal ablation techniques
Endovascular aneurysm repair including thoracic/fenestrated endovascular aortic repair and management of endoleaks
Use of alternative vascular access
Maintenance of dialysis fistulae
Management of vascular/ lymphatic anomalies
Nutrition support – gastrostomy/ gastrojejunal tube insertion
Percutaneous nephrolithotomy
Complex biliary intervention e.g. non dilated systems, fistulae, biliary leaks
Management of cirrhosis/ hepatic veno-occlusive disease and/ or portal hypertension – Transjugular Intrahepatic Portosystemic Shunt/Balloon-occluded Retrograde Transvenous Obliteration
Paediatric intervention

### 2.2.2 Presentations and Conditions: Interventional Neuroradiology

Consultant interventional neuroradiologists provide urgent and elective care for patients referred to neuroscience centres with vascular conditions affecting the brain, spinal cord, craniofacial tissues and the spine. The majority of patients in INR practice have or may develop life altering or life threatening conditions and most procedures are performed with the patient under general anaesthetic. Clinical outcomes are related to patients' presenting conditions and the interventional treatment and may include disability or death.

As a guide it is expected that INR trainees will:

1. be familiar with the anatomy, physiology and pathology in each area
2. develop knowledge of the imaging findings and INR management strategies of the pathological processes affecting each area as outlined in the clinical radiology curriculum
3. understand the role of other forms of management (medical, surgery, radiosurgery) for the neurovascular diseases outlined in the clinical radiology and IR curriculum
4. understand the principles of informed consent
5. understand the importance of communication skills related to all aspects of clinical practice

Table 4: Presentations and conditions for interventional neuroradiology

#### Develop an appropriate imaging and clinical strategy for the following presentations

See Clinical Radiology Curriculum, Diagnostic Neuroradiology section (page 36).

Also for operators in tertiary paediatric neurovascular centres: Antenatal MRI imaging where neurovascular diseases are suspected on ultrasound

Table 5: Practical procedures for all interventional neuroradiologists

**Perform the following interventional procedures**

US guided arterial puncture (including direct carotid artery puncture)

Cerebral and spinal angiography including use of microcatheters, tri-axial systems and occlusion testing

All endovascular forms of treatment of intra / extra cranial aneurysm and treatment of cerebral vasospasm

Embolisation for haemorrhage e.g. epistaxis or vessel trauma

Endovascular procedures for device migration, malfunction or vessel perforation

Cervical vessel angioplasty and stenting including carotid blow out

Endovascular treatment of stroke due to large vessel occlusion (mechanical thrombectomy)

Thrombolysis (arterial and dural venous sinus)

Embolisation of dural, brain, craniofacial or spinal tumour

Embolisation of cerebral, dural and spinal AVM or AVF

Table 6: Additional practical procedures for interventional neuroradiologists, or specific to operators in tertiary paediatric neurovascular centres

Perform the following adult or paediatric interventional procedures
Venous sinus stenting for intracranial hypertension and dural AVF
Embolisation of craniofacial AVM, AVF, venous or lymphatic malformation
Spinal procedures including: guided LP, facet joint, epidural and nerve root injection, blood patches, vertebroplasty, kyphoplasty and spinal biopsy.
Specific endovascular techniques for infants and neonates e.g. embolisation of Vein of Galen malformation or high flow pial AVF, childhood capillary, venous and lymphatic malformations

## 2.3 Breadth of training

### 2.3.1 Paediatric interventional radiology

Paediatric IR is a specialist area of IR. Commonly performed procedures in paediatric interventional radiology include vascular anomaly interventions, biopsy, venous access, enteric access and drainage procedures. The full range of procedures performed in adult intervention are also be performed in children, although vascular interventions are less frequently performed as the underlying pathological processes differ, and also in part due to the lack of infrastructure to support paediatric IR services.

Some of the core skills developed in adult interventional radiology training are transferable to paediatric interventional radiology procedures. Techniques used to treat emergency presentations, such as haemorrhage, sepsis and luminal obstruction, are similar to adult IR practice, although the indications for treatment and potential complications can differ significantly. The diseases arising in childhood and the underlying pathological processes can be very different to those seen in adults, and so a more in depth understanding of paediatric disease processes is required. In addition to paediatric diagnostic radiology knowledge, communication skills facilitating effective communication with children and their parents is required. Techniques to reduce radiation dose should be used for all paediatric interventions. The paediatric IR service currently delivered in the UK is provided by specialist paediatric trained IRs, adult IRs with a special interest in paediatrics and paediatric radiologists with an IR interest. Access to this service nationally is currently limited and confined to larger centres. Specialist training opportunities are available in certain centres.

