

Female medical student impression of interventional radiology: what can we do to improve this?

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PURPOSE

The number of female medical students has increased significantly in the last decade due to increased gender diversity. However, the number of female doctors going into interventional radiology (IR) does not reflect this trend on an international scale.

METHODS

A standardized set of questions was created looking into medical students' demographics, awareness of IR, their general opinion, and whether they would consider IR as a potential career path. One-hundred female medical students from the United Kingdom, Germany, Poland, Spain, and New Zealand were approached either directly or via an online survey platform. The students ranged from first to final year study of Medicine and were between 18 and 30 years of age.

RESULTS

The majority of medical students (68%) were unaware of what IR is and 98% denied having teaching about IR in their university. Influential factors to choosing IR were more exposure to IR in medical school (15%), more options to allow family life (15%), direct training pathway to IR rather than via diagnostic radiology (13%), options of private practice (13%), and understanding more about radiation protection during pregnancy (12%).

CONCLUSION

A lack of awareness about what IR is and misconceptions, particularly regarding radiation exposure during pregnancy, play an important role in discouraging entry into IR. Additionally, some of the concerns raised were directed at IR training pathway. Female IR consultants should also take leadership initiative to act as role models. More lectures and direct clinical exposure are paramount to their understanding of IR.

Over the past decades, the number of female medical students has gradually increased equalizing the gender gap. The Royal College of Physicians suggest that more than 60% of new medical students in 2009 were female (1). This was increased by ten-fold in comparison to the late 20th century when medicine was a male dominated career (1). However, the number of female doctors going into interventional radiology (IR) training schemes or female IR consultants does not reflect this trend on an international scale. When compared with other specialties such as general surgery and vascular surgery, entrance of women into IR was substantially lower in proportion (2, 3). Even though female consultant radiologists make 35% of the IR workforce in the UK, it was estimated that only 10% of interventional radiology consultants were female (4, 5).

Many factors have been perceived to contribute to this discrepancy. These include radiation exposure concerns (particularly those relating to pregnancy), the frequency of being on call, the lack of female role models, and an overwhelmingly male dominant culture in IR (3, 5). Methods to attract females into IR include early exposure to the specialty, preferably at the medical student stage to increase interest and address any misconceptions of the perceived work life imbalance and radiation exposure (5). The aim of our study was to evaluate and understand female medical students' perception of the obstacles preventing them from entering this career path.

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Methods

This observational study was conducted at Auckland City Hospital, New Zealand. A standardized set of questions under the title "What do you think of IR as a career?" was created looking into medical students' demographics, awareness of IR, their general opinion and whether they would consider IR as a potential career path (Appendix 1). Subsequently, 100 female medical students from the United Kingdom, Germany, Poland, Spain, and New Zealand were randomly selected either directly from the Auckland University campus or via Survey Monkey questionnaire sent out via social media by elective medical students from the countries listed during their IR placement. Survey Monkey is an open access online surveying platform and was used due to its wide accessibility. The students ranged from first to final year study of Medicine and were between 18 and 30 years of age. They were approached during the period of 2017–2018. The questionnaires were only sent out to female medical students on social media groups and only female medical students were approached face to face. Male and non-medical students were not included.

The first 20 participants' responses were accepted from each country to make the survey result less skewed towards a single country. Once 20 responses were ob-

tained, no further results were collected. This meant that any further replies were not included and the study did not actively pursue further students. The participants were not asked for any identifiable information to maintain confidentiality and they were aware that the data collected would be used for research purposes. Informed verbal consent was obtained from all participants.

The questions were designed so that they were simple and easy to be filled in, while relevant questions regarding the understanding of the students about IR is maintained. Towards the end of the survey, each participant had a brief introduction to IR as "Image-guided surgery that covers all patient groups seen within the hospital, with the potential to treat all body parts, without cutting the patient open; from neuro-intervention for brain bleeds or stroke clots, to pediatric line insertion, to improving blood flow to the toes." The students who filled in the questionnaire were assisted by two rotating medical students within the radiology department to assure accuracy of the collected information. This was done either by directly filling in the questionnaire face to face at the university campus or contact access via online social media which meant any questions or discussions were easily available. No financial or compensatory items were given for this study.

