



Provision of interventional radiology services

The Royal College of Radiologists in collaboration with the British Society of Interventional Radiology



British Society of
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**Clinical
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The Royal College of Radiologists

Index

Foreword	3
Working group	3
1. Executive summary	4
2. Interventional radiology – the specialty	5
3. Interventional radiology units	6
4. Interventional radiology facilities	8
5. Interventional radiology teams	9
6. The role of the interventional radiologist	9
7. Training	11
8. Registries, audit and quality improvement	11
9. Specialist areas	12
10. Patient information	12
11. Conclusion	12
References	13
Appendix 1. Clinical risk assessment	15
Appendix 2. Training	16
Appendix 3. Specialty areas	17
Glossary	19

Foreword

Using innovative, evolving and often complex techniques, interventional radiology (IR) has revolutionised patient care in a wide range of diseases. Founded on image guidance, IR has contributed to major improvements in safe, patient-focused care, demonstrating cost-effectiveness in the treatment of numerous conditions. IR is increasingly recognised as a vital component of hospital medicine, providing lifesaving care, both in and out of hours (OOH). It became a separate subspecialty of radiology in 2010. The purpose of this document is to inform service providers, clinicians and commissioning bodies of the requirements for the provision of a safe and sustainable IR service.

Many surgical procedures have been replaced or enhanced by the provision of IR services, and it has enabled new treatments for patients which were not previously feasible. However, with many hospitals having limited or, in some instances, no direct access to IR services, provision remains variable. This is particularly true OOH with a recent NHS improvement survey demonstrating that less than one-third of units are able to provide comprehensive OOH IR care, potentially putting many patients at risk. The principal cause of this variability is insufficient numbers of trained interventional radiologists – a problem which needs to be urgently addressed. This document demonstrates the range of services offered by interventional radiologists and sets out the core requirements for the provision of an IR service both in district general hospitals (DGH) and tertiary or teaching hospitals, advising on how services may be set up collaboratively within regions to offer the highest quality of care to all patients, both in and out of hours. This document should be used in conjunction with

documents relating to IR published by The Royal College of Radiologists (RCR) and NHS Improving Quality ([NHS IQ] formerly NHS Improvement, responsibility transferred to NHS IQ from April 2013), and standards documents published by the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) and the Society of Interventional Radiology (SIR) referenced here.

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Working group and consultation

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The document was made available for consultation and comments from the BSIR members for one month from 15 November to 15 December 2013. It has been subsequently revised in consultation with the membership of the BSIR, the Councils of the Vascular Society (VS) and the Faculty of Clinical Radiology of the RCR.

The document will be subject to revision in November 2015.

1. Executive summary

Interventional radiology (IR) procedures are minimally invasive, targeted treatments, performed under imaging guidance which play a vital role in both elective and emergency patient care.

IR procedures can replace many surgical procedures and are less invasive, reducing morbidity and mortality, and allowing more rapid recovery.

IR encompasses a large range of procedures and techniques and some hospital sites will not be able to offer all types of treatment.

Access to robust 24/7 IR cover should be a priority for all acute hospitals. Hospital units that undertake acute medical and surgical care should have access to IR services, particularly haemorrhage control and nephrostomy drainage, either on-site or by formal arrangement to transfer the patient to a site where the service is available.

Reconfigurations to individual services should ensure that continuity of access to IR services, particularly for emergency care, is maintained.

Services consisting of six or more interventional radiologists will usually be able to provide an effective and sustainable service and networks and units should aim for a rota frequency of 1:6. Units covering populations of more than one million will require rota frequencies of 1:8 or greater. Some networks will be able to provide a separate vascular and non-vascular rota.

Larger, busier units will have daily emergency lists as for acute surgery and trauma services.

IR nurses and radiographers provide vital specialist skills to the interventional radiology team. Safe and sustainable support for IR services will require similar rota frequencies to the interventional radiologists' rota.

There is significant variation in the provision of IR nursing support, particularly for OOH procedures. A minimum recommendation for patient safety is the provision of one staff member experienced with the procedures and equipment as scrubbed assistant, with sedation and monitoring provided by a separate member of staff.

