

A Survey of Interventional Radiology Awareness Among Final-Year Medical Students in a European Country

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Abstract Interventional radiology (IR) is a rapidly expanding specialty that is facing the challenges of turf wars and personnel shortages. Appropriate exposure of medical students to this field can be vital to recruitment of potential future trainees or referring physicians. The aim of this study was to determine the knowledge and views of final-year medical students in a single EU country regarding various aspects of IR. An electronic survey was sent via e-mail to all final-year medical students in a European country. The students were given a month to respond to the questionnaire. A total of 234 students of 675 (34.5%) replied to the survey. Of the respondents, 35% had previously completed an attachment to the radiology department. The majority of students (63%) thought their knowledge in radiology in general was poor. The percentage of students who correctly identified procedures performed by interventional radiologists was 69% for Hickman line insertion, 79% for fibroid embolization, and 67.5% for lower limb angioplasty. Sixty percent, 30%, and 47% thought that interventional radiologists perform cardiac angioplasties, perform arterial bypasses, and create AV fistulas, respectively. Forty-nine percent felt that interventional radiologists are surgically trained. Eighty-three percent of students were first made aware of angioplasty by a cardiologist. Thirty-one percent thought that interventional radiologists do ward rounds, 24% thought that interventional radiologists have admitting rights, and 26% felt that interventional radiologists run an outpatient practice. A significant number of students (76%) thought

that the job prospects in IR are good or excellent but only 40.5% were willing to consider a career in IR. In conclusion, this study indicates that IR remains a nascent but attractive specialty to the majority of medical students. Further development of the existing informal undergraduate curriculum to address shortcomings will ensure that IR continues to attract the brightest talents to the field.

Keywords Interventional radiology · Survey · Awareness

Introduction

The field of interventional radiology (IR) is rapidly expanding, with an ever-increasing pace and number of procedures [1]. There are, however, a number of challenges that need to be addressed including the so-called turf wars with other clinicians and the worsening personnel shortage [2]. This study reports the views of medical students in one European country regarding their knowledge and perception of IR. Hopefully, this study will allow us to reflect on current practice and make changes to attract future trainees. Data concerning medical students' perception of IR are sparse in the literature and we hope to address this deficit.

Methods

An electronic survey was sent to 675 final-year medical students in one European country. A total of 234 students of 675 (34.5%) replied to the survey. All questions were completed in the questionnaires returned. The survey consisted of 11 questions (see the Appendix). Students were informed that the survey was anonymous and would have no bearing on current or future assessments. They

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were given 1 month to provide an electronic reply. Questions were divided into several categories, including knowledge of IR procedures, training route, and clinical duties, with 'yes' or 'no' responses. Students were also asked to recall the primary source of their knowledge of various IR procedures. Respondents also rated their knowledge of radiology in general, interest in pursuing a career in IR, and future prospects for IR. Students were also asked to rank preference in relation to different methods of didactic or directed instruction in IR. Electronic reminders were sent to all the students twice before the closing date.

Results

The majority of respondents had not completed a previous elective in radiology (65%). Students felt that their knowledge of IR was poor (63%) or they had no knowledge (3%) (Fig. 1). Only a few students thought they had good or adequate knowledge of IR (3.4% and 30%, respectively). Sixty percent, 30%, and 47% of respondents thought that interventional radiologists perform cardiac angioplasty, perform arterial bypasses, and create AV fistulas, respectively. Sixty-nine percent, 80%, and 68% of students correctly identified that an interventional radiologist inserts Hickman lines, performs uterine fibroid embolization (UFE), and performs lower limb angioplasty, respectively (Fig. 2). In terms of training, 45% thought that

