

# Understanding the Awareness, Knowledge and Perceptions of Interventional Radiology Amongst Undergraduates in the UK

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## Abstract

**Introduction** The role of interventional radiology (IR) in health care is rapidly expanding in the United Kingdom (UK). However, the presence of IR in the current undergraduate curriculum is lacking.

**Purpose** This study investigates the awareness, knowledge and perceptions of IR in undergraduates through the clinical years of medical school to suggest future interventions.

**Methods** A total of 360 questionnaires, designed to test undergraduates' knowledge of, and exposure to, IR were

distributed over a 14-day period in a UK medical institution.

**Results** Of the 312 respondents (86.7%), the majority had never formally shadowed a radiologist (65.4%) or encountered teaching from an interventional radiologist (54.5%). Most students (88.5%) felt their knowledge of IR was lower than other specialties. Students' knowledge of IR procedures did not statistically increase through the clinical years. Students were most cognisant of vascular procedures and least aware of IR's role in oncology. Only 10.9% would consider a career in IR, with 39.7% citing the lack of knowledge and 18.6% citing patient contact as the top reasons for this.

**Conclusion** Current students have poor exposure to IR through the undergraduate curriculum. Consequently, there is no increase in knowledge of IR clinical practice through the clinical years. Multi-level interventions, incorporating universities and radiological societies are required to increase undergraduate awareness and promote IR as a career.

**Level of Evidence** Level 3, Local non-random sample.

**Electronic supplementary material** The online version of this article (<https://doi.org/10.1007/s00270-019-02234-5>) contains supplementary material, which is available to authorized users.

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## Introduction

Interventional radiology (IR), recognised as a subspecialty in 2010, is rapidly growing in its breadth of techniques and procedural workload [1]. Consequently, there is an increasing gap between staff supply and demand, both in and out of hours [2]. Driving IR awareness in medical students, as future practitioners and referrers, is a key to encouraging recruitment in this field. Despite a growing body of evidence to support this notion, IR remains under-represented in the undergraduate curriculum [3, 4]. As a result, the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) published “Interventional Radiology Curriculum for Medical Students” in 2012 to provide an undergraduate IR syllabus [5].

Whilst the awareness of IR amongst undergraduates of varying seniority levels has been studied in multiple institutions across several countries, this study is the largest of its kind to investigate IR awareness amongst undergraduates, stratified by year, at a single medical institution in the United Kingdom (UK) [6–8]. This study does a unique comparison of undergraduate medical students across different years, to assess whether IR awareness and knowledge is developed over the course of the clinical years at a UK medical institution, and how perceptions of IR influence the decision of students to pursue it as a future career. An in-depth understanding of this is required to pinpoint deficits in knowledge and strategically place interventions.

## Materials and Methods

A total of 360 questionnaires (120 questionnaires per year group) were distributed to medical students in their clinical years over a 14-day period. Verbal consent was obtained from all participants. The survey consisted of 13 questions divided into the following subcategories: knowledge of IR and its training pathway, exposure to IR in clinical years and perceptions of IR clinical practice (Supplementary Material Appendix: Figure 1). Participants were informed that the survey was anonymous, and all information was unidentifiable; answers would have no bearing on current or future assessments, and individual answers would not be disclosed or shared outside of the study’s investigators. Due to the nature of the study, no ethical approval was required from the Health Research Authority or the Local Research Ethics Committee.

All the data were collated into a spreadsheet and analysed using STATA software, version-13 (2013). All categorical data were tested using the chi-square or fisher’s exact test. A  $p$  value of  $< 0.05$  was considered significant.

