

Provision
of
Interventional Radiology Services



British Society of Interventional
Radiology

Terminology:

ARCP:	Annual Review of Competence Progression.
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
CT:	Computerized Tomography
DGH:	District general Hospitals
ESR:	European society of Radiologists
EWTD:	European working time directive
GI:	Gastro-Intestinal
HCA:	Health care assistants
IR :	Interventional Radiology
IR's:	Interventional Radiologists
IVC:	Inferior Vena Cava
OOH:	Out of hours
MHRA:	Medicines and Healthcare products Regulatory Authority
MR:	Magnetic Resonance
NHSI:	National Health Service Improvement
NTN:	National Training Number
NVR:	National Vascular Registry
RCR:	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

Index

1. Foreword
2. Working Group
3. Executive Summary
4. Interventional Radiology- the specialty
5. Interventional Radiology Units
6. Interventional Radiology Facilities
7. Interventional Radiology Teams
8. The role of the Interventional Radiologist
9. Training
10. Registries audit and quality improvement.
11. Specialist areas

1. Foreword

Interventional radiology has developed into an innovative and exciting specialty utilizing imaging guidance at its heart with novel and complex technologies to deliver high quality care to patients, often with a significantly reduced risk compared to standard procedures and at a reduced cost. Interventional radiology is increasingly recognized as a vital component of hospital medicine providing life saving care both in and out of hours (OOH) and became a separate subspecialty of Radiology in 2010. Many surgical procedures have been replaced or enhanced by the provision of IR services as well as allowing new treatments for patients which were not previously feasible. The provision of IR services however remains variable with many hospitals having limited and in some instances no direct access to IR services. This is particularly true OOH and a recent survey of units by NHS improvement demonstrated that less than 1/3 of units were able to provide comprehensive OOH IR care potentially putting many patients at risk. The principle causative factor is insufficient numbers of trained IR's a fact which needs to be urgently addressed. This document demonstrates the range of services offered by IR's and sets out the core requirements for the provision of an IR service both in 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 OOH. This document should be used in conjunction with documents relating to IR published by the Royal College of Radiologists, NHS improvement and standards documents published by CIRSE and SIR.

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2.Working Group and Consultation

We would like to thank the following for their time and effort in helping produce this document; Dr D Ettles , Dr I Robertson, Dr N Chalmers. Dr R Uberoi.

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The document will be subject to revision in November 2015.

3. Executive Summary

- 3.1 Interventional Radiology procedures are minimally invasive, targeted treatments performed under imaging guidance that play a vital role in both elective and emergency treatment.
- 3.2 Interventional Radiology procedures can replace surgical procedures as they are less invasive, reducing morbidity and mortality and allowing more rapid recovery.
- 3.3 Interventional Radiology encompasses a large range of procedures and techniques and some hospital sites will not be able to offer all types of treatment.
- 3.4 The development of robust 24/7/365 IR cover should be a priority for all acute hospitals.
- 3.5 Hospital units that undertake acute medical and surgical care should have access to Interventional Radiology techniques, particularly hemorrhage control and nephrostomy drainage, either on-site or by formal arrangement to transfer the patient to the site where the service is available.
- 3.6 Reconfigurations to individual services should ensure that a continuity of access to IR services, particularly for emergency care is maintained.
- 3.7 Services consisting of 6 or more Interventional Radiologists will usually be able to provide a robust and sustainable service and networks/ units should aim for a rota frequency of 1:6. Units covering populations > 800,000 may require rota frequencies of 1:8. .
- 3.9 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.
- 3.10 Interventional Radiologists play an increasing clinical role and job plans should incorporate all aspects of activity including the requirements to

provide outpatient clinics and inpatient clinical support.