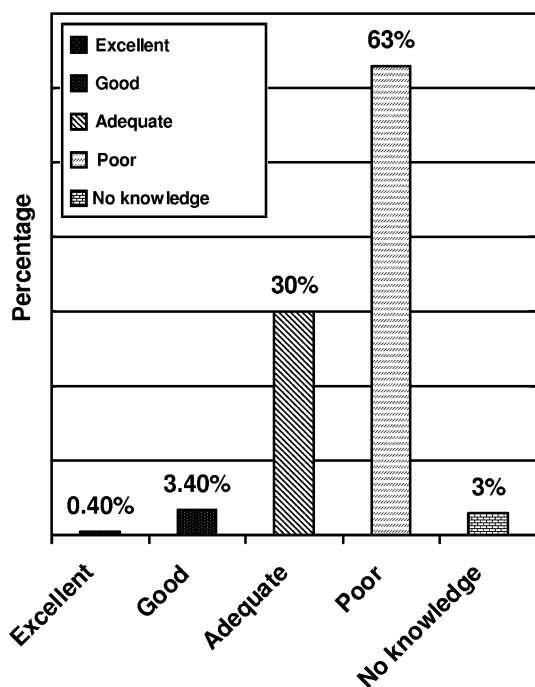


Fig. 1 Student ratings of their knowledge about IR

interventional radiologists are surgically trained, 92% thought that interventional radiologists are trained by the radiology route, and 52% identified training as coming from both surgical and radiological fields (Fig. 3). From a list of five interventional procedures, image-guided biopsy was most familiar (72%) to medical students as being performed by an interventional radiologist. This was closely followed by EVAR (62%), radiofrequency ablation (45%), and percutaneous nephrostomy (38%). Only 13% of students were familiar with percutaneous vertebroplasty (Fig. 4).

All respondents were familiar with the procedure "angioplasty." Of these, an overwhelming majority (83%) were first informed of this procedure by a cardiologist. This was followed closely by vascular surgeons (59%), but interventional radiologists lagged far behind, at 20% (Fig. 5). Other sources of angioplasty knowledge included books, tutors, and neurosurgeons.

Regarding the components of IR practice, 31% felt that interventional radiologists do ward rounds, 24% thought that interventional radiologists have admitting rights, and 26% felt that interventional radiologists run outpatient clinics. Sixty-eight percent and 85% of students thought that interventional radiologists treat major and minor illnesses, respectively. Not unexpectedly, only 7% felt that interventional radiologists do not treat patients at all (Fig. 6).

In terms of educational content delivery in IR, an overwhelming majority preferred an attachment to the department (60%) or lectures by an interventional radiologist (28%). Research in this subject was thought to be the least effective method of delivering teaching. The breakdown of student preference is reported in Table 1 and Fig. 7.

Compared with other specialties, students thought their knowledge of IR was poor (52%) or they had no knowledge (1.3%) (Fig. 8). Only 7.7% felt they had good or 38.6% adequate knowledge of IR. A significant number of respondents were willing to consider a career in IR (41%) (Fig. 9). The majority of students thought the prospects for this specialty are excellent (43%), good (37%), and adequate (4.3%) respectively; 18% and 2% of respondents did not know or felt the prospects in this specialty are poor, respectively (Fig. 10).

Discussion

IR is a relatively nascent specialty that is still evolving, with an average of 3.5% new procedures per annum [2]. The future of this specialty is currently faced with many challenges including the shortage of personnel and turf battles. Undergraduate medical students are an important

Fig. 2 Students' knowledge of procedures performed by interventional radiologists