### 2.3.2 Interventional oncology (IO)

IO is a rapidly developing area within Interventional Radiology. It draws on all of the skills covered in this curriculum to provide minimally invasive treatments specifically directed at primary and secondary tumours and the complications that can arise from cancer treatments. IO procedures incorporate both vascular and non-vascular techniques and two of the most commonly performed procedures are embolotherapy and image guided ablation.

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### **3 Teaching and learning methods**

The teaching and learning methodology and tools, including simulation, are described in the curriculum for clinical radiology and continue to apply for interventional radiology. This information is not duplicated in this curriculum.

## 4 Programme of assessment

The assessment system (including purpose, methodology, evidence and tools) is described in the curriculum for clinical radiology and continues to apply for interventional radiology. This information is not duplicated in this curriculum.

### 4.1 Assessment of CiPs

Assessment of the CiPs involves looking across a range of key skills and evidence of progress to make an overall judgement about a trainee's achievement of the CiPs in the context of their clinical practice at the current stage of training. This will be informed by the professional judgement of the trainer and take account of workplace based assessment, supervisors' reports, summative assessment and the trainee's own self assessment. Assessment of the CiPs, or aspects of the CiPs, should take place throughout training and include formative feedback to the trainee on their performance.

The same scale used to assess the clinical radiology specialty-specific CiPs will be used to assess the interventional radiology specialty-specific CiPs. This scale is shown in Table 7: Level descriptors for specialty-specific CiPs.

Table 7: Level descriptors for specialty-specific CiPs

Level	Descriptors	
1	Entrusted to observe only	No provision of direct clinical care
2	Entrusted to act with direct supervision	The supervising doctor is physically within the hospital or other site of patient care and is immediately available to provide direct supervision. For IR procedures the supervising doctor is present in the operating theatre.
3	Entrusted to act with indirect/minimal supervision	The supervising doctor is not physically present within the hospital or other site of patient care, but is immediately available by means of telephone and/or electronic media, to provide advice and can attend physically if required to provide direct supervision. For IR procedures the supervising doctor is on hand in the department.
4	Entrusted to act unsupervised	The trainee is working independently and at a level equivalent to a consultant

The expectations of progress against the CiPs for each stage of training are outlined in the progression grid in Table 8.

Table 8: Progression grid for interventional radiology CiPs, showing minimum expected progress at the end of each stage of training

Interventional radiology CiP		ST4	ST5	ST6	CCT
13. Clinically manage all patients undergoing interventional radiology procedures under their care	Critical progression point	2	3	4	Critical progression point
14. Provide essential image guided therapy in emergency care as well as elective care in patients with complex pathology and multiple co-morbidities		2	3	4	

## 4.2 Critical progression points

A critical progression point is a point in a curriculum where a learner transitions to higher levels of professional responsibility or enters a new or specialist area of practice, including successful completion of training. These transitions are often associated with an increase in potential risk to patients or those in training, so they need to be carefully managed and decisions to progress need to be based on robust evidence of satisfactory performance.

Trainees must pass a critical progression point in clinical radiology training at ST3 before they are able to begin interventional radiology training. This is followed by a final critical progression point which marks the end of interventional radiology training. Trainees are required to reach level 4 in the generic and specialty-specific CiPs detailed in the clinical radiology curriculum as well as level 4 in the interventional radiology specific CiPs.

Tables 9 and 10 outline the key milestones that trainees should accomplish in order to pass these critical progression points, in addition to achievement of the interventional radiology CiPs as appropriate for their stage of training (see Table 8).

Transferable skills are acquired during IR training but due to some specialised procedures only being undertaken in relatively small numbers and in a limited number of centres, it is likely that IR trainees will be exposed to either more vascular techniques or more interventional oncology techniques, depending on local service need and provision. In addition some of the more complex vascular procedures are undertaken with a team approach which allows continued development post CCT. Therefore, trainees are only expected to reach level 3 at ST6 in complex EVAR procedures.