Statistical analysis

A descriptive statistical analysis was performed using SPSS software (Statistical Package for Social Sciences) version 15.

Results

A total of 100 female medical students participated from the UK (20%), Poland (20%), Germany (20%), Spain (20%), and New Zealand (20%). The year of university study ranged from 1 to 6 (Table 1).

The results show that the majority of medical students (68%) were unaware of what exactly IR is (Table 2). Moreover, as many as 94% responded "No" when asked "Have you ever seen or heard of what IR doctors do?". Ninety-eight percent denied having teaching, lectures or cases about IR taught in their university. In contrast, almost every student (99%) knew what a vascular surgery specialist is.

Despite initially lacking insight of what IR clinicians do, similar proportion of female medical students would consider IR is a po-

Table 1. Medical student demographics

Medical student demographics (%)	
Age (years)	
18–21	21%
22–25	70%
25+	9%
Year of study	
1	7%
2	12%
3	13%
4	20%
5	23%
6	25%
Country	
United Kingdom	20%
Spain	20%
Poland	20%
Germany	20%
New Zealand	20%

tential career (13%) when compared with vascular surgery (12%) following a brief explanation of the specialty.

In regard to their thoughts of IR as a career after providing a brief description of IR (Fig. 1), approximately half of medical students did not have an opinion due to either not having seen any IR role models (32%) or did not know at this stage of training (20%). Also, 17% had concerns of not having adequate patient contact. On a positive aspect, 12% thought of IR as an amazing career, 5% thought that IR was the future of medicine and although 7% had some concerns, they were willing to consider it. Only 5% of students had an IR role model. Other responses were shown in the Appendix 2.

There was a wide range of responses of what would make a career in IR more appealing to women (Fig. 2). The top influential factors were more exposure to IR in medical school (15%), more option to allow family life (15%), direct training pathway to IR rather than via diagnostic radiology (13%), options of private practice (13%), and understanding more about radiation protection during pregnancy (12%). Twenty-percent of the students expressed that more female IR consultants would make IR more appealing. This was divided into needing more female leadership roles (9%) and more female support at workplace (11%).

Main points

- There is discrepancy between the number of female doctors entering IR compared with the increasing number of female doctors in other male-dominated specialties.
- Lack of awareness about what IR is and the misconceptions, particularly those regarding radiation exposure during pregnancy, play an important role in discouraging entry into IR.
- Some of the concerns raised were not gender specific but directed at IR training; should there be a separate training pathway to diagnostic radiology like the United States of America?
- It is important to engage early on at University and School level. More lectures and direct clinical exposure are paramount to their understanding of IR and to clarify the misconceptions. It is also important for current female IR consultants to take leadership initiative to act as role models and make them feel that they have equal opportunity getting into this specialty.
- Larger and country-specific surveys would be helpful to give more insights into this matter.

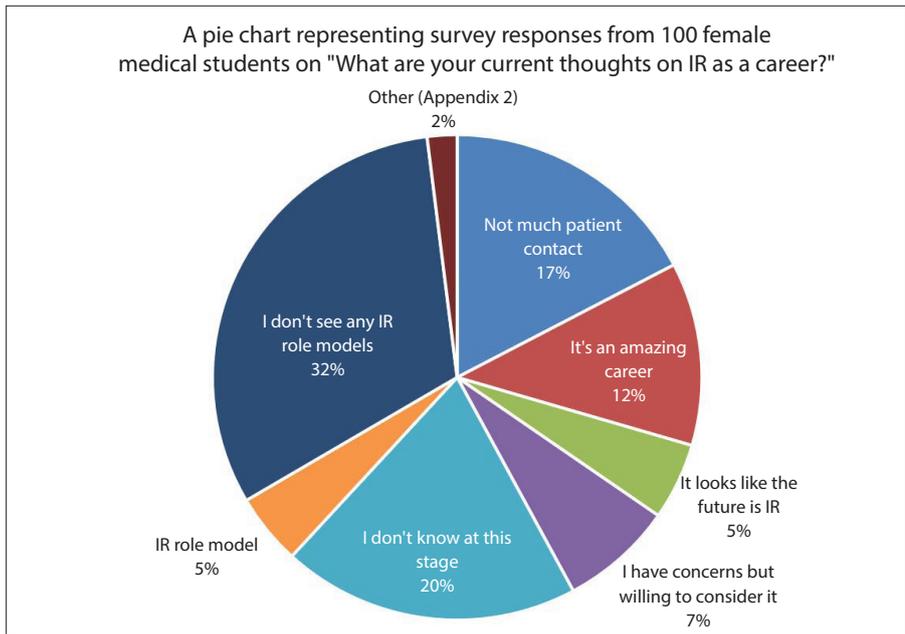


Figure 1. Pie chart shows the responders' current thoughts on IR as a career.

