Article:
Jenkins, P, MacCormick, A, Harborne, K et al. (4 more authors) (2022) Barriers to research in interventional radiology within the UK. Clinical Radiology, 77 (12). e821-e825. ISSN 0009-9260

https://doi.org/10.1016/j.crad.2022.08.146

Introduction

Since its inception in 1964[1], Interventional Radiology (IR) has pioneered innovative procedures and techniques which have led to its rapid expansion. IR is now embedded in the treatment pathways for many conditions such as trauma, vascular disease and oncology which should only occur in the presence of evidence. Supporting high calibre research is central to a speciality's survival, especially with more informed patients, increased scrutiny, tighter financial constraints and competition from other specialties. Developing IR led research is paramount to shift the perception of IRs as solely proceduralists to being seen as a complete clinician, taking full responsibility for the patient's diagnostic work-up, management decisions and follow-up.

Despite the introduction of countless novel procedures, the evidence base in IR has not caught up to traditional surgical specialties, with the absence of high-level evidence to support some areas of IR practice. Recently, there has been considerable improvement with landmark studies such as the UK-ROPE[2] and BASIL[3] trials showing the value of IR therapies, however these have often been led and co-ordinated by other specialties with IRs often not playing a major role in the research activities. Without evidence, IR therapies will be challenged and IR will struggle to compete with established treatments, develop services, obtain research funding and garner support from referring clinicians. As a specialty, IR needs to develop a greater academic presence to ensure the longevity of the specialty.

The number of research active academic interventional radiologists within the UK is unknown and suspected to be low, with the authors estimating less than 10 University-funded clinical academics in IR. The recent announcement of the National Institute of Health Research (NIHR)

Senior Investigator appointments had no radiologists[4] and out of the 367 listed previous investigators there were no interventional radiologists (IRs)[5].

A parallel with Emergency Medicine can be drawn, also a relatively young specialty (with their Royal College only established in 1993)[6], which has grown at a fast pace with particular focus on utilising new and innovative technology, however the academic output from emergency medicine has flourished, with a large network of journals, established academics, ACF's and trainee-led research networks producing high caliber research[7]. In a similar vein, the relatively new specialty of vascular surgery also has a strong track record in research, having emerged from general surgery where there is already an established research culture. In contrast, IR currently faces more challenges due to a lack of patient ownership, variability of practice, and at times too much focus on the technical procedure rather than the holistic management for a patient, which highlights some perceived barriers to the development of academia within the specialty. Similarly, within clinical radiology as a whole, research is not as ingrained as other specialties and there remain significant barriers to research[8]. We aim to identify barriers to being involved in IR research, where different challenges exist, and advocate potential solutions to advance and support IR academia within the UK

Methods

Data Collection

An electronic survey was compiled using Google Forms, approved by the [redacted] and distributed to [redacted] Trainee members by email on 15th October 2021 and remained open for 2 months. The questionnaire remained open until after [redacted] and trainee day on [redacted]. This was also shared on the social media platform [redacted] account to

access. The target audience for this survey were IRs from all stages of training, including junior trainees, IR fellows and consultants, however medical students and foundation doctors were also included. Questions regarding research experience, qualifications, academic publications and career intent as well as the perceived barriers to being involved in research in IR. The sample questionnaire is provided in appendix 1. Data was analysed in Microsoft Excel 365.

Results

A total of 106 responses were received from the invited participants. The greatest proportion of responses were from junior radiology trainees (42.5%) and senior radiology trainees (25.5%). This was closely followed by consultants (18.9%), foundation trainees (7.5%) and medical students (5.7%).

83% of respondents (88/106) had not undertaken any postgraduate research qualifications and of the 18 who had, only 5 had undertaken a PhD and 2 an MD, with the remainder undertaking a Masters in research. 56.4% (44/78) of respondents stated that they would be interested in undertaking clinical research training leading to a PhD or MD.