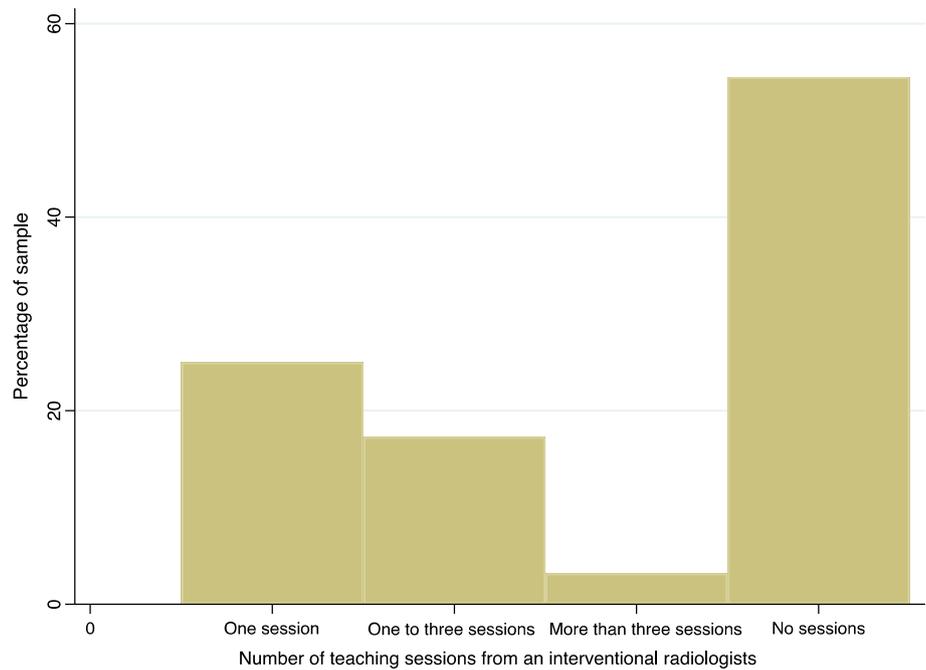
## Results

A total of 312 (86.7%) of the 360 surveys were fully completed, with 100, 112 and 100 completed by third, fourth and fifth years, respectively. With respect to exposure, 49.7% of respondents did not have formal IR teaching through lectures and seminars in their undergraduate curriculum. There was a statistically significant increase in the total amount of time students had spent shadowing a radiologist ( $p = 0.001$ ), and the total amount of teaching received from an interventional radiologist ( $p = 0.009$ ) as students rose through the clinical years. However, only 45.5% had encountered teaching from an interventional radiologist, with the majority having received only one teaching session (Fig. 1). Similarly, only 34.6% of students had formally shadowed a radiologist, with the majority of them having spent less than a week shadowing (Fig. 2). A significant 74.7% of students desired increased exposure to IR.

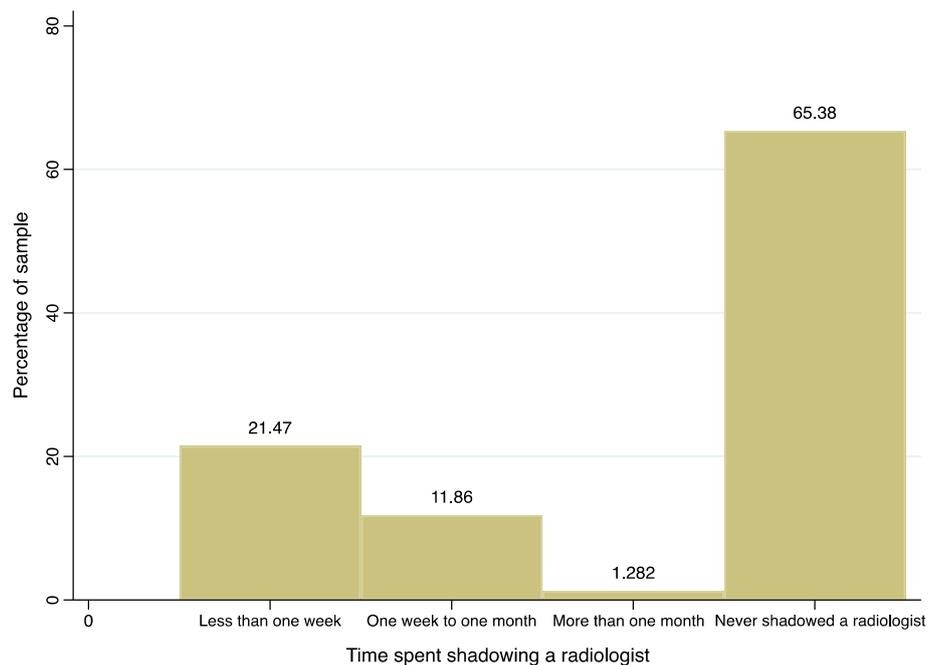
Nearly half the respondents felt their knowledge of IR was far lower (45.8%) or slightly lower (42.6%) than other specialties (Fig. 3). Approximately half the sample (53.3%) correctly identified the requirement for training in diagnostic radiology (DR) to become an interventional radiologist. However, the vast majority (91.9%) could not correctly identify the level at which diagnostic radiologists begin subspecialty IR training. Concerning subspecialty knowledge, a significant proportion correctly identified the role of IR in vascular procedures such as common iliac stenting (66.3%), femoral angioplasty (70.5%) and endovascular aneurysm repair (70.8%). The majority of students could correctly identify IR’s role in performing lymph node biopsies (68.2%) and nephrostomies (60.2%). Regarding musculoskeletal (MSK) radiology, 52.2% correctly identified that IR performed joint injections. Knowledge was lowest in interventional oncology (IO); 39.1% correctly identified IR’s role in transarterial chemoembolization (TACE) (Fig. 4). There was no significant increase in awareness of the role of IR in the above procedures (data not shown) with the rising seniority of students, apart from common iliac stenting ( $p = 0.01$ ). Students were more aware of interventional radiologists conducting their own clinics ( $p = 0.005$ ) and having their own ward patients ( $p = 0.001$ ) through the clinical years.

