

Awareness of interventional radiology among final-year medical students and medical interns at a university in Southwestern Saudi Arabia

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ABSTRACT

الأهداف: معرفة درجة الوعي بالأشعة التداخلية بين طلاب السنة النهائية بكلية الطب وأطباء الامتياز بإحدى الجامعات السعودية. قد يساعد تحليل المعلومات الناتجة عن ذلك إلى تطوير مستقبل ممارسة الأشعة التداخلية في المملكة العربية السعودية.

الطريقة: تم إرسال استبيانات دون أسماء لطلاب السنة النهائية وأطباء الامتياز بجامعة الملك خالد بأبها، المملكة العربية السعودية خلال الفترة من 1-31 ديسمبر 2012م. بلغ عدد الطلاب وأطباء الامتياز الذين شملهم الاستبيان 119 وبلغ عدد الردود المستلمة 42 بما نسبته 35.3%. شملت الاستبانة 25 سؤالاً تغطي الإدراك والمعرفة والاهتمام بالأشعة التداخلية.

النتائج: شعر غالبية المجيبين على الاستبيان (52%) أن معرفتهم بالأشعة التداخلية ضعيفة. أكمل أو يخطط لإكمال دورة اختيارية في الأشعة ما مجموعه 40% فقط من المجيبين. ثمانية وثلاثون في المائة من المجيبين يرغبون في اعتبار الأشعة التداخلية كخيار لعملهم المستقبلي. السبب الأكثر شيوعاً (43%) الذي ذكره المجيبون أنه يمنعهم من النظر في الأشعة التداخلية كخيار عملي مستقبلي هو ضعف المعلومات المتوفرة لديهم عنها. لم يتعرف على الطريق التدريبي لطبيب الأشعة التداخلية سوى ثلث المجيبين. غالبية المجيبين يعتقدون أن طبيب الأشعة التداخلية يجري قسطرة القلب (81%) أو يجري عمليات التوصيلات الوعائية (74%).

خاتمة: تظهر نتائج هذه الدراسة أن التعرض العلمي لطلاب الطب وأطباء الامتياز لتخصص الأشعة التداخلية ضعيف، ويمكن تحسين هذا الوضع بالتركيز على تدريس طلاب كلية الطب مواضيع الأشعة التداخلية ويكون ذلك بواسطة أطباء الأشعة التداخلية مع التركيز على الجانب السريري من الممارسة.

Objectives: To assess the awareness of interventional radiology (IR) among final-year medical students and medical interns at a Saudi University. Analysis of such awareness could help to improve the future of IR in Saudi Arabia.

Methods: This cross-sectional study was based on anonymous surveys administered over a one month period (1st - 31st December 2012). One hundred and nineteen medical students and interns of King Khalid University, Abha, Saudi Arabia were included. Forty-two (35.3%) replies were received. The survey consisted of 25 questions covering perception, knowledge, and interest of interventional radiology.

Results: The majority of the respondents (52%) felt their knowledge in IR is poor. Only 40% of the respondents either completed or plan to complete an elective rotation in radiology. Thirty-eight percent of respondents were willing to consider a career in IR. The most common reason (43%) for not considering a career in IR was lack of knowledge. Only 33% correctly identified the route of training of interventional radiologist. The majority of respondents thought that interventional radiologists performed cardiac angioplasty (81%), and femoral popliteal bypass (74%).

Conclusion: Exposure to IR among medical students and interns was poor. This can be addressed by dedicated undergraduate teaching of IR by interventional radiologists with emphasis on the clinical practice.

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Interventional radiology (IR) is a clinical specialty that utilizes image guidance to perform minimally invasive diagnostic and therapeutic procedures. It is a rapidly expanding field, which encounters several challenges including a worsening shortage of personnel and lack of awareness among physicians, medical students and patients.^{1,2} The objective of this study is to report the views of final-year medical students and medical interns at a Saudi (King Khalid) University regarding their knowledge and perception of IR. Hopefully, this study will have positive implications on the future of IR in Saudi Arabia by helping to attract more medical students to this field and increasing the awareness of the future referring physicians. Although similar studies have been performed in Europe, United States and Canada; data concerning exposure of Saudi medical students and interns to IR is lacking in the literature and hopefully this study will address this deficit.³⁻⁵

Methods. Institutional Research Ethics Committee (REC) approval was obtained for this study according to the Principles of Helsinki Declaration (REC # 2013-02-02). This is a cross-sectional self-administered questionnaire study. A survey consisted of 25 questions (Appendix 1) was sent to 119 final-year medical students and interns of King Khalid University, Abha, Saudi Arabia during the period from 1-31 December 2012.