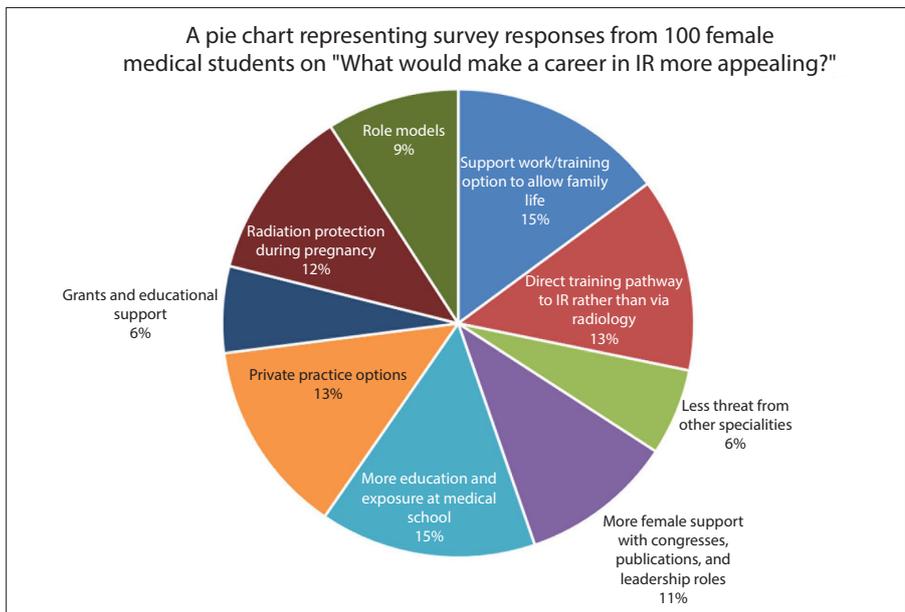


Figure 2. Pie chart shows the responders' view on aspects that would make a career in IR more appealing.

Table 2. Perception of the female students regarding IR awareness and knowledge

Question	Percentage of response (%)		
	Yes	No	Don't know
Do you know what interventional radiology (IR) specialty is?	13	68	19
Have you ever seen or heard of what IR doctors do?	2	94	4
Would you consider a career in IR?	13	55	32
Do you know what Vascular Surgery specialty is?	99	1	0
Would you consider a career in vascular surgery?	12	55	33
Have you had any teaching/lectures/cases about IR?	0	98	2

IR, interventional radiology.

Discussion

This survey of 100 female medical students from the UK, Germany, Poland, Spain, and New Zealand identified several barriers to choosing a career in IR. Overall, the themes identified in our survey are comparable to existing literature (6, 7); however, a new theme of direct entry into IR training has emerged.

One of the major barriers was not having a direct training route into IR. Some participants felt discouraged from having to do diagnostic radiology before entering an IR training program. It is relevant to note that when the United States of America's IR training program changed from requiring full diagnostic radiology training to a direct route to IR training, a greater proportion of female trainees was seen in IR (8). Therefore, a similar change to a more direct training pathway to IR in other countries could lead to greater female representation in IR. Other previously male-dominated specialties have also seen increase in female trainees when the route was direct from medical school/foundation program (3). In general, irrespective of sex and specialty, students are attracted to direct training pathway. For female doctors in particular, family-work life balance is important and thus investing in a career with a direct pathway is believed to involve less relocation instability and offers more security in knowing this will lead to completion of training without further significant change or re-application. Although the result was not split per country, we noticed that training programs varied throughout the countries and thus access to radiology and IR. However, none of the countries involved provided a run-through training program for IR at the time.

