

Are US Medical Students Familiar with Interventional Radiology? A Systematic Review

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BACKGROUND

Since its introduction as an independent residency by the American Board of Medical Specialties (ABMS) in 2012, Interventional Radiology (IR) has developed rapidly. As IR application is expanding in diverse practices, the lack of IR awareness among medical students and doctors and the shortage of IR specialists is becoming more noticeable. The purpose of the current systematic review is to investigate the IR knowledge among the United States (US) medical students and to explore possible shortcomings in the presentation of this novel specialty to medical students.

MATERIAL AND METHODS

The protocol of the present review is designed based on PRISMA guideline. A systematic search using a proper syntax was accomplished on PubMed, Web of science, Scopus, and Embase databases in June 2022 (Figure 1). No limitation was considered in primary literature searching. Subsequently, to ensure all the desired evidences are collected, a manual search on Google Scholar search engine was performed. The studies which investigated the level of IR knowledge among students in the US medical schools were included in our data synthesis.

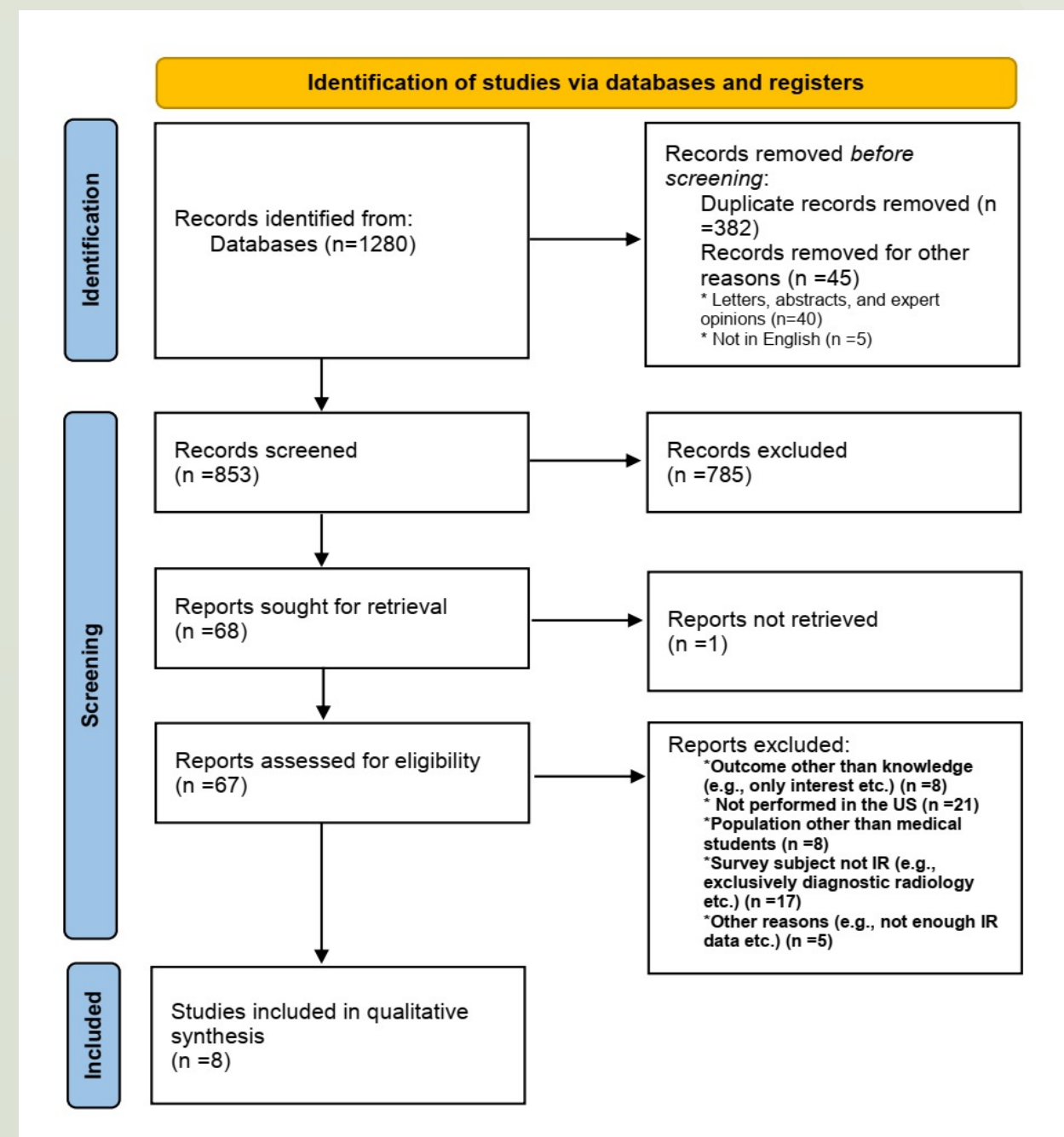


Figure 1. PRISMA flow chart

RESULTS

After the screening of titles, abstracts, and full-texts, eight studies were included. Included studies were accomplished between 2010 and 2021 and encompassed a total of 2054 students (Table 1). The IR interest and exposure were also assessed in the studies. Four studies examined the IR knowledge by a one-session survey (cross-sectional) while the other four comprised a tutorial course and the students' knowledge was assessed before and after it (interventional). The assessments were performed either through a self-report survey or through a quiz. The overall IR knowledge was poor in all studies, however, in interventional studies, the results improved significantly in post-course surveys (Table 2). Studies reported the better IR knowledge is associated with more interest and considering this specialty as a future career.

Table 1. Characteristics of included studies

| Author | Year | Type of Evidence | Number of Participants | Assessed Field | Number of Survey Questions | Type of Questions | Intervention Type | Number of Administered Surveys | Scope of Assessment |