The survey was based on a validated questionnaires used previously in European and Canadian similar studies.^{1,2} A total of 42 students and interns (35.3%) responded to the survey. All the questions were completed in the returned questionnaires with exception of questions number 8 and 25 (open-ended questions), which were answered by 29 (69%) and 21 (50%) of the respondents, respectively. The survey was anonymous. The time allowed for reply was one month, during which 2 reminders were sent before the closing date. The study included the final-year medical students and interns, while other levels medical students were excluded. The questions covered several categories, including knowledge of IR procedures, route of training, and hospital duties. Respondents were asked to rate their knowledge of IR compared to other subjects, recall the primary source of their knowledge of various IR procedures and rank their preferred methods for learning about IR. They were also asked on their level of interest in IR and their thoughts on career prospects for interventional radiologist. In the medical school of the respondents to this survey, radiology is not taught to the medical students as a separate course, but as a series of lectures and clinical sessions integrated with

internal medicine, general surgery, pediatrics, obstetrics and gynecology, orthopedics and anatomy. Online literature review was performed to find prior related research studies. Percentage of the respondents who answered each question was calculated.

Results. The majority of respondents (52%) felt their knowledge in IR is poor. Those who rated their knowledge to be adequate, good or excellent were 29%, 14% and 5%, respectively. In Diagnostic Radiology (DR), 45% of the respondents rated their knowledge as poor, while those who rated it as adequate, good or excellent were 36%, 17% and 2%, respectively. Forty percent of the respondents either completed or plan to complete an elective rotation in Radiology while 60% of the respondents answered either "no" or "not sure" to this question. A reasonable number of respondents were willing to consider a career in IR (38%) or in DR (31%), however, the remaining respondents were not willing or not sure. The reasons of those who will not consider a career in IR or who are not sure are shown in Figure 1. The most common reason (43%) was lack of knowledge on IR.

The majority of respondents (60%) did not see patients who were treated by an interventional radiologist. The most common 3 IR procedures that the respondents are aware of were uterine fibroid embolization, stent placement and angioplasty, and image-guided biopsy. As regard to training, 50% of the respondents thought interventional radiologists must complete training in both radiology and surgery and only 33% correctly identified the route of training as radiology, while 17% thought there must be training in either surgery alone or internal medicine. The perception of the respondents regarding the clinical duties of the interventional radiologists is summarized in Figure 2. The majority of the respondents did not think IR have outpatient clinics (62%) or do ward rounds (64%). The source of respondents' information on IR was mostly lectures by interventional radiologist (67%) and radiology elective rotation (11%). Other sources included self-directed research, ward rounds, multi-disciplinary meetings (5% each), and problem-based learning (2%). Five percent of the respondents had no exposure to IR. The preferred methods of gaining exposure to IR and the ranking of each method are summarized in Table 1. Electives in radiology department and ward rounds were rated the best preferred methods by 38% and 36% of the respondents, respectively, while clinical research projects was rated as the worst method by 31% of the respondents. Eighty-eight percent of the respondents thought mandatory course of radiology

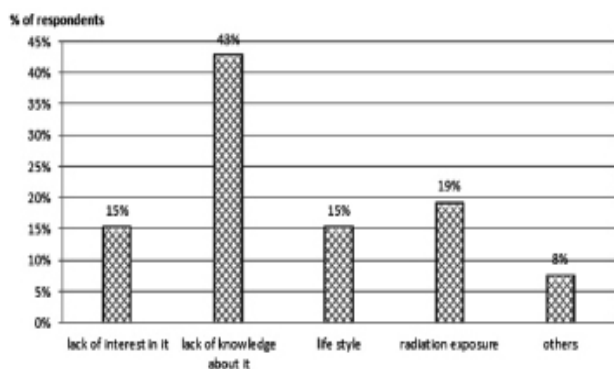


Figure 1 - Reasons not to consider a career in interventional radiology.

