**INTERVENTIONAL RADIOLOGY IN THE 21ST CENTURY: PLANNING FOR THE FUTURE.**

**Robert Morgan, Trevor Cleveland, Mohamad Hamady, Raman Oberoi, Phil Haslam, Ram Kasthuri, Malcolm Johnston, Ian McCafferty.**

***INTRODUCTION:***

The British Society of Interventional Radiology (BSIR) defines an interventional radiologist (IR – image guided surgeon) as a “clinical doctor who performs image-guided procedures, fully interprets the imaging required to guide and monitor the response of those procedures, as well as providing the pre and post procedural care for those patients receiving imaged guided surgery procedures” **(1).** This definition implies that IRs are skilled not only in IR procedures, but also in diagnostic imaging and clinical practice.

In 2021, Interventional radiology (IR) is a mature discipline, and its provision is widely appreciated by many clinical specialties throughout the hospital service delivering improved outcomes for patients. After more than fifty years in existence, it is timely to reflect on whether the current systems in place for training and the provision of interventional radiology services are sufficiently robust to support the evolution and future of patient centered interventional radiology care.

Interventional radiology is a subspecialty of clinical radiology (CR) under the auspices of the Royal College of Radiologists (RCR). Any discussion around changes to interventional radiology must acknowledge that IRs are also diagnostic radiologists (DR) and that IRs comprise a spectrum of practitioners. This spectrum of practice ranges from a “pure” IR, who may spend the majority of their working life engaged in interventional radiology practice, to radiologists who perform a limited number of interventional procedures, and who do not necessarily regard themselves as an “Interventional Radiologist”. Any aspirations arising from this discussion must take account of all these circumstances and must endeavor to avoid disadvantaging any radiologists, irrespective of whether they consider that they are “interventional” or “diagnostic” radiologists. The aim of this paper is to describe the current challenges faced by interventional radiology and to discuss potential ways forward for the subspecialty and practitioners of interventional radiology.

***CHALLENGES:***

There are several challenges to the delivery of interventional radiology services. These include the training of IRs, workforce provision, clinical practice commitments, access to inpatient beds, day-case facilities, competition, and certification of IR practice.

***IR Training:***Training of interventional and diagnostic radiologists is the responsibility of the RCR. For several years, the pathway for the training of IRs has been a “three plus three” approach i.e., three years of training in clinical radiology, completion of the FRCR examination, followed by three years of training in interventional radiology, using the IR curriculum **(2),** and developing advanced imaging skills. Recently, both the interventional and diagnostic radiology curricula have undergone significant revisions and, having been approved by the GMC, are now being implemented. Both curricula acknowledge a greater clinical interaction with patients and colleagues.

The RCR and BSIR have worked collaboratively for many years, more recently through the development of the RCR Interventional Radiology Committee. Significant progress has led to the development of an amended recruitment pathway for IRs within CR recruitment at the medical and dental recruitment and selection (MDRS) panel, planned to commence in the autumn of 2022.

In the new training pathway, doctors can elect to join clinical radiology training and can preference interventional radiology at ST1 entry. Thus, prospective IRs will be able to indicate from the start of their radiology training that they wish to pursue a career in interventional radiology, and will thereby gain greater access to interventional radiology earlier in their training as compared with the current scheme. The final FRCR will still be required. IRs will still receive training in DR, potentially targeted towards a career in IR, while still enabling them to pass the FRCR examination and obtain the level of image interpretation that is so key to IR practice. Flexibility will be maintained so that there will be an option to transfer from the IR stream to the DR stream at the end of ST3 and vice versa. Years ST4-6 will be spent in subspecialty training in IR using the new IR curriculum as at present.

In summary, the changes described above have the potential to increase the visibility of interventional radiology as a career during the MDRS process. This will hopefully facilitate increased recruitment to IR along similar lines to the core surgical run-through training. With the overall increase in CR NTNs, it is anticipated that there would likely also be a parallel increase in IR numbers, which is needed to deliver the consultant led clinical service. The collaboration between the RCR and the BSIR has enabled this meaningful facilitation for IR trainees to enter a career in IR. Challenges remain for IR training, including a need for further increases in IR numbers with possible dedicated IR NTNs and certification in IR, both of which are discussed below.

***Workforce –*** In common with national shortages of diagnostic radiologists, there are insufficient interventional radiologists to meet the service needs for the increasing range of, and demand for, interventional radiology procedures. The RCR has stated that there should be 1 IR per 64,000 of the population. The 2019 RCR census reported that there is only 1 IR per 100,000 people **(3).** This workforce shortage has adverse consequences for the elective and out-of-hours provision of IR services, as well as adding pressure to the expanding diagnostic workload of CR. While some aspects of IR can potentially be delivered by other associated medical specialties (e.g. advanced radiographic practitioners, physician’s associates and nurses), a further real increase in IR training numbers is needed to satisfy the ongoing increase in demand for IR procedures.