Table 9: Progression grid for milestones and procedures in general interventional radiology training, showing minimum expected progress at the end of each stage of training

Milestones and procedures			ST4	ST5	ST6	CCT
All	Treatment of haemorrhage	Critical progression point	2	3	4	Critical progression point
	Treatment of ischemia		2	3	4	
	Management of sepsis		2	3	4	
	Management of luminal stenosis/obstruction		2	3	4	
	Management of thrombo-embolic disease		2	3	4	
Vascular intervention	Abdominal endovascular aortic aneurysm repair (EVAR)		2	3	4	
	Thoracic endovascular aortic aneurysm repair (TEVAR)		2	3	4	
	Complex EVAR e.g. fenestrated techniques		2	2	3	
Interventional oncology	Tumour ablation		2	3	4	
	Tumour embolotherapy		2	3	4	



Table 10: Progression grid for milestones and procedures in interventional neuroradiology training, showing minimum expected progress at the end of each stage of training

Milestones and procedures		ST4	ST5	ST6	CCT
US guided arterial puncture (including carotid artery puncture)	Critical progression point	2	3	4	Critical progression point
Cerebral and spinal angiography including use of microcatheters, triaxial systems and occlusion testing		2	3	3	
All endovascular forms of treatment of intra/extra cranial aneurysm and treatment of cerebral vasospasm		2	2	3	
Embolisation for haemorrhage e.g. epistaxis and vessel trauma		2	2	3	
Endovascular procedures for device migration, malfunction or vessel perforation		2	2	3	
Cervical vessel angioplasty and stenting including carotid blow out		2	2	3	
Endovascular treatment of stroke due to large vessel occlusion (mechanical thrombectomy)		2	3	3	
Thrombolysis (arterial and venous sinus)		2	3	4	
Embolisation of dural, brain, craniofacial or spinal tumour		2	2	3	
Embolisation of cerebral, dural and spinal AVM or AVF		2	2	3	

Due to inherent practice risks, it is rare for INR trainees to work without supervision, even in later stages of training. Some conditions and procedures are rare and it takes more than the three years of sub-specialty training to build the necessary skills and experience. INR procedures are normally carried out by supportive teams that allow continued development post-CCT. For this reason, trainees are only expected to reach level 3 at ST6 in some of the INR procedures in Table 10.

### 4.3 Evidence of progress

As for clinical radiology, interventional radiology practice will be assessed using an integrated package of formative workplace based assessments (WPBAs) and summative examination of knowledge and radiological skills, which will sample across the curriculum. The range of assessment used to support learning and provide evidence of progress is listed in the clinical radiology curriculum, with the only difference being that 12 Rad-DOPS are required for interventional radiology. The requirements for each stage of interventional radiology training are stipulated in the progression grid for the interventional radiology CiPs and critical progression points (see sections 5.1 and 5.2). Trainees should continue to record evidence of their progress against the CiPs in the e-portfolio and this will continue to inform appraisal meetings and the ARCP process. Logbooks should be used for documenting the skills and experience attained and to facilitate reflective learning.

## 4.4 Decisions on progress (ARCP)

Individual progress will continue to be monitored by an annual review (ARCP) up to the end of training. There is no concept of differentiating between the ARCPs for CR and IR, since the curriculum encompasses the CiPs leading to both the CCT in CR and the sub-specialty recognition. Once a trainee begins interventional radiology sub-specialty training we would expect them to have a single ARCP process to cover clinical radiology and sub-specialty interventional radiology. An ARCP decision aid for interventional radiology is available on the RCR website.

### 4.4.1 Appeals

As for clinical radiology, there are formal mechanisms for appealing against decisions taken at all stages of training. Appeals against decisions of the ARCP panel are conducted locally under the supervision of the Postgraduate Dean. Appeals related to examination results are conducted by the RCR; information can be obtained from the Examinations section of the RCR website. Appeals against a failure to award a CCT may be made to the GMC. It is important to be aware that the relevant regulations specify strict time limits within which appeals must be lodged.

## 4.5 Assessment blueprints

Table 11 shows the possible methods of assessment for the interventional radiology CiPs. It is not expected that every method will be used for each competency and additional evidence may be used to help make a judgement on capability. For blueprinting of examinations please see the clinical radiology curriculum.

Table 11: Blueprint of WPBAs to the interventional radiology CiPs (for blueprinting of examinations please see the clinical radiology curriculum).