The majority of respondents had led a retrospective audit (89.6% (95/106), with 57.5% (61/106) having led a retrospective research project. Only 22.6% (24/106) of respondents stated they had led a prospective research project. 73.6% (78/106) of respondents had been a named author on a paper in a peer reviewed journal. Of the 77 who responded to the follow up question, the majority (57.1%) had published within radiology specific journals with only 24 (31.2%) publishing within an IR specific journal. Over half (50.6%) of respondents (50.6%) had published within a surgical journal. Table 1 provides an overview of the type of journals published within.

Respondents were asked how confident they would be in leading a research project from the start, with 0 representing 'not confident at all' and 5 representing 'very confident'. The median response was a 2, indicating an overall lack of confidence. Similarly, respondents felt unconfident to progress a research project within their local department (median score 2). Despite this 81.1% planned on being involved in research within their future career. The main barriers to research identified are listed within Table 2 with lack of time, lack of senior supervision and lack of research experience being given as the top three items. The main reasons for wanting to be involved in research were 'in search of new knowledge', 'personal development' and 'moving the specialty forward'. These are highlighted within Table 3.

Discussion

The results of this study highlight significant interest in research amongst radiology trainees and consultants, however, numerous barriers which hinder research activity and output in IR should be addressed.

Firstly there was a paucity of respondents who had undertaken a postgraduate qualification in research. Although this is not a requirement to be involved in research, the skills and experience that can be gained through the completion of a Masters in Research or an MD/PhD can be of paramount importance to ensure high quality research is undertaken, establish a robust research infrastructure and develop an academic culture. These skills may include critical appraisal, academic writing, statistical analysis and understanding of clinical trial design. Unsurprisingly, there was a general lack of confidence from respondents in their ability to lead a research project from the start given the lack of formal research training.

More should be done to encourage IR trainees to undertake research degrees by addressing funding and accessibility issues. Greater focus should also be placed towards conducting meaningful research studies instead of less impactful audits amongst the trainees which are sometimes done as a tick box exercise.

The overwhelming response from trainees is that there is enthusiasm towards research which is not matched by designated research orientated pathways nor a standard requirement for a consultant job. These factors lead to a lack fo academic IRs in the UK, both at trainee and consultant level. The majority of Academics are in a honorary position which does not provide designated time for research, nor require PHD candidate supervision, where much research is created. Designated chairs are required to be created to promote the research through PhD / MD supervison and expand the next generation of IR research.

The lack of availability of academic supervision by senior interventional radiologists is concerning. Trainees who wish to undertake higher degrees in research should consider approaching allied medical specialties such as Oncology, Surgery, Cardiology and Emergency Medicine to support their academic development within IR. Imaging based research opportunities are growing with the advent of artificial intelligence, big data and predictive imaging biomarkers. It is important that trainees are supported by both radiologists and other specialties to undertake these projects which will also help promote cross-specialty research.[9-11]

The required research support from outside of IR is reflected in the types of journals that the respondents are publishing within with the most common journal to publish in being radiological themed. However a large proportion of papers have also been published in surgical journals, in contrast to the smaller number published within IR specific journals. This

may be due to the wider availability and range of higher impact surgical journals in which to publish. Currently, no UK based IR-specific journal is available, and developing one would potentially increase the accessibility of publishing and communicating scientific findings for the UK IR community.

In addition to support and experience, time was identified as a key barrier. One radiology-specific reason for this is the radiology fellowship examination structure, notorious in their difficulty, frequency and how early on in training they must be taken, leaving minimal time for research[12]. Following exam completion, there is a relatively short period of time to upskill clinically in IR whilst retaining diagnostic skills before applying for consultant posts. The Royal College of Radiologists (RCR) has commenced a new direct entry route into IR for prospective radiology applicants, a step towards IR becoming a separate specialty as seen in the USA[4]. This may help to recruit interested candidates who had previously considered surgical specialties and with the early IR exposure, they may be more engaged with IR research earlier in their training. The 2021 RCR IR curriculum also reiterates the need for all to have research experience as a pre-requisite for completion of training which hopefully renews the focus on academia within IR training and translates to subsequent increased academic productivity within the UK IR community.