In addition, there was also a significant lack of awareness about the specialty among the students. Up to 94% of the students did not know exactly what interventional radiologist's role is before the brief description of IR provided at the end of the survey. Recently, efforts have been made to increase students exposure to the IR specialty, such as the "IR curriculum for medical students" developed by the Interventional Radiological Society of Europe (CIRSE) at their annual conference (6). This has not only spread awareness about what IR involves and what interventional radiologists do, but has also cleared misconceptions which may be deterrents for women (5). Common misunderstandings among the medical students included risk of radiation

exposure, particularly during pregnancy, less patient contact, and inability to maintain a work-life balance due to lack of a flexible training program. It has been proven now that the occupational radiation exposure in IR is the same as natural background radiation; and fetal radiation exposure of female IRs during pregnancy is well below recommended guidelines (9, 10). Further reasons that discouraged female students from joining the specialty found in this survey were the lack of female role models in IR and male dominance in the specialty.

There are various misconceptions regarding medical radiation exposure in the public (10). This could inadvertently perpetuate misinformation to female medical students regarding radiation exposure during pregnancy, which may interrupt their training and thus maybe perceived as a burden by her fellow IR colleagues, whom might then have to cover her rota and on-call responsibilities. This can be avoided by education and if possible, allowing more flexible training program during pregnancy. For instance, less than full time training and less on-call hours, so that IR becomes more plannable and less unpredictable as a career.

Once clearing all the misconceptions about workplace, medical students still need female role models and successful women in IR to look up to. This will likely generate interest among female medical students/doctors to choose IR as a career. A study has shown that promoting visibility of women in radiology as early as first pre-clinical year has had the largest impact of female medical student interest in radiology (11). It is imperative that female IRs take up leadership roles, and their male IR colleagues encourage women to feel that they have an equal opportunity as their fellow male colleagues of choosing any of the currently male-dominated specialties. This can include providing educational support and

grants. Female IR consultants should be encouraged to take leadership roles including mentorship initiatives for interested medical students. A recent example to encourage female doctors and medical students to choose IR as a specialty were the Society of Interventional Radiology's "Women in IR" community, which held various events, forums and providing resources to support those who were interested (6).

The limitation of this observational study is that the geographic location of participants were highly varied across Europe and including New Zealand. As a result, the data was not representative of a particular country but demonstrates a generic view. More participants involved would make the data more representative. Furthermore, the elective medical students who assisted in sending out the survey through social media chose to undertake an IR elective. Therefore, they could represent a motivated cohort of students and may not reflect the perceptions of medical students in general.

We therefore recommend a further study taking on higher volume of students through training program directors to circulate to all female students at random, or following the new organized "Boot Camps" designed to encourage students into IR as webinars via social media and circulated by trainees and students to attend.

In conclusion, IR remains a relatively new subspecialty. Early input on education, raising awareness, addressing misconceptions, particularly on radiation protection, having role models, and creating opportunity for female medical students need to be done at national levels to address any barriers that discourage female medical students from choosing a career in IR. Direct training pathway into IR could increase the recruitment of women into IR. Larger surveys would be helpful to gain more insight into other areas that require improvements to support female entry into IR.

Conflict of interest disclosure

The authors declared no conflicts of interest.

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Appendix 1. Questionnaire format

Please fill in the following detail

Country of your medical school

Age

University year of study

Question	Yes	No	Don't know
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Do you know what interventional radiology (IR) specialty is?

Have you ever seen or heard of what IR doctors do?

Do you know much about Radiology?

Would you consider a career in Radiology?

Would you consider a career in IR?

Do you know what Vascular Surgery specialty is?

Have you ever seen or heard of what vascular surgeons do?

Would you consider a career in vascular surgery?

Have you had any teaching/lectures/cases about IR?

What would make you more interested in taking up or considering IR as a career?

After this interview and now that I have explained what I do for a living, would you consider IR as a career?

Appendix 2

Other**:

- In Germany I have to be a general radiologist first and I don't want that!
- Want to pursue IR but not sure about diagnostic radiology.
- Too much diagnostic radiology since IR has no own pathway.
- Worried by the time I train and finish, others would have taken over vascular IR. Then what would be the point in all this training and learning EVARs?
- Only a few get trained in IR and I feel there is no place for women in IR especially with a family.