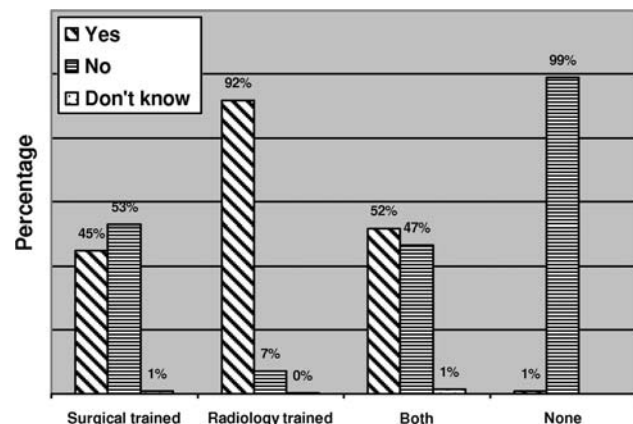
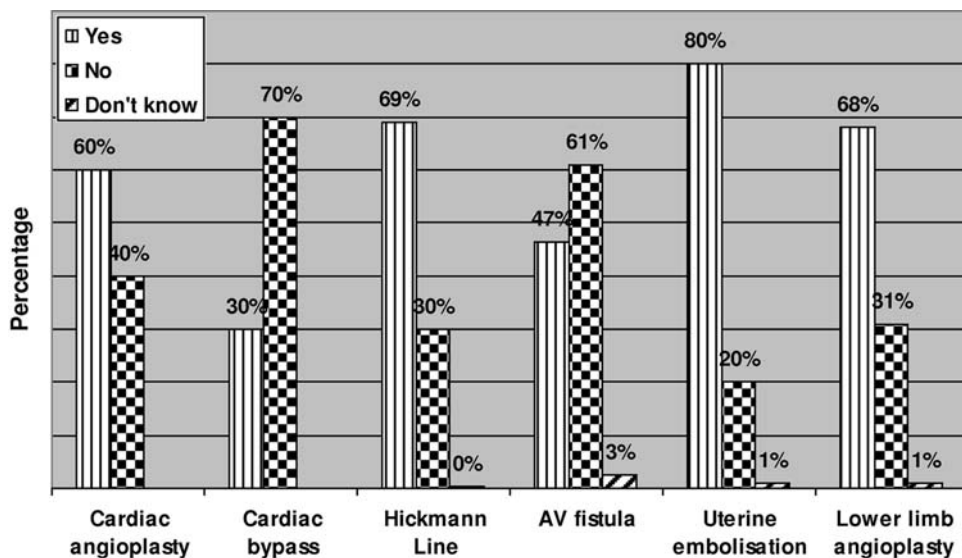


Fig. 3 Students' knowledge of interventional radiologists' training

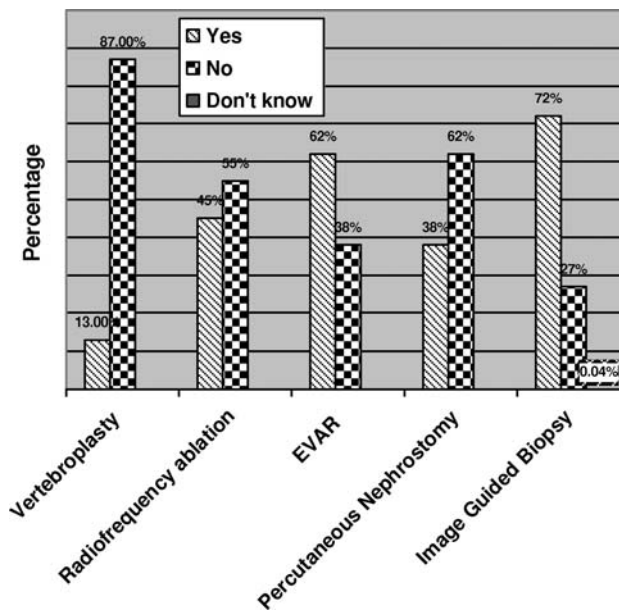


Fig. 4 Students' knowledge of procedures performed by interventional radiologists

part of the solution; only they can be the future interventional radiologists or physicians referring patients for the services we offer.

Over the last number of years, radiology has become increasingly integrated with undergraduate curricula [3, 4]. This is a positive development considering previous studies that demonstrated a positive impression about the role of radiology and an interest in pursuing a career in the field [5, 6]. Our results show that we are lagging far behind in organizing direct clinical attachments for medical students. Only 35% of respondents had previous exposure to an elective in radiology. We should strive to increase the number of medical students rotating through radiology departments, with the ultimate aim of making it a core rotation in the undergraduate curriculum. We feel that this is justified considering that there is not a single specialty within the hospital that does not utilize the radiology department. Furthermore, as our study shows, respondents

have indicated a rotation in radiology to be their preferred method (60%) of instruction in IR.