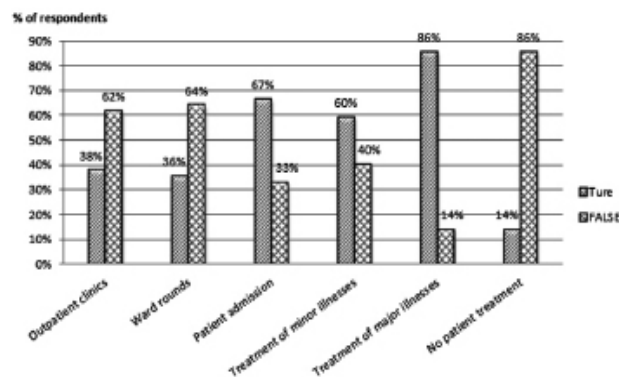


Figure 2 - Respondents' knowledge of clinical practice of interventional radiologists.

Table 1 - Respondents' ratings of the various teaching methods in interventional radiology, ranging from 1 (best) to 7 (worst). Note that various teaching methods may have been assigned the same rating more than once. Percentages are rounded to the nearest digit.

Various teaching methods	1	2	3	4	5	6	7	No reply
	best						worst	
Ward rounds	36	10	14	12	10	2	10	7
Radiology department electives	38	26	17	7	0	2	7	2
Lectures from interventional radiologists	19	29	29	12	7	5	0	0
Multidisciplinary meetings	17	7	24	29	10	5	5	5
Self-directed learning websites	5	5	5	7	26	17	26	10
Problem-based-learning tutorials	7	5	14	17	19	26	10	2
Clinical research projects	5	17	7	10	10	19	31	2

Data are expressed as percentage

during medical school would be beneficial. Eighty-six percent of the respondents were interested in doing a 2-week IR elective if it is offered during the 3-month surgery rotation in internship year.

The knowledge of the respondents of the types of procedures performed by interventional radiologists is summarized in Figure 3. The majority of respondents thought interventional radiologists performed cardiac angioplasty (81%) and femoral popliteal bypass (74%). The majority of respondents was unfamiliar with vertebroplasty (79%) or percutaneous nephrostomy (62%). However, the majority was familiar with radio-frequency ablation (55%), endovascular repair of aortic aneurysm (62%) and image guided tumor biopsy (60%). Fifty-five percent of respondents were familiar with angioplasty. The source of exposure to angioplasty was 74% from vascular surgery, 70% from IR, and 52% from cardiology (Figure 4). One-third of the respondents thought the career prospects of interventional radiologists are excellent, while 43% and 14% though they are good or adequate, respectively. Seven percent of the respondents thought the career

prospects are poor, and 3% answered “no knowledge” to this question.

The most common (67%) comment by the respondents was request to implement a separate radiology course in their medical school. Nineteen percent of the respondents suggested an elective course of radiology either in the medical school or as a fixed rotation in the internship. Fourteen percent of the respondents suggested more teaching of radiology in the medical school by more lectures and more clinical sessions.

Discussion. Interventional radiology is a rapidly expanding field which is facing several challenges including shortage of personnel and lack of awareness.^{1,2} Statistics regarding growth of IR practice and the volume of IR procedures in Saudi Arabia are currently lacking in the literature. Nevertheless, it is noticeable that there is an increase in the number of Saudi interventional radiologists and hospitals providing IR services.

Medical interns and students represent an important part of any future advancement in the field of IR as they are the potential future interventional radiologists and referring physicians. Therefore, it is important to

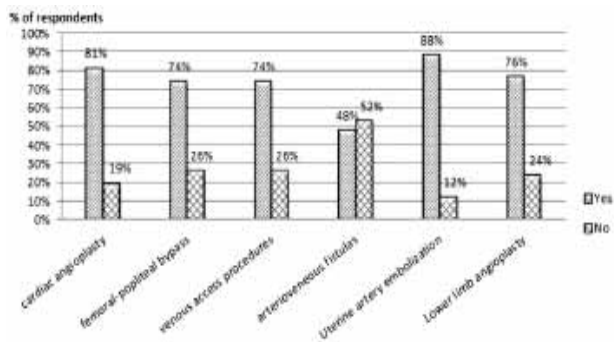


Figure 3 - Respondents' knowledge of the types of procedures performed by interventional radiologists.