***Clinical Practice*** – The last two decades have seen an increasing requirement for IRs to have a clinical practice commitment to fulfil their roles. This is a reflection of the increasing complexity of interventions, as well as the potential consequences for patients when taking on an IR procedure. Quite rightly, patients expect to consult with a doctor who knows the procedure and its limitations, can potentially deliver it, and can monitor their individual progress. This expectation is reflected in the IR curriculum and GMC guidance. This contrasts with the hitherto mainly procedural nature of interventional radiology practice. In addition to performing the IR procedure itself, there is now an expectation that IRs must be closely involved in pre-procedural assessment, the consent process, and follow-up both after the procedure and subsequently post discharge. **(4,5,6).** This commitment requires time allocated in job plans for the IR, and can be a source of potential friction between radiology department leads and IRs. Clinical practice commitments also require access to dedicated clinical rooms in which to conduct clinics, consent and pre-assessment of patients. Access to dedicated IR inpatient beds is also essential to accommodate patients when their specific procedure necessitates inpatient care pre and/or post procedure (see below). There is, of course, tariff income to off-set these commitments, but these may not be directly obvious to radiology departments, and may not effectively reimburse the loss of other diagnostic time.

***Access to inpatient beds-*** Many patients referred to IRs for image guided surgery need an overnight stay post- and/or pre-procedure. Although many patients referred for inpatient IR procedures are accommodated on the ward of the referring clinical specialty, there are many patients who fall outside this scenario, and for professional and patient safety issues, IRs need access to hospital beds for their patients. While this may not be problem for some IR departments, other IRs may have significant difficulty in accessing overnight beds. The reasons for this are usually a combination of poor collaborative relationships with other clinical colleagues and resistance by Trust management to facilitate this.

***Day-Case facilities*** – Related, though slightly different, to inpatient bed access is the provision of adequate facilities to cater for patients undergoing day-case (ambulatory care) interventions. The 2020 Radiology GIRFT report stated that “all radiology services should have access to dedicated facilities to admit and discharge day case patients for interventional procedures” **(7).** Although many departments already have day-case facilities, many others either do not have an interventional radiology day-case area or have insufficient space and/or personnel to provide a comprehensive day-case IR service. Improving day-case facilities (or implementing day-case facilities where there are none), requires finance, space and resolve by Trust management.

***Competition –*** With the increasing range, acceptance and applicability of IR procedures, it is not surprising that other non-imaging clinical specialties have started to do procedures that have traditionally been regarded as IR procedures. Although a source of dissatisfaction among IRs concerned about invasion of their “turf”, IRs do not have a monopoly of imaging equipment or the IR procedures that the possession of imaging equipment allows practitioners to perform. What they do have is the unique imaging knowledge that allows them to practice these procedures with accuracy and safety. Nevertheless, there is a potential that other clinical specialties performing IR-type procedures opens the risk that the number of IR procedures performed by IRs, particularly the more attractive ones, will gradually reduce. This would leave the least popular procedures for IRs to perform as the default provider. This might lead to a reduction in the numbers of doctors who wish to train in IR, with adverse implications for in- and out-of-hours IR services at Trusts across the UK. To counteract this, IR needs to have an infrastructure within Trusts that allows research, development, and mandatory outcome measurement to ensure and document a high quality and safe service. It is also incumbent upon IRs to deliver the full range of procedures to ensure that as few gaps as possible exist, and to ensure that patients have good access to these interventions.

***Certification and accreditation –*** Common sense dictates that doctors who perform procedures must be qualified to perform them. In the majority of clinical specialties, clinicians must pass an examination after their training to show that they have satisfied basic training standards - i.e. accreditation - required to allow them to practice on patients safely. Some specialties also require repeat examination after several years of practice – reaccreditation, although this is more common in North America. Interventional radiology is unusual among procedural disciplines in the UK in that it does not require its trainees to undergo assessment by examination prior to entering clinical practice. A specific examination in IR at the end of training would provide concrete evidence of training in IR, which would help potential employers, and would also assist in issues of competition with other specialties/credentials where these arise.