Many interventional radiologists are aware that Charles Dotter was the radiologist to pioneer angioplasty in 1964 [7]. Since then, the mix of specialties involved in vascular intervention has evolved, and it continues to do so [8]. IR has lost turf battles to cardiologists and, increasingly, to vascular surgeons [9, 10]. In this study, cardiologists and, to a lesser extent, vascular surgeons have been the predominant source of knowledge regarding angioplasty for medical students. This is most likely due to the fact that cardiology and vascular surgery are core rotations in the medical curriculum, and therefore all students invariably

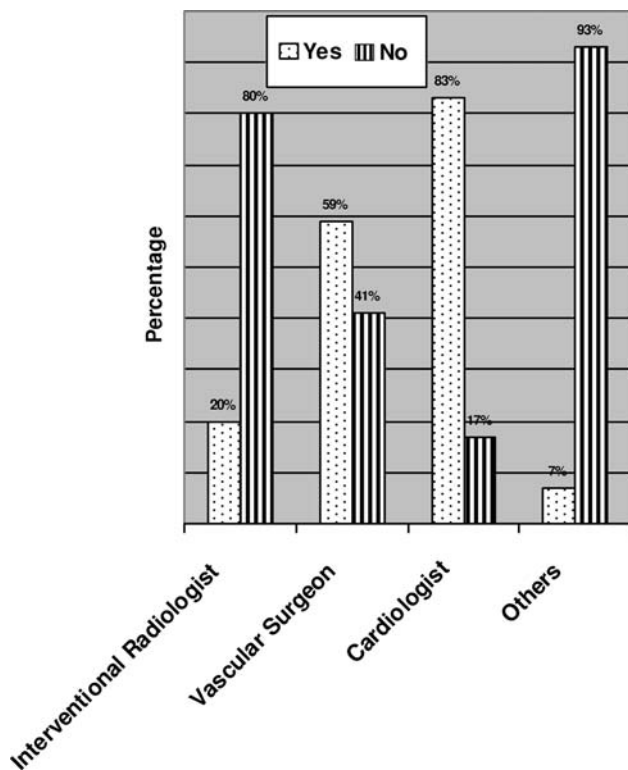


Fig. 5 Students' familiarity with "angioplasty" and their source of exposure

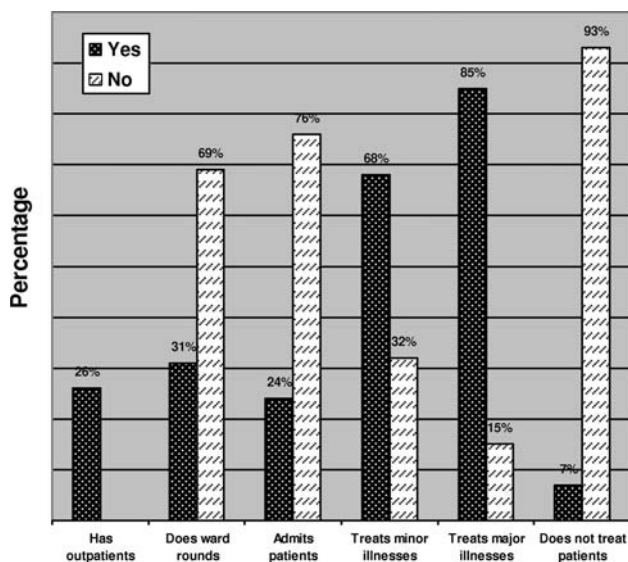


Fig. 6 Students' knowledge of tasks performed by interventional radiologists

have lectures on interventional cardiology and vascular surgery. Students will also spend time in attachments to these specialties. In fact, only 20% of students surveyed had heard of angioplasty from an interventional radiologist. This is because interventional radiologists, for a variety of historical reasons, do not take on leading roles in

undergraduate teaching. Additionally, IR as a specialty relies on referring physicians and therefore does not 'own' patients. Both of the latter situations have to change if IR is to take its place as a clinical specialty in its own right. Interventional radiologists need to get involved in undergraduate teaching and develop a full clinical practice to excite and interest medical students and tempt them to pursue a career in IR. Additionally, medical students who pursue other specialties should at least know what IR has to offer [11].