- 3.11 Interventional Radiologists have the primary responsibility to ensure that patients have sufficient information to consent for IR procedures and the establishment of IR OP clinics is strongly recommended to facilitate appropriately informed treatment decisions.
- 3.12 The episodic nature of IR means that true follow up of clinical outcomes is best supported by a systematic process and submission to national registries is strongly advised.
- 3.13. Interventional Radiology Nurses and Radiographers provide vital specialist skills to the IR team. Safe and sustainable support for IR services will require similar rota frequencies to the Interventional Radiologist rota.

4. Interventional Radiology- the specialty

- 4.1 Interventional Radiology procedures are minimally invasive, targeted treatments performed under imaging guidance. A wide range of procedures are included extending from treatment of ruptured arterial aneurysms to the treatment of cancer and it's complications.
- 4.2 Interventional radiology procedures often replace open surgical procedures as they are less invasive, reducing morbidity and mortality and allowing more rapid patient recovery and hospital discharge. Over 90% of procedures are undertaken through incisions less than 5mm and most procedures are performed under local anesthesia , often allowing discharge from hospital the same day.
- 4.3 Interventional Radiology 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 treatment available-

Renal dialysis support- now a major component of many IR units including complex venous access, fistuloplasty and fistula thrombectomy (1-3)

Interventional Oncology- Radiofrequency ablation and transarterial

chemoembolization provide minimally invasive treatment options to patients with solid tumors. In addition, treatment of obstructive lesions of both vascular and non-vascular systems can provide invaluable palliation for patients with advanced disease (4-11).

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 (12-17).

Hemorrhage control – IR allows rapid control of hemorrhage by embolization or stent grafting without the morbidity of a open surgical procedure. IR now plays a vital role in trauma and GI bleeding pathways (18-25).

Gastro-intestinal and Hepatobiliary- Palliation of obstruction due to tumors at many site's including bowel and biliary tree as well as direct access to the gut to provide nutrition as an alternative to parenteral nutrition (26-27).

Uro-intervention: Acute and chronic treatment of ureteric obstruction from stone disease and tumors to prevent renal damage as well as treatments of chronic renal stone disease(28).

Other conditions: With the established huge benefits of minimally invasive techniques in providing safe and effective care for patients there is an increasing usage of IR These techniques are also being used to provide, treatment of failing transplants (Liver, Pancreas and Renal) acute and chronic mesenteric ischemia, renovascular disease, and vascular malformations.

5. Interventional Radiology Units

- 5.1 Interventional Radiology encompasses a large range of procedures and techniques and some hospital sites will not be able to offer all types of treatment.
- 5.2 Interventional Radiology Units should clearly define the procedures they undertake within working hours and out of hours to ensure that patient access to appropriate treatment may be maintained.
- 5.3 The development of robust 24/7/365 IR cover should be a priority for all acute hospitals. BSIR has worked with the Department of Health and NHS Improvement to detail the availability of 24/7 IR services in NHS England (29-30). There is substantial variation in access to common IR procedures.

- 5.4 The most frequent IR procedures undertaken as an emergency are arterial embolization to arrest haemorrhage and nephrostomy. Hospitals should prioritize cover for these two procedures. Rarer procedures may need to be provided by referral to a neighboring unit but should not impede the development of cover for the commoner procedures.
- 5.5 Hospital units that undertake acute medical and surgical care should have access to Interventional Radiology techniques, particularly hemorrhage control and nephrostomy drainage, either on-site or by formal arrangement to transfer the patient to the site where the service is available.
- 5.6 Some procedures occur sufficiently infrequently and/or are sufficiently complex that it is not appropriate that all units provide them. Guidance on optimizing training opportunities for low volume procedures is given in “Best Practice in Interventional Radiology” (NHSI/ BSIR 2012) (29-30). Centres covering a small population may be better to develop a formal network with a neighboring unit to permit prompt transfer
- 5.7 It is in the interests 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. Service commissioning should ensure appropriate pathways are established for local and regional services.
- 5.8 Reconfigurations to individual services should ensure that a 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.
- 5.9 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 4 IR should liaise with neighboring units to develop a model of care that will permit robust IR rota's.