Interventional radiologists play an increasingly clinical role and job plans should incorporate all aspects of activity, including the requirements to provide outpatient clinics and inpatient clinical support.

Patients expect the procedure and their treatment to be explained by the clinician carrying them out. Interventional radiologists have the primary responsibility to ensure that patients have sufficient information to give their consent for IR procedures, and the establishment of IR outpatient clinics is strongly recommended to facilitate appropriately informed treatment decisions.

The episodic nature of IR means that optimal follow-up of clinical outcomes is best supported by a systematic process and submission to national registries should be mandatory.

2. Interventional radiology – the speciality

IR procedures are minimally invasive, targeted treatments performed under imaging guidance. A wide range of procedures are included, extending from treatment of obstructed kidneys to the emergency management of ruptured arterial aneurysms and the treatment of cancer and its complications.

IR procedures often replace open surgical procedures as they are less invasive, reduce morbidity and mortality and allow more rapid patient recovery and hospital discharge. Over 90% of procedures are undertaken through incisions of around 2–3 mm, and most procedures are performed under local anaesthesia, often allowing same-day discharge from hospital.

IR has expanded to play a vital role in both elective and emergency treatment. The examples included below are by no means exhaustive but illustrate the breadth of treatments available.

Vascular disease – interventional radiologists are integral to the provision of endovascular aneurysm repair, and angioplasty and stenting for the treatment of peripheral and aortic vascular disease.^{1–6}

Haemorrhage control – interventional radiology allows rapid control of haemorrhage by embolisation or stent grafting, without the morbidity of an open surgical procedure. IR now plays a vital role in trauma and gastrointestinal (GI) bleeding pathways.^{7–14}

Renal dialysis support – now a major component of many interventional radiology units, including complex venous access, fistuloplasty and fistula thrombectomy.^{15,16}

Interventional oncology – ablative procedures such as radiofrequency ablation, cryotherapy, microwave ablation, high-intensity focused ultrasound and transarterial chemoembolisation provide minimally invasive, targeted treatment options for patients with solid tumours. In addition, treatment of obstructive lesions in multiple-organ systems including vascular, urological, hepatobiliary and GI systems can provide invaluable palliation for patients with advanced disease.^{17–24}

GI and hepatobiliary disease – palliation of obstruction due to tumours at many sites, including bowel and biliary tree, as well as direct access to the gut to provide nutrition as an alternative to parenteral nutrition.^{25,26}

Uro-intervention – acute and chronic treatment of ureteric obstruction from stone disease and tumours to prevent renal damage.²⁷

Other conditions – with the established benefits of minimally invasive techniques in providing safe and effective care for patients, IR is being used increasingly. These techniques are also being used to treat failing transplants (liver, pancreas and kidney): acute and chronic bowel ischemia, vascular disease of the kidney; and vascular malformations.

3. Interventional radiology units

IR encompasses a large range of procedures and techniques and some hospital sites will not be able to offer all types of treatment.

IR units should clearly define the procedures they undertake within working hours and OOH to ensure that patient access to appropriate treatment is maintained.

The development of robust 24/7 access to IR cover should be a priority for all acute hospitals. BSIR has worked with the Department of Health (DH) and NHS IQ to detail the availability of 24/7 IR services in NHS England.^{28,29} This has documented substantial variation in access to common IR procedures.

The most frequent IR procedures undertaken as an emergency are arterial embolisation to arrest haemorrhage and nephrostomy to relieve obstructed kidneys and avoid renal failure. All IR specialists should be able to carry out these core procedures for which hospital trust boards should prioritise cover. Less frequent procedures may need to be provided by referral to a neighbouring unit but should not impede the development of cover for the more common procedures.

Hospital units that undertake acute medical and surgical care should have access to IR techniques, particularly haemorrhage control and nephrostomy drainage, either on-site or by formal arrangement to transfer the patient to a site where the service is available.

Some procedures occur sufficiently infrequently and/or are sufficiently complex that it is not appropriate that all units provide them. Guidance on optimising training opportunities for low-volume procedures is given in *Towards best practice in interventional radiology* (NHSI/BSIR 2012).^{28,29} For units covering a small population, it may be better to develop a formal network with a neighbouring unit to permit prompt transfer.