In terms of clinical practice, only 31% of students thought that interventional radiologists do ward rounds, 24% thought that interventional radiologists have patient admitting rights, and 21% thought that interventional radiologists run an outpatient service. At a time when IR is becoming a more clinical specialty, it is disappointing to realize that the message is not filtering down to medical students who might be interested in IR but want more patient contact in their chosen career. Indeed, a previous study suggested a perceived lack of patient contact in radiology as a strong reason why students turn down radiology, and by inference IR, as a career [12].

The majority of our respondents felt that the future prospects of this specialty are good (37%) to excellent (43%). However, only 41% of respondents were willing to consider a career in IR. The reasons for this were not ascertained in this study. This percentage could also have been offset by the fact that diagnostic radiology itself is an attractive career option [13]. Though trends may be changing [11], we are still faced with difficulty in recruiting residents into IR from the current radiology trainee pool [5]. Therefore, a follow-up study would be useful to elucidate the reasons why students felt that a career in IR is good but were not willing to consider it. We could then tailor student electives to address these issues and thus encourage a greater variety of applicants into radiology residencies. Interventional radiologists should also strive to provide a unique attachment experience to medical students who may consider a career in IR, as this does impact future career choices [14].

While the definitive integrated training pathway for the 'vascular specialist' has yet to be finalized [15], we must realize that medical students are aware of the possibility of having an endovascular career via a surgical route. This is in keeping with a mixed practice at many hospitals wherein endovascular procedures are performed by interventional radiologists and, increasingly, by vascular surgeons. Indeed, the future may lie in multidisciplinary integration [16]; we must continue to offer qualitative expertise in our procedures with full clinical, academic, and technological backing similar or superior to that of our colleagues in other fields [17]. In doing so, we potentially draw future trainees with an interest in vascular imaging and

Table 1 Student ratings of the various teaching methods in interventional radiology, ranging from 1 (best) to 8 (worst)

Method	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	7 (%)	8 (%)	No rating (%)
Ward rounds	2	6	9	13	13	14	29	39	3
Attachment	60	21	6	2	1	1	2	4	3
Lectures	28	41	9	7	3	3	3	3	3
MDT	2	47	15	12	16	12	15	20	3
OPD	7	7	17	12	15	13	17	9	3
Self-learning	2	6	11	20	18	19	12	8	3
Module	5	5	20	20	18	13	9	6	3
Research	2	5	9	10	11	16	13	31	3

Note: MDT multidisciplinary team meetings, OPD outpatient department. Percentages are rounded to the nearest digit. Note that various teaching methods may have been assigned the same rating more than once

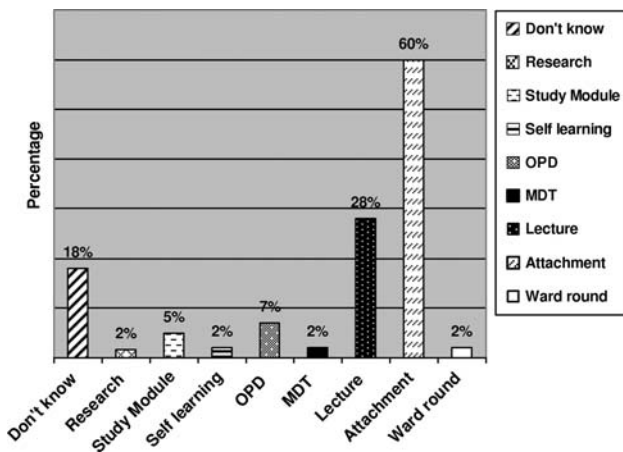


Fig. 7 Students' opinions on the best method for teaching IR. OPD, outpatient department; MDT, multidisciplinary team meetings