Services with between 4-6 IR may be able to provide on call rota depending on the intensity of activity. Most services in this range should consider networking with neighboring units to ensure a more robust long-term service.

Service consisting of 6 or more IR will usually be able to provide a robust 24/7/365 service which is compliant with EWTD. For populations greater than 1 million a 1:8 rota may be more sustainable.

- 5.10 There is a significant shortage of Interventional Radiologists in the UK. Data from the Centre for Workforce Intelligence (England) demonstrated the need of an additional 222 consultants in IR (Table 1). There remains a large number of unfilled IR consultant posts in the UK . Expansion of the number of trainees in Interventional Radiology is urgently required. A continued shortfall will be damaging to both elective and emergency patient care (31)
- 5.11 Units should develop a systematic approach to the collection and assessment of patient outcome data. Recruitment to registries such as BIAS, BDSR and NVR is strongly advised and units should provide appropriate support and periodic local analysis of recruitment.

Table 1

Table 12: Interventional radiologists by trust, England, between May 2011 and March 2012

SHA	total trusts	trusts with data	interventional radiologists	IR needed for 1:5 ratio
North East	8	7	17	18
North West	24	22	75	35
Yorkshire and Humberside	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
	151	147	513	222

Source: National Clinical Director for Imaging, Department of Health (DH, 2012c)

6. Interventional Radiology Facilities

- 6.1 Most interventional units place many implantable devices including stents, venous access devices, and IVC filters. Insertion of these devices require a sterile environment and are increasingly undertaken in clean air environments
- 6.2 Specific MHRA guidance is available detailing the requirements for facilities to support Endovascular aneurysm repair which include theatre quality air exchange, fixed high quality angiographic machine, anesthetic facilities and an appropriate amount of angiographic equipment. These facilities may be optimally provided within the provision of hybrid imaging systems

- 6.3 Non-invasive imaging using US, CT and MR is essential for planning non-vascular and vascular interventions in Interventional Radiology. High quality CT imaging requires access to scanners capable of isometric volume reconstruction at 1mm minimum and appropriate imaging processing software.
- 6.4 Interventional radiology units should have established links and access to day case facilities. Many interventional radiology 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 appropriately utilized.
- 6.5 Interventional radiologists have the 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.

7. Interventional Radiology Teams

- 7.1 Interventional Radiology teams include extended teams of healthcare professionals. Effective team working is essential if the team are to deliver co-ordinated care with task interdependency and the best patient outcomes.
- 7.2 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.
- 7.3 The importance of effective team working cannot be over-emphasized and is reflected in the recent guidance regarding team briefs and surgical pause. Every member of the team contributes to patient safety and adoption of the methodology including in the RCR/ NPSA safe surgery checklists is strongly recommended (32-33).
- 7.4 Interventional 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 ionizing radiation and interventional equipment and procedures.
- 7.5 Interventional Radiographers 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.
- 7.6 Interventional Radiology 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 both in elective and emergency procedures.

- 7.6 Approximately one-third of patients requiring vascular and non-vascular intervention present as emergency cases and therefore both interventional nurse and radiographer rota's are required for 24/7 services (34).
- 7.7 Although general anesthesia is occasionally required, the nature of minimally invasive vascular and non-vascular interventional radiology means that most procedures are carried out with conscious patients, who are often sedated. While individual models may vary between units, a minimum requirement for patient safety is the provision of one member of staff providing direct scrubbed assistance who is experienced with the procedures and equipment. Sedation and monitoring of the patient should be provided by a separate member of staff, this does not need to be a member of radiology staff but should have competency in sedation and monitoring (34).
- 7.8 Healthcare assistants with appropriate training and education can provide support for of interventional radiology activity in a given department. However, such HCA support can never entirely replace that of registered nurses, the absence of whom might determine or limit the type of procedure that an individual department can safely perform (34).