It is in the interest of good patient care that written pathways are established by agreement between all parties, and understood by local clinical colleagues. In particular, services should develop clear referral

pathways in conjunction with recipient units for procedures not undertaken in the local unit. Where services are commissioned, commissioners should ensure appropriate pathways are established for local and regional services.

Reconfigurations to individual services should ensure that continuity of access to IR services, particularly for emergency care, is maintained. An illustrative clinical risk assessment table for a range of clinical services is provided in Appendix 1.

The number of interventional radiologists within a unit is clearly a key factor in determining the approach to developing a safe and sustainable rota. The following guidance should be applied.

- **Services with fewer than four interventional radiologists** should liaise with neighbouring units to develop a model of care that will permit robust IR rotas.
- **Services with between 4–6 interventional radiologists** may be able to provide an independent on-call rota, depending on the intensity of activity. Most services in this range should consider networking with neighbouring units to ensure a more robust long-term service.
- **Services consisting of six or more interventional radiologists** will usually be able to provide a robust 24/7 service which is compliant with the European Working Time Directive (EWTd). For populations greater than one million, a 1:8 rota may be more sustainable.

There is a significant shortage of interventional radiologists in the UK, with almost half (45%) of the services in England not currently able to provide either local or networked OOH access to IR.³⁰ Data from the Centre for Workforce Intelligence (England) demonstrated the need for an additional 222 consultants in IR in England alone to achieve a rota of 1:5 (Table 1). In addition, there remains a large number of unfilled IR consultant posts in the UK due to a shortage of suitably trained candidates. Expansion of the number of trainees in IR is urgently required. A continued shortfall will be damaging to both elective and emergency patient care.³⁰

Units should develop a systematic approach to the collection and assessment of patient-outcome data. Recruitment to registries such as British Society of Interventional Radiology Iliac Angioplasty and Stenting

(BIAS) registry, Biliary Drainage and Stenting Registry (BDSR) and the National Vascular Registry (NVR) is strongly advised, and units should provide appropriate support and periodic local analysis of recruitment.³¹⁻³³

Table 1. Interventional radiologists by trust, England, between May 2011 and March 2012³⁰

Strategic health authority (SHA)	Total trusts	Trusts with data	Current numbers of interventional radiologists	Additional interventional radiologists required to provide 1:5 on call rota in each trust
North East	8	7	17	18
North West	24	22	75	35
Yorkshire and The Humber	15	15	53	22
East Midlands	8	8	43	-3
West Midlands	15	15	52	23
East of England	18	18	46	44
London	24	23	93	22
South East Coast	12	12	46	14
South Central	10	10	33	17
South West	17	17	55	30
Total	151	147	513	222

Source: *Securing the future workforce supply: clinical radiology stocktake*.³⁰

4. Interventional radiology facilities

Most IR units place many implantable devices including arterial stents, venous access devices and inferior vena cava (IVC) filters. Insertion of these devices requires a sterile environment and such procedures are increasingly undertaken in clean air environments.

Specific guidance produced by a joint working group led by the Medicines and Healthcare products Regulatory Agency (MHRA) is available, detailing the requirements for facilities to support endovascular aneurysm repair which include theatre-quality air exchange, a fixed, high-quality angiographic X-ray system, anaesthetic facilities and an appropriate stock of consumables.³⁴ These facilities may be optimally provided within the provision of a hybrid imaging system where a high-quality fixed angiographic suite is installed within a highly sterile operating theatre environment. Using mobile C-arms in an operating theatre is not an adequate substitute.

Non-invasive imaging using ultrasound (US), computed tomography (CT) and magnetic resonance (MR) is essential for planning non-vascular and vascular interventional radiology procedures.

High-quality CT imaging requires access to scanners capable of isometric volume reconstruction at 1 mm minimum and appropriate image processing software.

IR units should have established links and access to day-case facilities. Many IR procedures can be performed as a day-case episode and IR offers an opportunity to deliver more cost-effective care when day-case and outpatient facilities are used appropriately.