A mere 10.9% of students had considered a career in IR. The three most cited reasons for non-consideration were lack of knowledge (39.7%), lack of interest (16%) and lack of patient contact (18.6%) (Fig. 5).

**Fig. 1** Number of teaching sessions participants received from interventional radiologists



**Fig. 2** Figure showing the amount of time subjects spent shadowing a radiologist

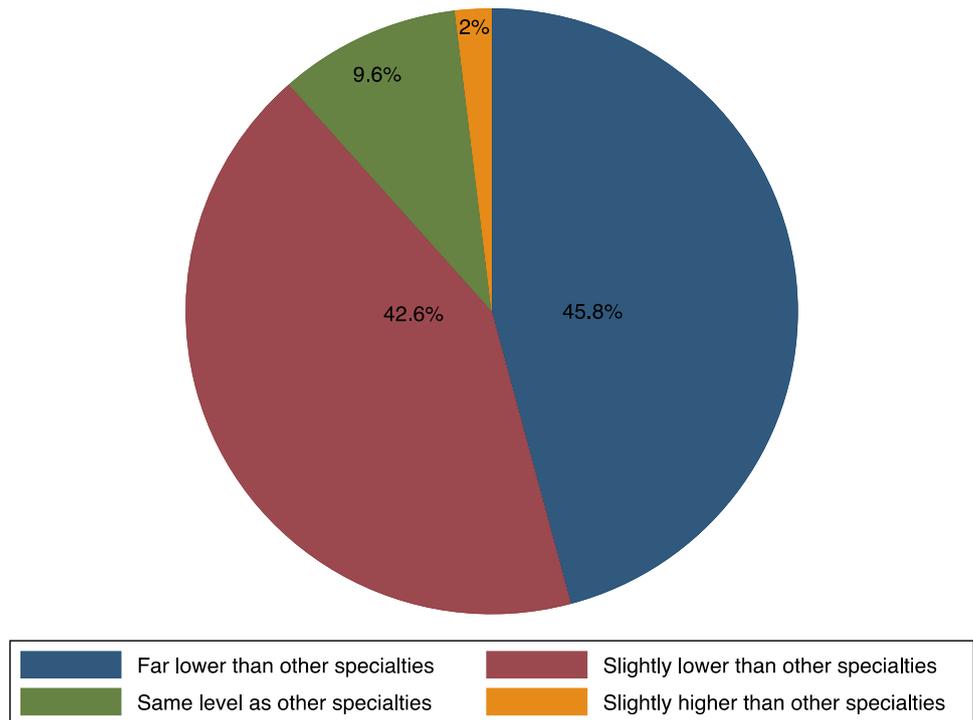


**Discussion**

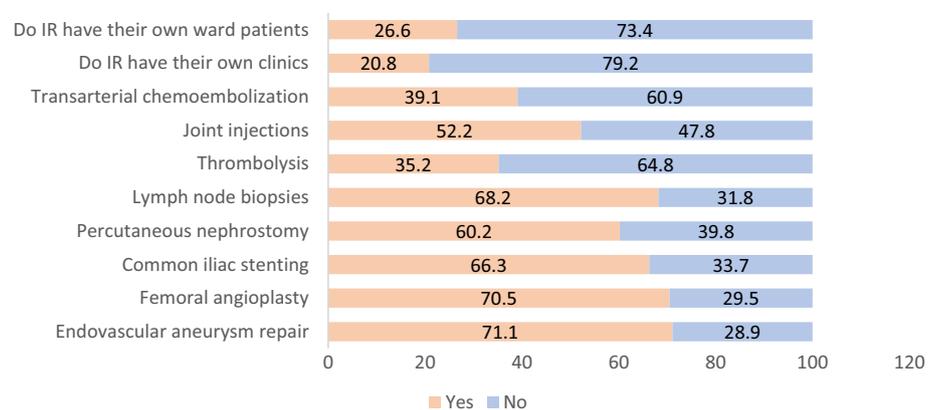
Interventional radiology faces three key challenges in continuing its existing exponential growth [9]. First, with the increased demand for services, there is a rise in unfilled IR consultant posts [10]. Second, IR requires its own identity, both inside and outside diagnostic radiology [11, 12]. Third, IR requires enough manpower to effectively provide interventional procedures, in order to retain

its exclusivity in providing these services over other specialties [13]. This study holds importance as increasing awareness and knowledge of IR in medical students forms part of the solution to this problem. This study explores how awareness in undergraduates develops with seniority in a single institution and identifies which subspecialties within IR are the most and least represented, to contextualise the need to incorporate IR into the undergraduate

**Fig. 3** Pie chart showing students' self-reported knowledge of interventional radiology in comparison with other specialties