8. The role of the Interventional Radiologist

- 8.1 Interventional Radiologists are radiologists who have undergone additional specialist training in the practical elements of Interventional Radiology.
- 8.2 Diagnostic radiology remains a vital core element of Interventional Radiology however Interventional radiology practice is significantly different than diagnostic radiology. Interventional Radiology places additional clinical responsibilities for pre-intervention assessment, consent and follow-up.
- 8.3 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 DGH 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.
- 8.4 Interventional radiology practice varies significantly between individual units and

job plans will be decided by local negotiation however careful consideration should be made of the following themes.

- 8.4.1 Job planning should take account of all Interventional Radiology activity as DCC including the sufficient flexibility to support day time emergency and urgent cases.
- 8.4.2 It is not possible to set a fixed amount of Interventional to diagnostic activity due to variations in the services supported. Most Interventional Radiologists will have a component of diagnostic activity and this should help support their IR activity e.g. CT scanning
- 8.4.3 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. Many Interventional Radiologists are providing a first on-call service with limited support from junior staff and will be both the first contact and responsible for delivery of care. It is important that rota's designed are sustainable.
- 8.4.4 Interventional Radiologists also have responsibility for undertaking clinical assessment and peri-procedural assessment of in patient work. Sufficient time and flexibility should exist within job plans to ensure this can be achieved.
- 8.5 Interventional radiologists require sufficient clinical time within job plans to ensure that they can comply with appropriate consent process.
- 8.5.1 Interventional Radiologists possess the required skills and knowledge to help patients make appropriate treatment decisions using IR techniques. The primary responsibility to ensure that patients have sufficient information to inform treatment decisions lies with the Interventional Radiologist.
- 8.5.2 Interventional Radiologists are often not the practitioner with primary responsibility for the patient's inpatient care. Some specialist colleagues will have sufficient knowledge of the outcomes, risks and benefits of IR techniques to inform patients, however others will not possess this knowledge. Therefore the provision of adequate time for this clinical activity is vital.
- 8.5.3 Patients need sufficient time to reflect before and after they make a decision especially for complex treatments with significant risks. Interventional Radiologists are often not the practitioner with primary responsibility for the patients care which may create an additional difficulty. 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

- 8.5.4 The process of consent is facilitated by a consultation with an Interventional Radiologist, particularly prior to complex procedures. This is best undertaken in an outpatient clinic setting.
- 8.6. 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 out-patient environment. An out-patient IR clinic is also useful for post procedure review in selected cases.
- 8.6.1 In addition to the physical resources of space and support personnel, direct clinical care time should be made available in job plans to support this activity. A recent survey of IR clinic activity across the UK has shown that approximately 50% of Interventional Radiologists who responded have IR clinics in place (30).
- 8.7 Post procedure, Interventional Radiologists have an obligation to ensure that they are aware of procedural outcomes and complications.
- 8.8 Guidance for quality improvement and standards of practice for individual procedures are available from the Cardiovascular and Interventional Radiology Society of Europe (www.cirse.org).
- 8.8.1 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 true follow up is best supported by a systematic process and submission to appropriate registries is of great value.
- 8.8.2 Follow-up may be delegated to another clinical group with specialist expertise but formal processes are advised to ensure that IRs remain aware of the outcomes of intervention.
- 8.8.3 It is essential that sufficient time is included within job plans to ensure that these duties can be undertaken.
- 8.9. 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 MDT 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 to ensure access to an Interventional Radiology opinion when required.