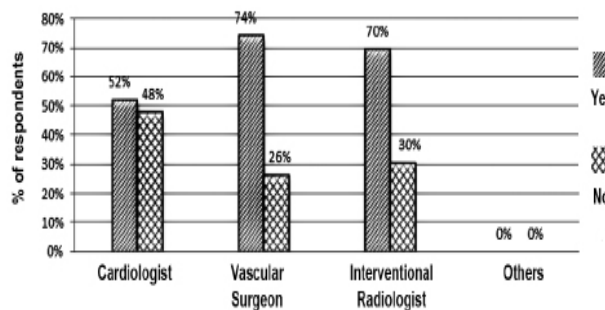


Figure 4 - Respondents' source of knowledge of angioplasty.

study and analyze the awareness of IR among Saudi medical students and interns and compare it to the published data in the developed countries. To fulfill that purpose, this survey was created based on similar surveys implemented in Europe, Canada and USA.³⁻⁵

There is no standardized curriculum of Radiology in Saudi medical schools. It is taught as a separate course in some Saudi universities and as integrated topics in some others. In the surveyed medical school, radiology is taught to the medical students as integrated topics mostly with internal medicine courses and to a less extent with surgery, pediatrics, obstetrics and gynecology, orthopedics and anatomy courses. The role of radiology in undergraduate medical curricula, including preclinical studies, has expanded in the recent years.^{6,7}

Fifty-two percent of the respondents in this survey reported poor or no knowledge of IR. In the European and Canadian surveys, total of 66% and 63%, respectively, reported poor or no knowledge of IR.^{3,4} This self-reported better knowledge in this survey might be explained by the seniority of the surveyed medical interns and final-year medical students in comparison to the European and Canadian all-levels medical students. However, this figure of poor or no knowledge of IR is still high given such senior level and that should be taken as a warning indicator.

The exposure to radiology is below expectation as only 40% of the respondents did complete or plan to complete an elective rotation in radiology and only the same percentage of respondents saw patients who were treated by an interventional radiologist. Since radiology is important to many other medical specialties, this figure was expected to be higher. The exposure of respondents to IR in this study is not far from the European study (35%).³ However, the Canadian study showed higher respondents' exposure (59%) to IR.⁴ A recent study from

USA showed much lower exposure (6%) to IR among medical students.⁸ More efforts to increase the exposure of medical interns and students to the field of radiology are needed. In this survey, a reasonable percentage of respondents were willing to consider a career in IR (38%) or in DR (31%). The majority of respondents (76%) thought career prospects for interventional radiologists are excellent or good. However, response bias in this voluntary survey might contribute to that, as possibly higher number of students and interns who are interested in radiology have responded to the survey. The European survey showed also reasonable percentage (41%) of respondents who are willing to consider a career in IR.³ However, in North America the interest of medical students to pursue a career in IR was not that high as it was only 18% in Canada and 13% in USA.^{4,8} The most common reason not to consider a career in IR was lack of knowledge, and that should warrant more efforts to address this gap, particularly during radiology undergraduate courses and internship radiology electives. There are other reasons reported particularly in radiology residents that dissuade them from pursuing a career in IR including income, work hours, and hours of on-call.⁹ Collaborative efforts are needed to address all these reasons that may turn medical students and postgraduates away from IR in order to attract more future interventional radiologists.

In this survey, there was a clear shortage of information about training and clinical practice of interventional radiologists. Only one third of the respondents correctly identified the route of training as radiology. One third or more of the respondents did not think interventional radiologists admit patients, do word rounds, have outpatient clinics or treat minor illnesses. The majority of respondents thought interventional radiologists perform cardiac angioplasty and femoral popliteal bypass. There was also unfamiliarity by the

majority of the respondents on some IR procedures like radiofrequency ablation and nephrostomy. Such shortage of information on the clinical side of radiology including IR practice may contribute to turning medical graduates away from considering a career in this field.¹⁰ The source of respondents' information on IR was mostly (67%) lectures by interventional radiologist, while their most preferred methods of gaining exposure to IR were radiology department electives (38%) and ward rounds (36%). Such feedback should be utilized to modify the teaching methods of medical students to provide more exposure to the hospital clinical teaching of IR.