Senior trainees and consultants highlighted lack of time as a key barrier to conduncting research, partly due to a heavy workload from understaffed rotas. Currently there are also no dedicated IR Academic Clinical Fellows (ACF's) to give trainees dedicated time to conduct research, and those who do choose to undertake higher research training will likely undertake projects with limited IR applicability and are supervised by diagnostic radiologists or clinicians from other clinical specialties. Addressing the IR consultant workforce shortage through

138 increasing training numbers will also free up more time for research. In addition, developing
139 a shift in culture to prioritising research that supports holistic patient care rather than
140 focusing too much on the technical procedural part will also be beneficial. Funding for
141 protected research posts and research programmed activities should be encouraged by
142 employers, improving the attractiveness of the specialty. In the longer term, the aim would
143 be to develop dedicated tenured university posts for IRs who would be able to mentor and
144 support future academic trainees. The value of additional support from research nurses and
145 clinical trials units cannot be emphasised enough, but both ultimately come with financial
146 cost, however early engagement with such services will improve the quality of IR research.

147 The newly formed UK National Interventional Radiology Trainee Research (UNITE)
148 collaborative,[13] an IR trainee led research network, provides another platform for multi-
149 centre IR projects which can stimulate early academic interest. Similarly, increasing
150 awareness of NIHR research pathways, even for established consultants, will help IRs identify
151 tailored options for them to be more involved with research. Calls for funding towards IR from
152 the NIHR, RCR and other research societies would be welcomed, specifically targeted towards
153 increasing the availability of supervision and support for trainees interested in research. The
154 development of the NIHR principal investigator (PI) program, which provides early career
155 researchers with on the job academic training opportunities by working closely with a local PI
156 on a research study, is another way for IRs to obtain practical experience and mentorship[14].

157 Additional funding avenues should be promoted amongst the IR community including
158 research bursaries aimed at pump priming[15] and small research grants to enable clinicians to
159 gain experience in grant application and help develop initial ideas that may lead to larger scale
160 externally funded studies. One research approach is using available registry data, such as the

National Vascular Registry (NVR) or other societal or industry led registries which may foster further collaboration which brings additional funding from the relevant device or pharmaceutical company.

This survey demonstrates that although there are still significant barriers to IR research in the UK, tremendous enthusiasm does exist. Respondents highlighted the interest in moving the specialty forward, development of new knowledge and personal development. Over half of respondents stated they would like to undertake an MD or PhD and 81% planned on being involved in research during their career. Whilst this is only aspirational, this does highlight the interest for research which we hope will continue to drive IR towards an evidence-based specialty if supported well.

The main limitation of this study is that it only represents a snapshot of UK IR's and trainees. The questionnaire was intended for trainees with a desire to undertake IR training, not only those in a formal IR training post, therefore due to the subjectivity the respondents may have self-identified, particularly without IR dedicated ST1 trainees, it was difficult to define a junior IR trainee. In addition, this is a self-selecting group, who are likely to respond to a questionnaire about research if they are interested in research. This does, however,

demonstrate a strong interest in research within this community and highlights the barriers that are perceived by even the most enthusiastic of researchers which need to be addressed.

Suggested actions

1. The development of a specific UK IR journal
2. NIHR IR specific funding calls and further development of the NIHR PI scheme towards IR
3. Increasing awareness of the [redacted]
4. The development of trainee research networks within IR – Such as UNITE
5. The recent development of an IR research fellow to enable registry data to be analysed
6. RCR to highlight radiology research opportunities e.g. 1 year research fellowships, dedicated IR research grants and PhD funding
7. RCR to encourage more trainees to be involved with research during training e.g. through new curriculum
8. Push towards creation of IR dedicated tenured university posts

Conclusion

An urgent need to support the development of research within interventional radiology is called for. The enthusiasm by trainees (in particular) to be involved in research and undertake additional research training is encouraging, however, this needs to be matched by support from trusts, societies and the Royal College. IR's may need to consider looking towards allied specialties for support and collaboration in developing a research portfolio.

187

188

References

1. Dotter, C. Judkins M. Transluminal Treatment of Arteriosclerotic Obstruction Description of a New Technic and a Preliminary Report of Its Application. Circulation. 1964 30:654–670.