9. Training

- 9.1 Interventional Radiology gained subspecialty status in 2010. Subspecialty training is over a six- year period with three years dedicated to IR. Successful candidates qualify with the degree FRCR with a Completion of Certificate in Training in Interventional Radiology- FRCR (IR). A detailed subspecialty curriculum and description of the assessment process is available at the Royal College of Radiologists website.
- 9.2 Trainees are appointed to a general radiology training NTN at year one without specific IR training numbers. Trainees who have an established commitment to undertake Interventional Radiology training may approach their local deanery to apply for FIT (Focused Interventional Training) during their first three years of training.
- 9.3 Appointment to Interventional training for year 4-6 will be made, in most circumstances by interview, at the end of year 3.
- 9.4 Assessment of competence and completion of training will be made based on satisfactory progression through training assessments (ARCP) with evidence from a logbook of practical experience and practice -based assessments.
- 9.5 Successful candidates will be awarded the FRCR but will have a certificate of completed training in year six that reflects IR training. The first trainees completed this training programme in 2013
- 9.6 The European Board of Interventional Radiology examination was established in 2010. This examination was developed by the Society of Cardiovascular and Interventional Radiology of Europe and is endorsed by the ESR and the UEMS interventional radiology division. BSIR are a member of the Cardiovascular and Interventional Radiology Society of Europe.
- 9.7 Applicants must have completed a satisfactory period of training in Interventional Radiology and submit for a written and oral examination. The European Interventional Radiology curriculum was published in January 2013.
- 9.8 The UK and European Interventional Radiology curriculum are similar and BSIR encourage UK trainees to complete the EBIR examination.

10. Registries, audit and quality improvement

- 10.1 Interventional Radiologists, like all medical practitioners, have a duty to monitor and

improve the quality of their work by regular audit of their practice.

- 10.2 Registries offer a systematic way to monitor outcomes against peers and submission to appropriate registries is strongly recommended.
- 10.3 The BSIR support a number of registries on specific areas of interventional practice; iliac angioplasty (35) and stent insertion, biliary drainage(36). In addition there are several published quality standards that have been published for guidance by NICE, RCR, CIRSE and SIR which centers and operators should be aware of when assessing their practice (6,8-10,12,27,37).
- 10.4 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.
- 10.5 Interventional radiologists working within units that contribute to the AAA screening programme (England) must submit the result of their endovascular repaired aneurysms to the NVD.
- 10.6 The submission of data to registries is time-consuming but a vital component of monitoring performance. Registry submission can exceed available SPA time and employers should consider administrative support to ensure an accurate and comprehensive submission.
- 10.7 The BSIR has developed a quality improvement programme for interventional radiology units that focuses on four key areas; scope of services, providing good quality care, patient focus and service improvement.
- 10.8 The BSIRQI programme (www.bsirqi.com) offers units the opportunity to self assess against specific criteria and participation is recommended to all interventional units.

11 Specialty areas

Interventional Radiology provides treatments across a great number of specialist areas. It is not possible to detail all such areas. In this document version we have highlighted three areas; renal dialysis, vascular surgical and interventional oncology. In the future, we intend to expand the content for these areas and add further specific specialty areas.

Specialty Areas : Renal

- 11.1 Interventional Radiologists provide essential support to renal units including tunneled central venous access for dialysis line insertion , fistula intervention and native renal angioplasty and stent insertion.

- 11.2 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 most effective and safest 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)
- 11.3 Complex angioplasty and stent insertion, 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.
- 11.4 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 2 IR sessions per week are required for every 100 patients undergoing haemodialysis (2).
- 11.5 Increasing demand and changes to service provision are reflected in a variability to access for prompt fistula intervention.
- 11.6 The complex nature of the intervention and frequent patient comorbidities mean that MDT discussion prior to intervention is advised.

Specialty area: Vascular disease

- 11.7 Vascular radiologists specialize in providing imaging and intervention for patients with peripheral arterial disease. This includes treating patients with athero-occlusive disease or aneurysmal disease at multiple sites.
- 11.8 Interventional Radiologists work within the vascular team which includes vascular and cardiothoracic surgeons, vascular anesthetists, diabetologists, renal and stroke physicians.
- 11.9 In those patients where invasive treatment is required decisions about surgical and or interventional radiological treatments are best made at a formal MDT.
- 11.10 Endovascular treatment options have increased particularly for critical limb ischaemia and no patients with CLI should ever undergo amputation without discussion at an MDT where there is experience of infrapopliteal intervention (13) .
- 11.11 There have been significant changes to the structure of vascular services and networks in the last few years. Current recommendations from the Vascular Society advocate the centralization of all in – patient arterial surgical intervention and the provision of 24/7 access to vascular specialist intervention (38).