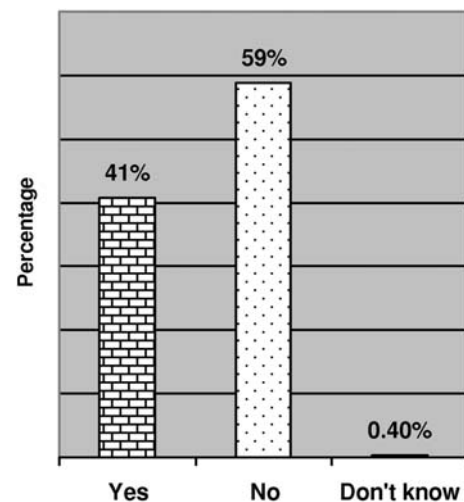


Fig. 9 Students' willingness to consider a career in radiology

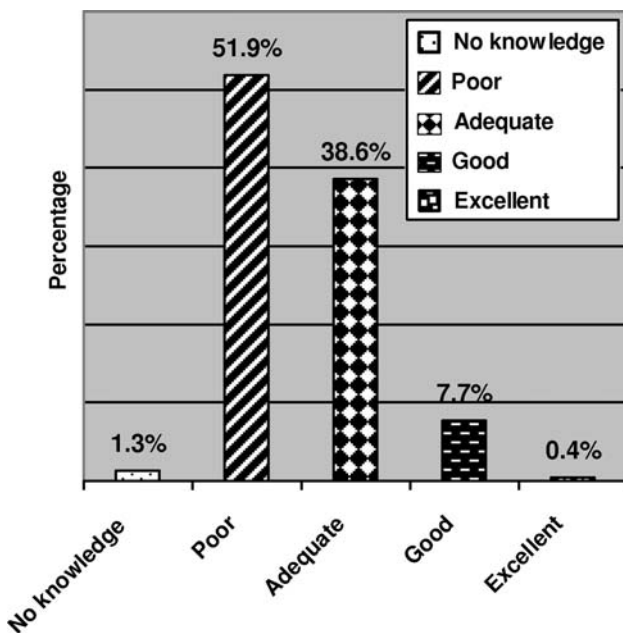


Fig. 8 Student ratings of their knowledge about radiology in general

intervention into radiology, which is essential for the survival of this field.

From the results of this survey, knowledge of procedures performed by interventional radiologists ranged from the least well known, such as nephrostomies and vertebroplasties (38% and 13%, respectively), to UFE and image-guided biopsies (80% and 72%, respectively). It is interesting to note that 80% of the students had heard of UFE. This is presumably because of the huge exposure to UFE in the lay press. Vertebroplasty, which is also a relatively new procedure, was less well known (38%) but has not had the same type of exposure in the lay press. However, irrespective of the power of the press in informing the public and medical personnel, it is vital that interventional radiologists teach medical students the range of services we have to offer.

There are several limitations to this study. We acknowledge that that the results apply to only one EU country. We plan to perform follow-up studies in the coming years to see if the perception and knowledge

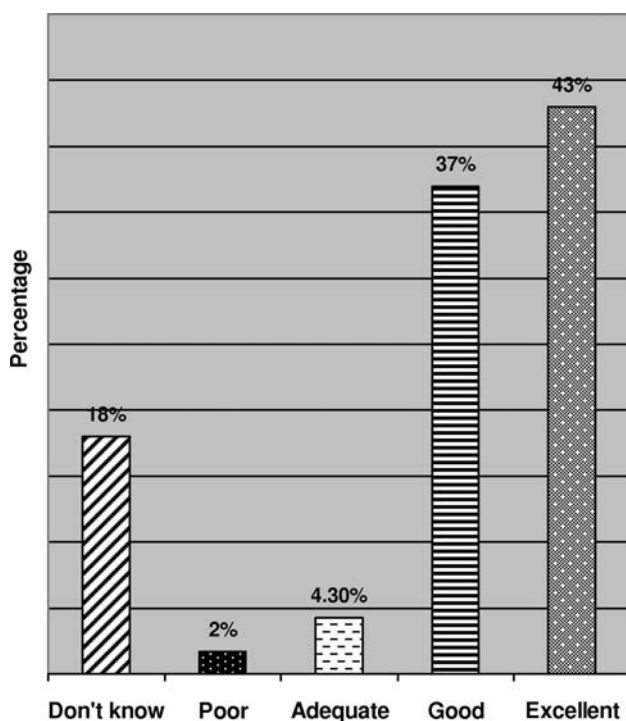


Fig. 10 Student ratings of the career prospects in IR

regarding IR change. It is also possible that the results could be slightly skewed due to different proportions of medical students responding across the four institutions. As there are no national guidelines regarding radiology teaching, this will invariably affect the level of exposure at each medical school.