	MSF	Mini-IPX	Rad-DOPS	Teaching observation	QIPAT	MDTA
<b>Interventional radiology CiPs</b>						
13. Clinically manage all patients undergoing interventional radiology procedures under their care	X	X	X	X	X	X
14. Provide essential image guided therapy in emergency care as well as elective care in patients with complex pathology and multiple co-morbidities	X	X				X

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## **5 Supervision and feedback**

Arrangements for feedback, supervision and appraisal are detailed in the clinical radiology curriculum and these also apply for interventional radiology training.

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## 6 Appendix

### 6.1 Curriculum development, implementation and review

#### 6.1.1 Development

This curriculum was developed by the Clinical Radiology Curriculum Committee. This is a sub-committee of the Specialty Training Board of the Faculty of Clinical Radiology of the Royal College of Radiologists (STB) and reports to it. The members of the Curriculum Committee and STB have broad UK representation across the range of radiological special interest areas and include consultants who are actively involved in teaching and training; trainees; service representatives; and lay persons.

Throughout the development of this curriculum, the Curriculum Committee has consulted widely with a range of stakeholders. These include: Special Interest Group Leads; the Fellowship Examining Board and FRCR Physics and Anatomy Committees; Regional Specialty Advisers; the STB; the RCR's Junior Radiologist's Forum; employers' groups, including NHS Employers; Clinical Directors; professional organisations such as the British Society of Skeletal Radiologists and British Society of Interventional Radiology; patient groups such as the NHS England Patient Experience Team; charities; the RCR lay member network; those representing allied health professions e.g. the Society and College of Radiographers and the Institute of Physics and Engineering in Medicine; other royal colleges including JRCPTB, RCGP, RCEM, RCoA, RCOG, and RCPCH; and the Nuclear Medicine Specialty Advisory Committee, including trainee representatives.

#### 6.1.2 Implementation

This curriculum will be implemented in August 2021 and all trainees will move to this curriculum, unless they are due to CCT before 1st September 2022. All evidence currently recorded in the e-portfolio will remain and can be used to demonstrate achievement of the new CiPs.

A full suite of training materials is available to support trainees and trainers in the transition to this curriculum. Further details can be found on the RCR website, along with documents mapping the competencies in the 2016 curriculum to the CiPs in this curriculum.

#### 6.1.3 Intended use

The curriculum is freely available to trainees and trainers on the RCR and GMC websites. Both trainees and trainers are expected to have a good knowledge of the curriculum and should use it as a guide for their training programme. Clinical and educational supervisors should use the curriculum as the basis of their discussion with trainees, particularly during the appraisal process. Each trainee will engage with the curriculum by maintaining an e-portfolio. The trainee will use the curriculum to develop learning objectives, self-assess accomplishments, and reflect on learning experiences.

#### 6.1.4 Review

The STB is responsible for review of the curriculum. Clinical radiology, as a technology supported specialty, is rapidly changing and evolving and as a result the curriculum is kept under constant review to ensure that radiology training and education reflect modern practice. To allow the curriculum to respond appropriately to these changes, there are regular meetings of Special Interest Groups, the Curriculum Committee, the Professional Support

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and Standards Board and the Specialty Training Board. These provide opportunities for the curriculum to be discussed, and amendments to be proposed and considered in advance of formal review. Trainers, tutors, Regional Specialty Advisers, Programme Directors and examiners will also continue to be involved in review through their membership of relevant working parties and committees.

Curriculum evaluation will establish how trainees have responded to the curriculum and ensure that the curriculum facilitates practical delivery of the required training. The curriculum will be evaluated by means of a range of qualitative and quantitative data.

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## 6.2 Quality Management and equality and diversity

Information on quality management and equality and diversity are contained within the clinical radiology curriculum and apply to this curriculum.

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## References

1. NHS England. *Next Steps on the NHS Five Year Forward View*. NHS England, 2017.
2. NHS England. *Achieving World-class Cancer Outcomes: a Strategy for England 2015-2020*. NHS England, 2016.
3. Health Education England. *HEE Cancer Workforce Plan Phase 1: Delivering the Cancer Strategy to 2021*. Health Education England, 2017
4. General Medical Council. *Generic professional capabilities framework*. General Medical Council, 2017.
5. General Medical Council. *Good medical practice*. General Medical Council, 2014.



The Royal College of Radiologists  
63 Lincoln's Inn Fields  
London WC2A 3JW

+44 (0)20 7405 1282  
enquiries@rcr.ac.uk  
www.rcr.ac.uk  
🐦 @RCRadiologists

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