**Fig. 4** Bar chart showing students' awareness of IR clinical practice and procedures

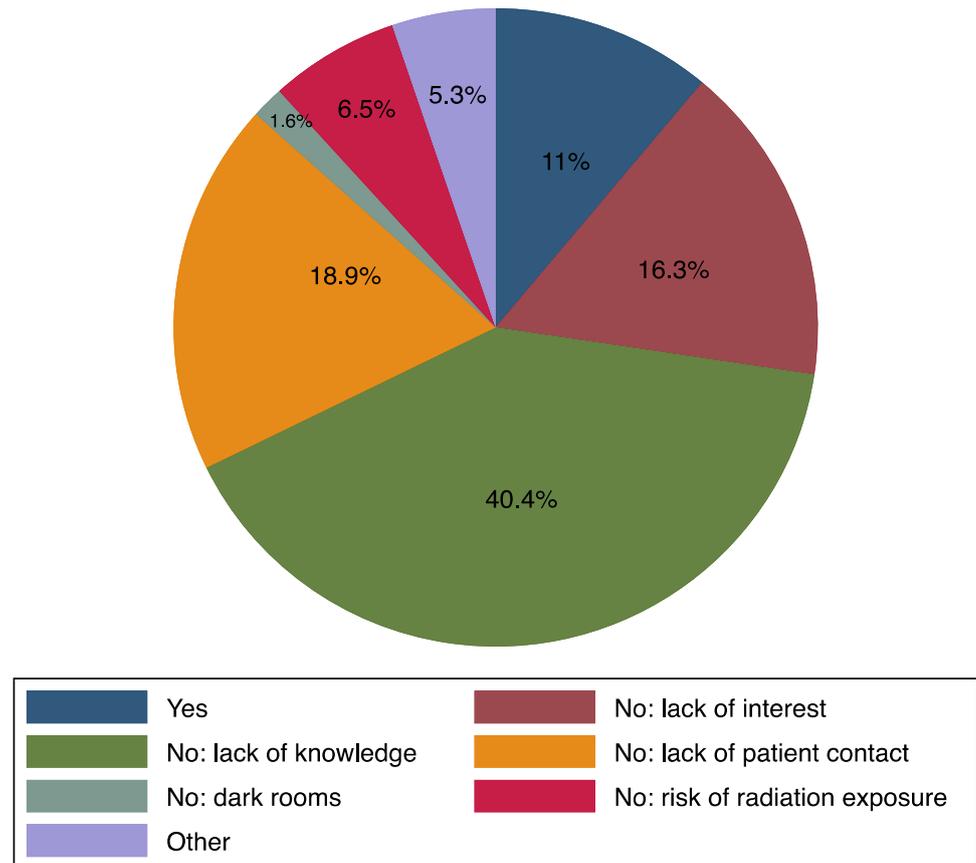


curriculum, and suggest interventions aimed at driving recruitment.

The study results show that there is poor exposure to IR amongst undergraduates. Nearly half the sample had never received dedicated lectures or seminars revolving around IR, or shadowed a radiologist. For the minority that received any formal teaching, the vast majority had received less than three sessions (Fig. 1). This result explains why there was no increase in knowledge of IR procedures in more senior final year students, when compared to their junior counterparts. It is thus unsurprising that 74.7% of students desired increased exposure to IR and 88.5% of the sample self-reported their knowledge of IR to be lower than that of other specialties. Although the single-centre methodology limits generalisability, as medical

school curriculums vary across the UK, our results are in line with the single previous study that has examined the exposure of IR to UK undergraduates. Atiiga et al.'s [6] study of 220 UK medical students, which found that only 43.2% of final year students, had past interactions with an interventional radiologist. Considering other countries, Leong et al.'s study of 234 European students found that only 35% had completed a radiology attachment [8]. Investigating this issue, the European Society of Radiology looked at 430 teaching centres in Europe, to find an average of 5.3 dedicated hours of IR teaching in the undergraduate curriculum [4]. Hence, there is enough evidence to show that the current level of exposure to IR for undergraduates is low and needs addressing [14, 15].

**Fig. 5** Pie chart showing percentage of sample that would consider a career in IR and various reasons for non-consideration



The study results suggest lack of exposure is a driving factor in non-recruitment, with 39.7% of the sample quoting lack of knowledge as a reason for non-consideration of an IR career. Medical students in their clinical years shadow various specialties, and in many countries, these are the crucial last years before deciding upon a specialisation. Consequently, it is important that undergraduates are