- 11.12 BSIR support the evidence review by the Vascular Society for the centralization of arterial surgery however this should not apply to all vascular radiological intervention. There are significant opportunities to network to deliver imaging and a large proportion of interventional procedures, particularly day case angioplasty or stenting in local hospitals away from the hub. This also helps maintain skill's for delivery of local IR treatments for other non-vascular IR procedures both elective and emergency.
- 11.13 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 will require changes to the provision of services by some local hospitals and the need for staff to work within alternative structures.
- 11.14 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 .
- 11.15 Current evidence does not support the centralization of all elective peripheral intervention. Models of service are available that may successfully and safely provide elective peripheral intervention without an on-site vascular unit.
- 11.16 Improving patient outcomes is supported by submission to appropriate registries including the National Vascular Registry and the British Iliac Angioplasty and Stent Registry(WWW.BSIR.ORG).
- 11.17 The BIAS registry permits assessment of a range outcomes against a funnel plot and is an index procedure registry for vascular interventional radiologists (35).

Specialty area: Interventional Oncology

- 11.18 Interventional oncology offers multiple new minimally invasive techniques which may complement and in some cases replace surgery to improve outcomes with reduced costs.
- 11.19 Interventional oncology techniques can be broadly be divided into those are purely palliative such, as stenting of the SVC, biliary or gastro-intestinal 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.
- 11.20 Interventional radiologists should function as part of a multidisciplinary team which includes medical and radiation oncologists and associated surgical specialties.
- 11.21 Treatment decisions should be made within an MDT where all treatment options can

be considered with detailed knowledge of the individual patients condition and stage of disease.

- 11.22 Although highly successful as shown by the BSIR UK registries in oesophageal stenting (ROST) and the recently published BSIR Biliary drainage and stenting registry(BDSR) morbidity and mortality associated with the treatment of these patients may be very high (BDSR mortality 19.8%,). 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 (36).
- 11.23 All practitioners should have knowledge of the various treatment options and cancer staging classifications to optimize patient selection. Training in oncology IR 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 and non vascular ablative and embolization techniques.
- 11.24 The infrastructure needs 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.
- 11.25 Interventional radiologists are encouraged to participate in appropriate registries such as the Biliary Drainage and stent registry and the SIRT registry.
- 11.26 The supporting data for some interventional radiology oncology techniques continues to evolve and some of these techniques remain experimental and should be continuously evaluated in clinical trials to assess how these techniques compare in outcomes and cost effectiveness to other surgical and medical therapies.

Appendix 1

Clinical Risk Assessment table

Individual health care providers may find this table useful to aid performing risk assessments for their individual environments.

Unit Description	Frequency	Risk Descriptor	Risk Mitigation
Acute Surgery / Medicine	Will occur - common	Upper & Lower GI haemorrhage (biliary and urinary sepsis)	On site IR facility and service.If unavailable, formal transfer arrangements and protocols essential.
Major Trauma unit	Will occur - common	Trauma related haemorrhage	On site IR facility and service.Formal arrangements and protocols essential.
Maternity Units	Will occur - uncommon	Post-partum haemorrhage is the leading cause of maternal death	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,	On site IR facility and service. If unavailable, formal transfer arrangements and protocols essential
Oncology	Will occur - uncommon	Tumour-related haemorrhage	Ideally on site IR facility and service. If unavailable, formal transfer arrangements and protocols essential.
Ortho (excl major trauma)	Will occur - rare	Post-operative haemorrhage	Ideally on site IR facility and service. If unavailable, formal transfer arrangements and protocols essential.

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