Interventional radiologists have specialist knowledge and experience of managing patients undergoing interventional procedures. To ensure the highest quality of inpatient care, interventional radiologists should be available to advise and should take shared (or where appropriate sole) responsibility for the hospital episode.

Anaesthetic support is increasingly required for some IR procedures but is often lacking in many units. There should be routine access to anaesthetic services in all units for the more complex, difficult and painful elective procedures as well as emergencies.



5. Interventional radiology teams

IR requires an extended team of healthcare professionals beyond interventional radiologists. This includes the referring clinical teams, anaesthetics, interventional nurses, radiographers and healthcare assistants. Effective team working with shared responsibilities is essential if the team are to deliver co-ordinated care with task interdependency and the best patient outcomes.

Interventional radiologists have a responsibility to lead and work within teams that encourage and accept participation from all team members. All team members must understand their individual role but be prepared to work flexibly to ensure successful outcomes.

The importance of effective team working cannot be overemphasised and is reflected in the recent guidance regarding team briefs and the World Health Organization (WHO) Radiology safety checklist.³⁵ Every member of the team contributes to patient safety and adoption of the methodology included in the RCR/National Patient Safety Agency (NPSA) safe surgery checklists is strongly recommended.^{36,37}

IR radiographers possess skills in ensuring the best quality images are obtained with the minimum patient dose, and have detailed knowledge of safe and appropriate use of ionising radiation and interventional equipment and procedures. They provide a vital team element for the safe provision of services both in and out of hours and experienced personnel are essential in a functioning unit.

IR nurses possess the skills of a theatre/recovery nurse with a detailed knowledge of the equipment and procedures performed within interventional radiology. This group of staff play a vital role in ensuring safe and successful procedures, in both the elective and emergency settings.

Approximately one-third of patients requiring vascular and non-vascular intervention present as emergency cases and, therefore, both interventional radiology nurse and radiographer rotas are required for 24/7 services.³⁸

Although general anaesthesia is sometimes required, the nature of minimally invasive vascular and non-vascular interventional radiology means that most procedures are carried out with conscious patients who may be sedated. While individual models may vary between units, a minimum requirement for patient safety is the provision of one member of staff who is experienced with the procedures and equipment providing direct scrubbed assistance. Sedation and monitoring of the patient should be provided by a separate member of staff. This does not need to be a member of the radiology staff, but the individual should have competency in sedation and monitoring.³⁸

Healthcare assistants (HCA) with appropriate training and education can provide support for interventional radiology activity. However, such HCA support can never entirely replace that of registered nurses, the absence of who might determine or limit the type of procedure that an individual department can safely perform.³⁸

6. The role of the interventional radiologist

Interventional radiologists are radiologists who have undergone additional specialist training in the practical elements of IR.

Diagnostic radiology remains a vital core element of IR, however, IR practice is significantly different from diagnostic radiology. IR places additional clinical responsibilities on the interventional radiologist for pre-intervention assessment, consent and follow-up.

Most interventional radiologists will work within a team of colleagues to provide an IR service to a hospital or number of hospital units. Interventional radiologists working within both DGHs and teaching hospitals play a vital role in the support of a range of services across the hospital, including acute medical, obstetric and surgical specialties.

IR practice varies significantly between individual units and job plans will be decided by local negotiation, however, careful consideration should be given to the following themes.

- Job planning should take account of all IR activity as direct clinical care (DCC), including sufficient flexibility to support daytime emergency and urgent cases.
- It is not possible to set a fixed ratio of interventional to diagnostic activity due to variations in the services supported. Most interventional radiologists will have a component of diagnostic activity in their job plan and this should help support their IR activity; for example, CT scanning.
- Interventional radiologists have an increasingly important role to play in the provision of on-call services. Time for on-call activity must be included in job plans as part of the programmed activity (PA) calculation during job planning. Many interventional radiologists will provide a first on-call service with limited support from junior staff and will be both the first contact and responsible clinician for the delivery of care. It is important that rotas are sustainable. Larger units should have daily emergency lists to avoid compromising routine sessions.