|----------------|------|------------------|--|----------------|-----------------------------------|---------------------------|--|--------------------------------|-------------------------------|
| Ghatan (1) | 2010 | Interventional | Total 65 (Only 2nd year) | IR | Pre-course: 5 Post-course: 5 | Both | Didactic course (60 minutes) | 2* | knowledge, interest, exposure |
| Nissim (2) | 2013 | Cross-sectional | Total 729 (22.8% 1st, 23.3% 2nd, 23.2% 3rd, 28.5% 4th year, 1.9% other) | IR + DR | 10 | Active examination (Quiz) | NA | 1 | knowledge, interest, exposure |
| Commander (3) | 2014 | Cross-sectional | MSE: Total 270 (158 Preclinical, 112 Clinical) MSR: Total 321 (113 Preclinical, 208 Clinical) | IR | MSE=17, MSR=15 | Both | NA | 2* | knowledge, interest, exposure |
| Kattapuram (4) | 2015 | Interventional | Total 119 registered (36 completed pre-symposium survey, 21 completed post-symposium survey) | IR | 4 | Self-report | IR symposium (one day) | 2* | knowledge, interest |
| DePietro (5) | 2017 | Interventional | Total 146 (Only 1st year) | IR | Pre-course: 19 Post-course: 19 | Both | 4 IR lectures embedded in anatomy courses (3 months) | 2* | knowledge, interest |
| Kumar (6) | 2019 | Interventional | Total 225 registered (32% 1st, 25% 2nd, 24% 3rd, 8% 4th, 10% other) (166 completed both surveys) | IR | Pre-course: 30 Post-course: 37 | Self-report | Webinar-based IR elective courses (11 weeks) | 2* | knowledge, interest, exposure |
| Makary (7) | 2019 | Interventional | Total 46 (53% 1st, 36% 2nd, 11% 3rd year) | IR + DR | Pre-course: 9 Post-course: 9 | Self-report | IR symposium (one day) | 2* | knowledge, interest, exposure |
| Park (8) | 2021 | Cross-sectional | Total 611 (1st to 4th year) | IR | 19 | Both | NA | 1 | knowledge, interest, exposure |

MSE = medical school with elective radiology component, MSR = medical school with required radiology component, IR = Interventional Radiology, DR = Diagnostic Radiology, NA = not applicable (available), * Pre- and post-intervention evaluation

CONCLUSION

The present review demonstrates the knowledge of IR is limited among US medical students. The better IR exposure in medical schools will improve the students' awareness of the field, which can lead to more interest in the specialty.