The most common (75%) source of respondents' exposure to angioplasty was vascular surgery, while it was 70% from IR and 52% from cardiology. In the European survey, only 20% of the respondents heard of angioplasty from an interventional radiologist.³ Such higher exposure to angioplasty from IR in this study is likely because interventional radiologists participate in teaching medical students in the surveyed university. The higher exposure of respondents to angioplasty by vascular surgery in comparison to IR likely indicates emphasis on endovascular techniques by vascular surgeons in their teaching of undergraduate medical students.

The most common (67%) comment by the respondents was to implement a standalone radiology course in their medical school and this correlates with response of the majority (88%) who thought mandatory course of radiology during medical school will be beneficial. Similar response on the need of mandatory radiology teaching in undergraduate curricula was reported in USA.¹¹ Teaching radiology even in the preclinical years of medical schools has a positive effect on medical students' interest, perception and attitude toward radiology.¹²

There are some limitations of this study. The results apply only to one Saudi university with small sample size. Larger national studies involving multiple Saudi universities would be needed. Response bias may affect the results of any survey, as respondents who are interested in the subject may be more likely to complete the survey. However, the response rate (35.3%) to this voluntary survey is higher than European (34.5%) and Canadian (19%) similar studies.^{3,4}

In conclusion, the results of this study suggest that the awareness, knowledge and exposure to IR among final-year medical students and medical interns are generally poor. This can be addressed by dedicated teaching of the medical students by interventional radiologists with emphasis on the clinical practice

of IR. Lack of unified radiology curriculum in Saudi universities may be addressed by the Council of the Deans of Saudi Medical Schools. Active role of the Radiological Society of Saudi Arabia (RSSA) and Saudi IR Society (currently under establishment) is important in this matter.

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References

- O'Brien J, Baerlocher MO, Asch MR, Hayeems E, Kachura JR, Collingwood P. Limitations influencing interventional radiology in Canada: results of a national survey by the Canadian Interventional Radiology Association (CIRA). *Cardiovasc Intervent Radiol* 2007; 30: 847-853.
- Sunshine JH, Cypel YS, Schepps B. Diagnostic radiologists in 2000: basic characteristics, practices, and issues related to the radiologist shortage. *AJR Am J Roentgenol* 2002; 178: 291-301.
- Leong S, Keeling AN, Lee MJ. A survey of interventional radiology awareness among final-year medical students in a European country. *Cardiovasc Intervent Radiol* 2009; 32: 623-629.
- O'Malley L, Athreya S. Awareness and level of knowledge of interventional radiology among medical students at a Canadian institution. *Acad Radiol* 2012; 19: 894-901.
- Ghatan CE, Kuo WT, Hofmann LV, Kothary N. Making the case for early medical student education in interventional radiology: a survey of 2nd-year students in a single U.S. institution. *J Vasc Interv Radiol* 2010; 21: 549-553.
- Miles KA. Diagnostic imaging in undergraduate medical education: an expanding role. *Clin Radiol* 2005; 60: 742-745.
- Jafri NE, Wu P, Stanfield L, Slanetz PJ. Use of radiologic imaging to enhance physical diagnosis instruction in the preclinical curriculum. *Acad Radiol* 2008; 15: 942-947.
- Nissim L, Krupinski E, Hunter T, Taljanovic M. Exposure to, understanding of, and interest in interventional radiology in American medical students. *Acad Radiol* 2013; 20: 493-499.
- Baerlocher MO, Asch MR, Eran H; Canadian Interventional Radiology Association (CIRA). Attitudes of and influences on residents in English Canadian radiology programs regarding interventional radiology: results of a national survey by the Canadian Interventional Radiology Association (CIRA). *J Vasc Interv Radiol* 2005; 16: 1349-1354.
- Fielding JR, Major NM, Mullan BF, Neutze JA, Shaffer K, Wilcox CB, et al. Choosing a specialty in medicine: female medical students and radiology. *AJR Am J Roentgenol* 2007; 188: 897-900.
- Poot JD, Hartman MS, Daffner RH. Understanding the US medical school requirements and medical students' attitudes about radiology rotations. *Acad Radiol* 2012; 19: 369-373.
- Branstetter BF 4th, Humphrey AL, Schumann JB. The long-term impact of preclinical education on medical students' opinions about radiology. *Acad Radiol* 2008; 15: 1331-1339.