Interventional radiologists possess the required skills and knowledge to help patients make appropriate treatment decisions, particularly before complex IR procedures. The primary responsibility to ensure that patients have sufficient information to make treatment decisions lies with the interventional radiologist. Patients need adequate time to reflect before and after they make a decision and patient information leaflets are an important method of supporting the consent process. The BSIR produce and maintain a wide range of patient information leaflets which are available at www.bsir.org and www.bsir-qi.com

Interventional radiologists also have responsibility to undertake the clinical assessment, review and appropriate further management of patients – both in an outpatient setting and on the ward.

The establishment of IR clinics with appropriate support staff is recommended to facilitate consent and treatment decisions. Clinical consultation is usually best undertaken in an outpatient environment. An outpatient IR clinic is also useful for post-procedure review in selected cases. In many instances, clinics can be run jointly as one-stop clinics with other specialties.

In addition to the physical resources of space and support personnel, DCC time and flexibility should be made available in job plans to support IR activity. In a recent survey of interventional radiology clinic activity across the UK, 50% of interventional radiologists who responded had IR clinics in place.³⁰

Post procedure, interventional radiologists have an obligation to ensure that they are aware of procedural outcomes and complications. Following an IR procedure, patients should be able to access IR services to advise on and/or deal with any complications. These should be reviewed within audit and morbidity–mortality meetings, and relevant information made available for individual appraisal.

Guidance for quality improvement and standards of practice for individual procedures are available from the CIRSE website (www.cirse.org).³⁹

Outcome follow-up beyond the immediate peri-intervention period is invaluable in demonstrating the true efficacy of a procedure and complication profile of an individual's practice. The episodic nature of IR means that optimal follow-up is best supported by a systematic process, and submission to appropriate registries is of great value.

Follow-up may be delegated to another clinical group with specialist expertise but formal processes are advised to ensure that interventional radiologists remain aware of the outcomes of their interventions.

It is essential that sufficient time is included within job plans to ensure that these duties can be undertaken.

Interventional radiologists support a wide range of clinical services and departments and therefore it will not be possible for an interventional radiologist to regularly attend every specialty multidisciplinary team (MDT) meeting that refers patients to the service. MDT meetings of specialties that make regular referral and treatment decisions should be attended. In many units this will include vascular, renal and possibly oncology meetings. Specialties that do not make regular referral should not require regular attendance, however, sufficient flexibility should be present within job plans to permit attendance when required, and mechanisms in place to ensure access to an IR opinion when required.

7. Training

There is an urgent need to significantly increase the workforce within IR in the UK and train more interventional radiologists for the future within the new subspecialty framework of the RCR. To ensure the high quality of training for future interventional radiologists, consultants in training centres should have sufficient time and resources to ensure adequate supervision of

training as well as sufficient workload and case mix to provide exposure to a range of procedures. The BSIR and RCR propose that an accreditation process should be developed for training centres. Specific dedicated time should be identified in job plans for trainers to ensure the provision of high-quality training programmes in IR (Appendix 2).

8. Registries, audit and quality improvement

Interventional radiologists, like all medical practitioners, have a duty to monitor and improve the quality of their work by regular audit of their practice.

Registries offer a systematic way to monitor outcomes against peers, and submission to appropriate registries should be mandatory.

The BSIR supports a number of registries on specific areas of IR practice such as iliac angioplasty and stent insertion (BIAS)³⁷ and biliary drainage (BDSR).³⁸ In addition, there are several published quality standards that have been published by NICE, the RCR, CIRSE and SIR of which units and operators should be aware when assessing their practice.^{6,8-10,12,27,40}

Interventional radiologists carrying out iliac angioplasty and stenting procedures should note that the BIAS registry is an index procedure registry as defined by the RCR.

Interventional radiologists working within units that contribute to the NHS Abdominal Aortic Aneurysm Screening Programme (England) must submit the results of their endovascular aneurysm repair procedures to the NVR.

Although the submission of data to registries is time-consuming, it is a vital component of monitoring performance. Registry submission can exceed available supporting professional activities (SPA) time and employers should consider administrative support to ensure an accurate and comprehensive submission.