Response bias is a potential limitation in the analysis of any survey responses. Students interested in radiology may be more likely to complete a survey on the subject. However, our response rate is similar to that of surveys [11] published in the literature, which generally approached one-third of the total.

Other than the methods mentioned above, there are other means to interact and expose our specialty to medical students. These include career fairs and dedicated introduction days, which could be enhanced by allowing medical students simulator time [18]. Additionally, the use of e-learning structures would be helpful. However, all of the above measures should be part of an undergraduate curriculum in IR.

In summary, this study suggests that medical students' exposure to IR teaching, procedures, clinical practice, and training requirements is poor. This can only change by direct involvement of interventional radiologists in the core undergraduate curriculum.

If we are to engage medical students, we must strive for the role played by our surgical counterparts, i.e., become clinically based. Clinical practice in IR is evolving and this evolution should go hand in glove with a dialogue with

undergraduate medical school deans to place IR firmly in the undergraduate curriculum. Designing a European-wide core curriculum and objectives for IR teaching would be a good starting point.

Appendix: Awareness of Interventional Radiology Among Final-Year Medical Students in Irish Hospitals

Medical School _____

Current Position _____

- Have you completed an elective attachment to a radiology department? Yes___No___
- How does your knowledge of Interventional Radiology compare to other subjects? Excellent___Good___ Adequate___ Poor___ No knowledge___
- An Interventional Radiologist performs the following procedures:
 - Cardiac angioplasty or stenting Yes___No___
 - Femoral-popliteal arterial bypass Yes___ No___
 - Venous access procedures (e.g., Hickman line) Yes___No___
 - Arteriovenous fistulas for dialysis Yes___ No___
 - Uterine artery embolisation for fibroids Yes___ No___
 - Lower limb angioplasty and stenting Yes___ No___
- An Interventional Radiologist trains
 - As a surgical trainee Yes___No___
 - As a radiology trainee Yes___No___
 - Both Yes___No___
 - None of the above Yes___No___
- Are you familiar with the following procedures?
 - Vertebroplasty Yes___No___
 - Radiofrequency ablation of tumours Yes___ No___
 - Endovascular repair of aortic aneurysms Yes___No___
 - Percutaneous nephrostomy Yes___No___
 - Image-guided tumour biopsy Yes___No___
- Are you familiar with the procedure called 'angioplasty'? Yes___No___

If yes, where did you gain that exposure?

 - Cardiologist Yes___No___
 - Vascular surgeon Yes___No___

- (c) Interventional Radiologist Yes____No____
 (d) Others (please specify)_____
7. An Interventional Radiologist
- (a) Has outpatient clinics Yes____No____
 (b) Does ward rounds in the hospital Yes____
 No____
 (c) Admits patients to the hospital Yes____No____
 (d) Treats patients with minor illnesses Yes____
 No____
 (e) Treats patients with major illnesses Yes____
 No____
 (f) Does not treat patients at all Yes____No____
8. How do you rate the following to provide student exposure to Interventional Radiology? [rank 1 (best) to 8 (worse)]
- (a) Ward rounds
 (b) Radiology department attachments
 (c) Lectures from Interventional Radiologists
 (d) Multidisciplinary meetings
 (e) Outpatient clinics
 (f) Self-directed learning websites
 (g) Study modules
 (h) Clinical research projects
9. How do you rate your knowledge of radiology in general compared to other subjects? Excellent____
 Good____Adequate____Poor____No knowledge____
10. Would you consider a career in Interventional Radiology? Yes____ No____
11. What do you think about the career prospects for Interventional Radiologists? Excellent____ Good____
 Adequate____Poor____Don't know____

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