exposed to IR in this period, as literature supports that increased exposure leads to interest and consideration of the specialty as a career choice [3, 15, 16]. Branstetter IV et al. first investigated this, comparing a cohort of students from the same university and year that undertook a radiology placement, to a control group that did not. Their results showed that exposure to radiology increased the students' interest in it and their consideration of it as a career [17]. Zimmerman et al. [18] developed on this with their study, which investigated the effect of a 5-week dedicated IR placement, concluding that increasing the formal interaction of undergraduates with interventional radiologists increased their understanding of the speciality and likelihood to consider an IR career. Commander et al.'s [7] study of American undergraduates concluded that 65% cited lack of knowledge as their primary reason for not considering an IR career. Assad et al.'s [19] study of Pakistani medical students supported this finding, with lack

of knowledge being the most cited reason for non-consideration as well.

Increasing exposure to IR is also important in preventing students from developing misguided perceptions of the specialty, which may deter them from pursuing an IR career. In the sample studied, 18.6% of students stated lack of patient contact as a reason for non-consideration of an IR career. However, the majority of students were unaware of IR having its own ward and own clinics in several institutions. This finding is corroborated by Nissim et al.'s [20] study of American medical students, which found that only 12.7% of students considered a career in IR, despite 58% expressing interest in a hands-on career. This stresses the importance of increasing the uptake of CIRSE's undergraduate curriculum, as literature stating that increasing student's exposure to the specialty allows development of informed perceptions, which drives recruitment. Shaikh et al.'s [21] study of 309 students found a significant increase in students' desire to pursue IR upon attending a 10-h IR symposium. Zimmerman et al.'s [18] 2014 study, also, found that a 5-week dedicated IR placement significantly increased students' consideration of an IR career.