The BSIR has developed a quality-improvement (BSIRQI) programme for IR units that focuses on four key areas: scope of services; providing good quality care; patient focus; and service improvement.

The BSIRQI programme (www.bsir-qi.com) offers units the opportunity to self-assess against specific criteria, and participation is recommended to all IR units.

9. Specialty areas

IR provides treatments across a great number of specialist areas. It is not possible to detail all such areas in this document. We have highlighted three important areas: renal dialysis, vascular surgical and

interventional oncology (Appendix 3). In the future, we intend to expand the content for these areas and add further specific specialty areas.

10. Patient information

Patient information leaflets for common IR procedures are available on the BSIR (www.bsir.org),

CIRSE (www.cirse.org) and SIR websites (www.sirweb.org).

11. Conclusion

Within this document we have demonstrated the pivotal role which IR plays in the delivery of modern healthcare. The clinical and economic advantages provided through increased use of these non-invasive treatments are undisputed and it is vital that their development continues. This requires appropriately trained medical, nursing and radiographic staff as well as appropriate imaging facilities and high-quality interventional X-ray rooms. In addition to providing elective care for a wide range of patients, the need for emergency IR services is widely recognised in the management of trauma, vascular disease and for the control of haemorrhage. Alongside ongoing service reconfigurations, an increase in the number of trained interventional radiologists as well IR nurses and radiographers is required if safe and sustainable out of hours services are to be maintained. The increasingly clinical role played by interventional radiologists requires changes in the way that these doctors are trained and needs to be reflected in the way that job plans are developed. This is also the case for IR

radiographers and nurses whose skills are vital to ensuring the safe delivery of care for patients undergoing interventional procedures. The delivery of high-quality interventional care is paramount and the need for further development of national registries and systematic analysis of outcome data has also been stressed.

In preparing this document, we have attempted to define the current position of IR and summarise the key elements required for future service implementation. We are confident that this publication will serve as an important reference and guide for managers, commissioners and healthcare professionals involved in the planning and delivery of IR services across the United Kingdom.

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Appendix 1. Clinical risk assessment table

Individual healthcare providers may find this table useful to help performing risk assessments for their individual environments.

Unit description	Frequency	Risk descriptor	Urgency of access	Risk mitigation
Acute surgery/medicine	Will occur – common	Upper and lower GI haemorrhage (biliary and urinary sepsis)	<1 hour	On-site IR facility and service. If unavailable, formal transfer arrangements and protocols essential.
Major trauma unit	Will occur – common	Trauma-related haemorrhage	<1 hour	On-site IR facility and service. Formal arrangements and protocols essential.
Maternity units	Will occur – uncommon	Postpartum haemorrhage is the leading cause of maternal death	<2 hours	On-site IR facility and service. If unavailable, angiography-capable mobile C-arm on site as poorer alternative. Formal transfer arrangements and protocols essential.
Vascular surgery	Will occur – common	Acute limb ischaemia Vascular trauma Ruptured abdominal aortic aneurysm (AAA) Deep vein thrombosis requiring thrombolysis or filter	<4 hours <1 hour <1 hour <12 hours	On-site IR facility and service. If unavailable, formal transfer arrangements and protocols essential.
Oncology	Will occur – uncommon	Tumour-related haemorrhage	<1 hour	Ideally on-site IR facility and service. If unavailable, formal transfer arrangements and protocols essential.
Orthopaedics (excluding major trauma)	Will occur – rare	Postoperative haemorrhage	<1 hour	Ideally on-site IR facility and service. If unavailable, formal transfer arrangements and protocols essential.
Urology	Frequent	Ureteric obstruction	<12 hours	Ideally on-site IR facility and service. If unavailable, formal transfer arrangements and protocols essential.
Gastrointestinal	Frequent	Acute obstruction	<24 hours	Ideally on-site IR facility and service. If unavailable, formal transfer arrangements and protocols essential.
Hepatobiliary	Frequent	Biliary obstruction	<24 hours	Ideally on-site IR facility and service. If unavailable, formal transfer arrangements and protocols essential.