Appendix 1 - Interventional radiology awareness survey.

1. How would you rate your knowledge of interventional radiology as compared to other subjects?
 - a. Excellent
 - b. Good
 - c. Adequate
 - d. Poor
 - e. No knowledge
2. How do you rate your knowledge of radiology in general compared to other subjects?
 - a. Excellent
 - b. Good
 - c. Adequate
 - d. Poor
 - e. No knowledge
3. Have you completed or do you plan to complete an elective rotation in Radiology (diagnostic or interventional)?
 - a. Yes
 - b. No
 - c. Not sure
4. Would you consider a career in diagnostic radiology?
 - a. Yes
 - b. No
 - c. Not sure
5. Would you consider a career in interventional radiology?
 - a. Yes
 - b. No
 - c. Not sure
6. If you answer No or Not sure to the previous question, please choose the most appropriate reason why.
 - a. I do not find it interesting
 - b. I do not know enough about it
 - c. The life style is not for me
 - d. Radiation exposure
 - e. Other (please specify): _____
7. Have you seen patients who were treated by an interventional radiologist?
 - a. Yes
 - b. No
 - c. Not sure
8. Please list 3 interventional radiology procedures that you are aware of:
 - a. _____
 - b. _____
 - c. _____
9. An interventional radiologist must complete training in:
 - a. Radiology
 - b. Surgery
 - c. Both radiology and surgery
 - d. Internal medicine
 - e. Other (please specify): _____
10. Interventional radiologists have outpatient clinics.
 - a. True
 - b. False
11. Interventional radiologists do ward rounds in the hospital.
 - a. True
 - b. False
12. Interventional radiologists admit patients to the hospital.
 - a. True
 - b. False
13. Interventional radiologists treat patients with minor illnesses.
 - a. True
 - b. False
14. Interventional radiologists treat patients with major illnesses.
 - a. True
 - b. False

15. Interventional radiologists do not treat patients at all.
- True
 - False
16. What has provided you with the most information about interventional radiology?
- Radiology elective rotation
 - Lectures from interventional radiologist
 - Problem-based learning tutorials
 - Self-directed research
 - Ward rounds in the hospital
 - Multidisciplinary meetings
 - I have had no exposure to interventional radiology
 - Other (please specify): _____
17. How would you prefer to gain exposure to interventional radiology? Please rank the following methods for learning (rank 1 (BEST) to 7 (WORST)).

Teaching methods	1 (Best)	2	3	4	5	6	7 (Worst)
a. Ward rounds							
a. Radiology department electives							
b. Lectures from interventional radiologists							
c. Multidisciplinary meetings							
d. Self-directed learning websites							
e. Problem-based-learning tutorials							
f. Clinical research projects							

18. Do you think a mandatory radiology course during medical school would be beneficial?
- Yes
 - No
 - Not sure
19. Would you be interested in doing a 2-week interventional radiology elective if it is offered during the 3-month surgery rotation in internship?
- Yes
 - No
 - Not sure
20. 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 ___
21. 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 ___
22. Are you familiar with the procedure called 'angioplasty'? Yes ___ No ___
23. If you answer yes to the previous question, where did you gain that exposure?
- Cardiologist Yes ___ No ___
 - Vascular surgeon Yes ___ No ___
 - Interventional Radiologist Yes ___ No ___
 - Others (please specify) _____
24. What do you think about the career prospects for interventional radiologists?
- Excellent
 - Good
 - Adequate
 - Poor
 - No knowledge
25. Do you have any comments about interventional radiology in the medical school curriculum?
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