***POTENTIAL SOLUTIONS:***

The preceding account of the challenges faced by interventional radiology/radiologists implies that solutions to all the problems must or can be found. However, the heterogeneous nature of interventional radiologists (pure vs DR with an interest in IR vs DR who do occasional IR procedures) and the intimate relationship of interventional radiology to diagnostic radiology and the RCR, raise the concern that some solutions will not please everybody and may alienate some BSIR and RCR members. While progress is needed, it needs to be as inclusive as possible.

***Specialty status:*** Although IR is a subspecialty of Clinical Radiology, many IR societies in other countries have become specialties in their own right. This was advocated by the Cardiovascular and Interventional Radiology Society of Europe in 2014 **(8)**. Many IR societies worldwide have already achieved specialty status including the USA and Canada.

Specialty status may improve IR’s ability to determine its own future in terms of clinical practice, governance, training, and certification. Moreover, specialty status may improve the ability of interventional radiology to counteract many of the challenges described previously.

However, an IR specialty in the UK would likely create its own problems. Interventional radiologists would have to choose which was their primary specialty – IR or DR? One model suggested would be that IRs could be affiliated to both specialties of DR and IR. However, in discussion with RCR, many IRs and DRs have indicated that creating an IR specialty might cause as many challenges as those that an IR specialty is intended to resolve.

In 2018, the membership of the BSIR voted to seek specialty status for interventional radiology. In responding to this stated desire, subsequent negotiations with the RCR and the General Medical Council (GMC) (the body that awards specialty status), made it clear to the BSIR leadership that Specialty status would be achieved only with difficulty and at a risk of alienating many radiologists (interventional and diagnostic). Moreover, the GMC informed the BSIR that approval for specialty status, by any discipline, would be declined in the current climate and was contrary to planned direction of travel of UK training.

It is, therefore, evident that in 2021, there is no realistic pathway to specialty status for IR. The 80% majority vote by BSIR members in 2018 demonstrates the desire to act as a specialty with all of the ensuing clinical and managerial responsibilities. We thus need to consider what can be done to achieve these stated desires, and to address above described challenges under the current structures, which would allow the evolution and sustainability of IR.

***IR Training and Workforce:***

Asdetailed above, through collaboration the RCR and the BSIR have made significant progress and as a result separate (closely allied) streams of training have been created for IR and DR with the option to move across from one pathway to the other after the FRCR examination has been passed. Moreover, IR training numbers, alongside DR numbers, are likely to be increased in 2021 and onwards. In association with the recognised requirement for increased numbers of all radiologists, whether IR or DR, this increase in NTNs must be considered by the RCR and BSIR as an aspiration to lobby government for an annual and sustainable progressive increase in IR and DR trainees. Ongoing efforts by the RCR working with the BSIR will need to be made to achieve this. Encouragingly, the process has started.

***Clinical Practice, Access to inpatient beds, Day Case facilities:***

In many ways, these three challenges are interlinked. All three issues require a recognition by radiological, clinical, and managerial colleagues at Trust, Regional and National level that the practice of interventional radiology has changed and that interventional radiologists have a significant clinical responsibility in addition to procedural skills.

It is a reality that not everybody who performs an IR procedure also wants to have clinical practice responsibilities. However, the requirement for a proper consent process is universal and is a fundamental clinical practice that all doctors who undertake IR, or any other invasive procedures perform. In modern medicine, patient safety is paramount and it is mandatory that practitioners performing a procedure are best placed to manage any ensuing complications (with help as necessary).

To fulfil the requirements for access to clinic space, access to inpatient beds, and dedicated IR day case facilities, IRs will likely need help to obtain these resources. In general, such facilities can only be achieved by local negotiation. However, supportive national and international guidance documents, alongside GMC requirements of Good Clinical Practice, will be key factors to assist local discussions. There is already guidance that IRs can cite regarding clinical practice, inpatient beds and day case facilities. New European guidelines on clinical practice for IRs have just been published and should be used by IRs in negotiations with their Trusts **(5).** The BSIR is in the process of producing a guidance document on day case facilities and inpatient bed access to assist IRs at a local level. Finally, the BSIR will soon produce an updated edition of the UK Provision of IR Services document, which will include persuasive statements for all three essential components of IR provision.

***Competition, Certification and Accreditation:***

These are also interlinked to a degree. The absence of a recognised examination in IR leading to a certificate of knowledge and competency in IR in the UK means that in theory any radiologist who acquires a CCT in Clinical Radiology can commence a consultant post with either a minor or even a major component of IR. Other clinical disciplines who also wish to perform IR procedures see no reason why they should not do so, in part because of the absence of a recognised UK certificate in IR. In the future there may be competition through credentialing processes. This contributes to competition between specialties for a variety of IR procedures. This absence of an examination to certify accreditation in interventional radiology leaves IRs at a disadvantage when competition arises with other disciplines. Although exclusion of other specialties from procedures that were created by IRs is not desirable or achievable, efforts could be made to produce a recognised standard to signify that competency in IR has been achieved by practitioners of IR procedures.