Appendix 2. Training

IR gained subspecialty status in 2010. Subspecialty training is over a six-year period with three years dedicated to IR. When followed as part of a prospectively approved training programme, it leads to the award of a certificate of completion of training (CCT) in clinical radiology with interventional radiology subspecialisation CCT in CR(IR). A detailed subspecialty curriculum and description of the assessment process is available on the RCR website (www.rcr.ac.uk/IRcurriculum).

Trainees are appointed to a general radiology national training number (NTN) at year one without specific IR training numbers. Trainees who have an established commitment to IR training may undertake focused individualised training (FIT) during their first three years of training.

Appointment to interventional training for years 4–6 will be made, in most circumstances, by interview halfway through year 3 (the General Medical Council [GMC] requirement is for trainees to be given 3 months' notice of their rotations).

Assessment of competence and completion of training will be made based on satisfactory progression through annual review of competence progression (ARCP) with evidence from a logbook of practical experience and workplace-based assessments.

There is currently no requirement for trainees to have exposure to IR on call as part of their core training. Exposure to IR on call should, however, form a key part of subspecialty training to ensure trainees have adequate experience of the variety of emergency procedures before they take up a consultant post.

The European Board of Interventional Radiology (EBIR) examination was established in 2010. This examination was developed by CIRSE and is endorsed by the European Society of Radiology (ESR) and the European Union of Medical Specialists (UEMS) interventional radiology division.

Applicants must have completed a satisfactory period of training in IR and submit for a written and oral examination. The European Interventional Radiology curriculum was published in January 2013.

The UK and European Interventional Radiology curricula are similar and the BSIR encourage UK trainees to complete the European Board of Interventional Radiology (EBIR) examination in addition to the RCR Fellowship Examination.

Appendix 3. Specialty area

Specialty area: renal

Interventional radiologists provide essential support to renal units, including tunnelled central venous catheter insertion for dialysis, fistula intervention and native renal angioplasty and stent insertion.

As the population ages, the number of patients undergoing dialysis will increase. Approximately 100 patients per million population start dialysis each year, of which 70 will undergo haemodialysis. The safest and most effective form of dialysis is via a surgical arteriovenous fistula. However, dialysis fistula stenosis or thrombosis occurs frequently – at a rate of about 15 per hundred fistula-years – and access to radiological intervention is a mainstay of preserving fistula function.²

Complex interventions to provide venous access for dialysis, secondary to an aging population and longer periods of dialysis, are required more frequently and are likely in the future to require an increasing proportion of IR resource.

Providing support for fistula angioplasty, intervention and central venous access is vital but has significant resource implications. It has been estimated that a minimum of two IR sessions per week are required for every 100 patients undergoing haemodialysis.²

Increasing demand and changes to service provision are reflected in the variability in access for prompt fistula intervention.

The complex nature of the intervention, and frequent patient co-morbidities mean that multidisciplinary team (MDT) discussion prior to intervention is advised.

Specialty area: vascular disease

Interventional radiologists specialise in providing imaging and intervention for patients with peripheral arterial disease. This includes treating patients with trauma, athero-occlusive disease or aneurysmal disease at multiple sites.

Interventional radiologists work within the vascular team which includes vascular and cardiothoracic surgeons, vascular anaesthetists, diabetologists, renal and stroke physicians.

In those patients where invasive treatment is required, decisions about surgical and or interventional radiological treatments are best made at a formal MDT meeting.

Endovascular treatment options have increased particularly for critical limb ischaemia (CLI) and no patient with CLI should ever undergo amputation without discussion at an MDT meeting where there is experience of infrapopliteal intervention.¹³

There have been significant changes to the structure of vascular services and networks in the last few years. Current recommendations from the VS advocate the centralisation of all inpatient arterial surgical intervention and the provision of 24/7 access to vascular specialist intervention.⁴¹

The BSIR support the evidence review by the VS for the centralisation of arterial surgery, however, as has been set out in the 2013–2014 standard contract for specialised vascular services (Adults) (AO4/S/a), this should not apply to all vascular radiological interventions. There are significant opportunities to deliver imaging and a large proportion of elective vascular interventional procedures via networks, particularly day-case angioplasty or stenting (such as infra-inguinal angioplasty or fistuloplasty), within local hospitals. This also helps to maintain skills for delivery of local IR treatments for other non-vascular IR procedures – both elective and emergency. As for all vascular patients, these cases should be discussed at the MDT meeting and there should be agreed local network protocols for the range of appropriate procedures, and rapid patient transfer in the event of a complication, as currently occurs for acute vascular emergencies.