Table 2. Findings of included studies

| Author | Results Pertaining to Knowledge (First Administered Survey in Interventional Studies) | Results of Post Interventional Survey Pertaining to Knowledge | Other Results | Correlations |
|------------|--|---|--|--|
| Ghatan | 1) 94% had some IR awareness and only 17% considered themselves familiar or very familiar 2) 52% thought IR does lifesaving procedures and 34% thought IR does more minor procedures | 1) After lecture: 29% said their IR impression and interest had a significant improvement and 46% had better impression | 1) 22% of post-lecture group were interested in taking IR electives and 52% showed strong desire to learn more IR 2) Most used IR learning source was previous lectures (15%) | NA |
| Nissim | 1) Knowledge of IR procedures was limited. The dominant exam score gained by participants was around 5 (of 10) | NA | 1) 70.8% reported no IR and 67.6% reported no DR exposure 2) Interest IR or DR: 4.4% DR, 12.7% IR, 18.6% both, 64.2% neither 3) Do IR rotation: 10.5% planned to do elective and 52.3% had no plan for electives | 1) Previous IR rotation resulted in better exam score (mean 7.3), however the difference was not significant. |
| Commander | 1) 84% of preclinical and 62% of clinical students reported poor or fair IR knowledge 2) knowledge of IR training path: (a) MSE: 73.2% radiology, 2.9% surgery, 21.1% both (b) MSR: 75.1% radiology, 0% surgery, 4.8% both | NA | 1) Consider an IR career: 11% of all respondents (15% preclinical; 5% clinical) 2) The main cause of not considering IR career: lack of knowledge (65%, preclinical; 20% clinical) 3) Main IR exposure source: (a) MSR: 49% required radiology course (b) MSE: 25% other rotations | 1) MSR clinical students displayed better IR knowledge compared to MSE peers***. 2) Clinical students showed better IR knowledge compared to preclinical peers*. |
| Kattapuram | 1) 83% knew with 14% powerfully knew IR duties 2) 57% knew with 5% powerfully knew when consult an IR-ist 3) 66% knew with 8% powerfully knew the conditions IR manages 4) 88% knew with 29% powerfully knew the difference between IR and DR | 1) 100% knew with 67% powerfully knew IR duties 2) 100% knew with 48% powerfully knew when to consult an IR-ist 3) 100% knew with 57% powerfully knew conditions IR manages 4) 100% knew with 86% powerfully knew difference of IR and DR | 1) IR as career: (pre-symposium) 91% interested, 31% strongly interested - (post-symposium) 100% interested, 67% strongly interested 2) DR as career: (pre-symposium) 83% - (post-symposium) 86% interested | NA |
| DePietro | 1) 73% of pre-lecture group reported poor IR knowledge | 1) 27% of post-lecture group reported poor IR knowledge, the lecture expanded IR knowledge significantly*** 2) 32% of post-lecture group believed they knew the most about IR among all medical fields 3) Knowledge of IR training path: 68% of post-lecture knew the training path, compared to 5% of pre-lecture and 33% of control group* | 1) Interest in IR as a career: 64% of post-lecture, 24% of pre-lecture and 33% of control group* | NA |
| Kumar | 1) The knowledge score (of 5) of IR field scope and when to consult IR in pre-course survey were about 3 and 3.5, respectively. | 1) Students displayed significant advancement in knowledge of the field of IR*** and recognition of when to consult IR-ist for patient management *** | 1) IR exposure: 13.3% had IR lectures, 27.1% had IR faculty mentorship, 23.5% unaware 2) 90.4% said the web-based lecture had a positive impact on their tendency to go for an IR career. | 1) DO students were more likely to be unaware of IR opportunities. |
| Makary | Included in post-course column | 1) An improvement in understanding of the dissimilarity between IR and DR (pre-course 3.86 vs. post-course 4.57) and IR duties (3.47 vs. 4.53) 2) An improvement in knowledge of when to consult IR-ist (2.47 vs. 4.07) and width of medical situations faced (3 vs. 4.4) 3) Increase in participants' knowledge of IR training paths (2.93 vs. 4.51) | 1) IR exposure: 59% school curriculum, 54% interest activities, 45.5% exploration week 2) The event increased IR interest (career) (3.7 vs. 4.12) and DR (3.07 vs. 3.35) 3) Seminar improved IR research tendency (3.51 vs. 3.68) | NA |
| Park | 1) Poor actual IR knowledge (quiz) 2) The majority of students were somewhat uncertain about IR procedures, training path, and IR duties. | NA | NA | 1) More IR interest and stronger tendency in pursuing IR were correlated with being more certain about IR knowledge* 2) 30% of IR interested students reported previous IR tutorials in college compared to 18% of their reluctant peers. |

MSE = medical school with elective radiology component, MSR = medical school with required radiology component, IR = Interventional Radiology, DR = Diagnostic Radiology, NA = not applicable (available), DO = osteopathic medical school doctors, * = significant difference between compared groups (p-value less than 0.05 =*, 0.01=**, 0.001=***)

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