Although not the complete solution, an examination in IR at the end of training would be beneficial to certify competency in IR. This would also help to promote patient safety by ensuring that IR practitioners had undergone a recognised standard of training in IR and may act as a tool to counteract competition.

The Cardiovascular and Interventional Radiology Society of Europe implemented its own examination, the European Board of Interventional Radiology (EBIR), in 2010. The EBIR is now taken by IRs all over the world including many IRs from the UK. However, the EBIR is not a UK examination and is not required at completion of IR training in the UK. This could be changed so that the EBIR is a requirement for completion of training by UK IR trainees. This would require both the RCR and the BSIR to officially adopt the EBIR as the exit examination for UK IR trainees and to mandate its sitting by all UK IR trainees at completion of IR training.

Alternatively, the RCR in collaboration with the BSIR could design and implement a specific UK IR examination. However, examination creation is a not insignificant undertaking and is demanding of resources, both intellectual and financial. The EBIR is a mature examination that has undergone continuous modification and improvement over the past 11 years. Adopting the EBIR for UK IR trainees would be reasonably straightforward, compared with creating a brand-new examination. It would also have the benefit of transferability internationally for trainees, but would have the drawback of being not specific to UK practice.

While there are other measures that may be useful to IRs to counteract competition from other specialties such as clinical practice guidelines, a dedicated examination and certificate of IR competency and knowledge would be very beneficial for interventional radiologists and interventional radiology going forward. BSIR would propose that we continue meaningful dialogue with the RCR within the RCR IR committee to explore these options.

**Conclusions:**

Interventional radiology has come a long way since the first catheter-based procedures in the 1960s. Any changes to professional practice conditions for IRs that are to be made going forward should be to the advantage of all practitioners of IR procedures, whether they spend all of their time in IR or just perform occasional IR cases. Moreover, it is important for any changes not to impose adversely on our diagnostic radiological colleagues. In the main, IRs and DRs work in harmony alongside each other for the benefit of patients and this must continue. IR remains strong due to its origins and knowledge in diagnostic radiology, and the BSIR strongly supports the ongoing relationship with the RCR and remaining within Clinical radiology. We believe that diagnostic radiologists also believe that the RCR family should remain united.

However, we must acknowledge that changes are required to ensure the maintenance of the practice of IR procedures by interventional radiologists and by doing these within the RCR community we will remain strong as a clinical radiology specialty. As discussed above, the main desirable changes and solutions are: 1. an annual incremental increase in IR trainee numbers, 2. improved ease of access to facilities for clinical practice, day case procedures and inpatient beds, and 3. the implementation of an examination at the completion of IR training to signify competency and knowledge in IR, which could easily be achieved by adopting the CIRSE EBIR examination.

**REFERENCES**

1. British Society of Interventional Radiology. Available at <https://www.bsir.org/society/what-is-the-bsir/#col_right>. (Accessed 10 April 2021).

2. The Royal College of Radiologists. Interventional Radiology Specialty Training Curriculum. 2019.

Available at: <https://www.rcr.ac.uk/clinical-radiology/specialty-training/curriculum/interventional-radiology-curriculum>

3. Clinical Radiology Workforce census 2020 report. RCR 2021,

<https://www.rcr.ac.uk/system/files/publication/field_publication_files/clinical-radiology-uk-workforce-census-2020-report.pdf>. (Accessed 10 May 2021).

4. British Society of Interventional Radiology and the Royal College of Radiologists. Provision of Interventional Radiology Services. Second edition. 2019. Available at https://www.rcr.ac.uk/publication/provision-interventional-radiology-services-second-edition

5. Mahnken A, Seoane EB, Cannavale A, de Haan MW, Dezman R, Kloeckner R, O’Sullivan G, Ryan A, Tsoumakidou G. CIRSE Clinical Practice Manual. Cardiovasc Intervent Radiol 2021; 44: 1323-1353.

6. SIR Global statement defining Interventional Radiology. J Vasc Interv Radiol 2010; 21: 1147-1149.

7. Radiology GIRFT Programme National Specialty Report. 2020. Available at: https://www.gettingitrightfirsttime.co.uk/reports/radiology-girft-report/

8. Lee ML, Belli AM, Brountzos E, Morgan R, Reekers JA Specialty status for interventional radiology: the time is now. Cardiovasc Intervent Radiol 2014; 37: 862.