The provision of 24/7 complex vascular intervention can be more safely and effectively undertaken within larger units that can provide all elements required for a comprehensive service. This would require changes to the provision of services by some local hospitals and may require staff to work within alternative structures. Interventional radiologists form a vital part of the 24/7 care for vascular emergencies and should be key members within the specialist team and available within a formal on-call rota.

Improving patient outcomes is supported by submission to appropriate registries including the NVR and BIAS (www.bsir.org).

The BIAS registry permits assessment of a range of outcomes against a funnel plot, which is monitored by the audit and registries committee of the BSIR and is an index procedure registry for vascular interventional radiologists.³¹

Specialty area: interventional oncology

Interventional oncology offers multiple new, minimally invasive techniques which may complement and, in some cases, replace surgery to improve outcomes with reduced costs.

Interventional oncology techniques can be broadly divided into those which are purely palliative, such as stenting of the superior vena cava (SVC), biliary or gastrointestinal tracts to relieve symptoms, or therapeutic where the intention is either to prolong life or sometimes achieve a cure. Techniques may also act as an adjunct to facilitate surgery and/or other medical therapies such as radiotherapy and chemotherapy.

Interventional radiologists should function as part of an MDT which includes medical and radiation oncologists and associated surgical specialties.

Treatment decisions should be made within an MDT where all treatment options can be considered with detailed knowledge of the individual patient's condition and stage of disease.⁴²

Although highly successful, as shown by the BSIR UK Registry of Oesophageal Stenting (ROST) and the recently published BDSR, morbidity and mortality associated with the treatment of these patients may be very high (BDSR mortality 19.8%).⁴³ It is important that clinicians, operators and patients are all aware of these risks so a fully considered risk–benefit assessment can be made with proper informed consent prior to treatment.³⁸

All practitioners should have knowledge of the various treatment options and cancer staging classifications to optimise patient selection. Training in interventional oncology requires a good understanding of the anatomy and knowledge of different imaging techniques, particularly cross-sectional imaging, in addition to specialist training in the use of the different vascular, non-arterial ablative,⁴⁴ and other palliative techniques.

The infrastructure needs to be in place to ensure that interventional radiologists operate within a team of specialist clinicians contributing to decision-making, follow-up and procedural care to ensure patient access to the highest quality of care.

Interventional radiologists are encouraged to participate in appropriate registries such as the BDSR and the selective internal radiation therapy (SIRT) registry.⁴⁵

The supporting data for some IR oncology techniques continues to evolve. Some of these techniques remain experimental and should be continuously evaluated in clinical trials to assess how they compare in outcomes and cost-effectiveness to other surgical and medical therapies.

Glossary

ARCP:	annual review of competence progression
BDSR:	Biliary Drainage and Stenting Registry
BIAS:	British Society of Interventional Radiology Iliac Angioplasty and Stenting Registry
BSIR:	British Society of Interventional Radiology
BSIRQI:	British Society of Interventional Radiology Quality Improvement
CIRSE:	Cardiovascular and Interventional Radiological Society of Europe
CT:	computed tomography
DGH:	district general hospitals
ESR:	European Society of Radiology
EWTD:	European working time directive
GI:	gastrointestinal
HCA:	healthcare assistants
IR:	interventional radiology
IVC:	inferior vena cava
OOH:	out of hours
MHRA:	Medicines and Healthcare products Regulatory Agency
MR:	magnetic resonance
NHSI:	National Health Service Improvement
NICE:	National Institute for Health and Care Excellence
NTN:	national training number
NVR:	National Vascular Registry
RCR:	The Royal College of Radiologists
ROST:	Registry of Oesophageal Stenting
SIR:	Society of Interventional Radiologists
SIRT:	selective internal radiation therapy
UEMS:	European Union of Medical Specialists
US:	ultrasound



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