2. Ray AF, Powell J, Speakman MJ, et al. Efficacy and safety of prostate artery embolization for benign prostatic hyperplasia: an observational study and propensity-matched comparison with transurethral resection of the prostate (the UK-ROPE study). BJU Int. 2018 Aug;122(2):270-282.

3. Bradbury AW, Adam DJ, Bell J. Bypass versus Angioplasty in Severe Ischaemia of the Leg (BASIL) trial: An intention-to-treat analysis of amputation-free and overall survival in patients randomized to a bypass surgery-first or a balloon angioplasty-first revascularization strategy. J Vasc Surg. 2010 May;51(5 Suppl):5S-17S.

4. National Institute for Health Research. NIHR Senior Investigators 2021. 2021 Available at https://www.nihr.ac.uk/documents/nihr-senior-investigators-2021/26864 accessed 21/3/22

5. National Institute for Health Research. Senior investigator Directory 2022. Available at https://si.gmg-is.co.uk/home. Accessed 21/3/22

6. Williams DJ. Brief history of the specialty of emergency medicine *Emergency Medicine Journal* 2018;35:139-141.

7. Cottey L, Roberts T, Graham B, et al. Trainee Emergency Research Network (TERN) and Paediatric Emergency Research in the UK and Ireland (PERUKI)*, et al* Need for recovery amongst emergency physicians in the UK and Ireland: a cross-sectional survey *BMJ Open* 2020;10:e041485.

8. Chan N, Gangi A, Kamaledeen S, Pantelidou M, Brown P. RADIANT: the Radiology Academic Network for Trainees Clinical Radiology, Volume 75, Issue 11, 813 - 814

9. O'Connor, J., Aboagye, E., Adams, J, et al . Imaging biomarker roadmap for cancer studies. *Nat Rev Clin Oncol* 14, 169–186 (2017).

10. deSouza, N.M., Achten, E., Alberich-Bayarri, A, et al. Validated imaging biomarkers as decision-making tools in clinical trials and routine practice: current status and recommendations from the EIBALL* subcommittee of the European Society of Radiology (ESR). *Insights Imaging* 10, 87 (2019).

11. S Sangha, A Gupta, K Negishi, F Pathan. The reporting of reproducibility of cardiac imaging biomarkers, *European Heart Journal*, Volume 41, Issue Supplement_2, November 2020, ehaa946.3549.

12. RCR, 2021. Clinical radiology exams. available at https://www.rcr.ac.uk/clinical-radiology/exams, accessed 4/1/22

13. Mandal I, Zhong J, Borchert R, et al. The UNITE Collaborative: Early Experiences of Introducing Collaborative Trainee Research to Interventional Radiology in the United Kingdom. Cardiovasc Intervent Radiol. 2021 Oct 19:1–2.

14. NIHR. 2021. Associate principle investigator scheme. Available at https://www.nihr.ac.uk/health-and-care-professionals/career-development/associate-principal-investigator-scheme.htm accessed 4/1/22

15. BSIR Education & Research Committee 2021/22. (2022). BSIR bursaries 2022. Available at: https://www.bsir.org/society/bsir-bursaries-2022/#use-of-research-funds. accessed 4/1/22

Table 1

Respondents were asked what type of journals they had published in

Type of journals published within.	Responses (%)
Radiological themed	44 (57.1%)
Surgical	39 (50.6%)
Interventional radiology	24 (31.2%)
Organ specific	16 (20.8%)
Basic science	11 (14.3%)

Table 2

Respondents were asked what they felt the key barriers were to their engagement within IR research

	Responses (%)
Lack of Time	68 (64.2)
Lack of Research Experience	65 (61.3)
Lack of Senior Supervision	62 (58.5)
Lack of Funding	58 (54.7)
Lack of Supporting Administrative Staff	45 (42.5)
Unable to Gain Access to Required Data	27 (25.5)
Lack of Support from Allied Specialties	23 (21.7)
Lack of Personal Interest	17 (16.0)

Table 3

Respondents were asked the main factors that made them interested in research

	Responses (%)
Search for new knowledge	82 (77.4%)
Sense of personal development	71 (67%)
Move the specialty forwards	70 (66%)
Prestige	21 (19.8%)