Considering knowledge of the various IR subspecialties, a majority of students recognised the role of IR in vascular

procedures. The lowest awareness was seen in IO, with only 39.2% recognising transarterial chemoembolization (TACE) and 35.2% recognising thrombolysis. The increased awareness in vascular interventions is likely due to students encountering them during their vascular surgery placement. IO still plays a niche role in oncological treatment, and thus significant exposure of undergraduates to it is unlikely. However, the discrepancy in awareness between lymph node biopsies and TACE, despite both being oncological in nature, is unexplained.

The results from the study, low levels of teaching and time spent with radiologists, highlight the need for a holistic approach with targeted interventions, leading to consistent exposure to radiology, and IR is needed. The breadth of current literature can be consolidated to derive that improving IR awareness requires a holistic approach with targeted interventions. From a pre-clinical perspective, students could have early contact with, and exposure to, radiology by correlating anatomy demonstrations to computed tomography (CT). This method was studied by several groups, which successfully demonstrated that solidifying anatomy knowledge through the use of CT increased anatomy scoring [22–24]. E-learning packages can further solidify this. The visual nature of the specialty lends itself to remote learning, and consolidation of learning outcomes through imaging correlation can further increase awareness of, and exposure to, radiology.

This strong foundation can be developed in the clinical years with a multi-level approach to increased awareness. At an individual level, a dedicated placement in IR that incorporates vascular IR, neuro-IR, IO and general IR can facilitate early contact with the specialty. An alternate approach would thus be to incorporate IR days into each relevant core specialty, namely vascular, neuro, hepatobiliary and oncology. Societies such as the RCR, British Society of Interventional Radiology (BSIR) and CIRSE can incentivise students to develop these interests with scholarships and essays. The RCR website offers prizes for essays, research and audits in radiology. The BSIR essay and case-study scholarship prizes allow recipients to attend conferences as delegates, whilst CIRSE subsidises registration for students. The medical school elective remains a focal point for deciding a career, as students pursue attachments globally in specialties of their choice, which often determines their career choice. The promotion of IR electives by medical schools, conferences and societies can consequently drive awareness and recruitment for IR [4].

Although this study offers novel insight into the development of IR knowledge through the undergraduate curriculum, it has several limitations. Firstly, the conduction of this study at one institution limits generalisability. The lack of a standardised IR curriculum and clinical placement limits extrapolation of the data to other institutions.

Secondly, this study did not evaluate understanding in pre-clinical students, which could be a target for future interventions. Thirdly, this study is open to response and recall bias, as survey answers are largely retrospective in nature. Lastly, from a statistical standpoint, the clinical assumptions of categorical statistics are flawed, as the variables of seniority in medical school are not independent of each other.

In conclusion, the study results in this sample indicate that current knowledge of IR amongst undergraduates is low, secondary to inadequate exposure. Increased exposure to IR is important to develop interest in the specialty as a career option and to prevent non-consideration of an IR career due to misperceptions of the specialty. Bringing about change in perceptions and knowledge will have to be a multi-level intervention involving undergraduate societies, university education panels and societies such as the RCR, BSIR and CIRSE. A multi-centre cohort studying undergraduate awareness and recruitment at baseline, then installing the CIRSE curriculum, and finally reassessing the cohort's awareness and knowledge will likely yield valuable results. In conjunction, the study makes a strong case for the introduction of a standardised IR curriculum to promote knowledge amongst medical students, thereby driving growth and recruitment in the specialty.

#### Compliance with Ethical Standards

**Conflict of interest** The authors declare they have no conflict of interest.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

**Consent for Publication** Consent for publication was obtained for every individual person's data included in the study.

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