



# Gender-Specific Factors Influencing Medical Students' Career Choice of IR

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## ABSTRACT

The authors conducted an anonymous survey to assess positive and negative factors that may affect medical students' decisions to pursue a career in interventional radiology (IR). The survey was sent to registrants for the Midwest IR Student Symposium in 2016 and/or 2017, with a response rate of 13%; male and female responses were then compared. Female and male medical students shared similar rankings of factors affecting their decisions about choosing IR as a career, such as concern about lifestyle and excitement about therapeutic applications. Access to female IR mentors and diversification of the currently male-dominated workplace were important, gender-specific concerns.

## ABBREVIATIONS

MIRMSS = Midwest IR Medical Student Symposium, WIR = Women in IR

## INTRODUCTION

The field of interventional radiology (IR) is 1 of the least gender-diverse medical specialties. Less than 10% of practicing interventional radiologists and 15% of IR fellows are women (1). The lack of gender diversity in IR may be in part due to the traditional pathway of recruiting IR fellows from diagnostic radiology residents. Because women now represent about 50% of all medical school graduates, integrated IR residency programs have a tremendous opportunity to expand the diversity of the field with a larger pool of potential female applicants from which to recruit (2). This training transition also necessitates raising awareness among medical students about career opportunities in IR earlier in their educational process. Furthermore, reasons for or against pursuing IR may be different among medical students compared to diagnostic radiology residents, thus

raising the importance of better understanding medical students' concerns and misperceptions about a career in IR (3–6). We have created a survey (**Appendix A** [available online on the article's **Supplemental Material** page at [www.jvir.org](http://www.jvir.org)]) to assess factors that may be influencing the decisions of medical students to pursue a career in IR, including gender-based differences and access to gender-specific mentorship.

## MATERIALS AND METHODS

The study was approved for exemption by University of Chicago's institutional review board. The authors performed a literature search to identify factors that may positively or negatively influence medical students' decision to pursue a career in IR. An anonymous 15-question survey was developed and consisted of multiple choice, 5-point Likert-type, and free-response questions in several categories (2,3,7,8). The survey was designed to assess demographics and factors that may influence a medical student's decision to choose a career in IR. The survey was sent electronically to medical students who registered for the Midwest IR Medical Student Symposium (MIRMSS) in 2016 and/or 2017, with 1 simultaneous collection period. Female registrants were contacted initially; male registrants were contacted at a later time with a survey adjusted to reflect the gender of respondents. Students were sent 2 reminder e-mails and had 2.5 weeks to complete the survey. Data were gathered in Microsoft Excel 2016 and presented as frequencies. Statistical analysis was performed with Stata/SE 14.2 (StataCorp, College Station, Texas). For Likert-type

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**Appendix A** can be found by accessing the online version of this article on [www.jvir.org](http://www.jvir.org) and clicking on the **Supplemental Material** tab.

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data, the nonparametric Wilcoxon-Mann-Whitney test was used (9). For categorical variables, the chi-square test was used except when frequencies in cells was <5, in which Fisher's exact test was used. A *P* value < .05 was considered statistically significant.

## RESULTS

Of 507 students who were sent the survey, 13% (66) responded. Demographic information, including level of training, medical school location, specialty of choice, and availability of an IR clerkship, are shown in **Table 1**. Medical students' ranking of negative and positive factors important for pursuing a career in IR are in **Tables 2** and **3**, respectively. In comparing female and male responses for these categories, the male-dominated workplace within IR was the only area of concern with a statistically significant difference in ranking (*P* < .001), whereas financial compensation was the only area of importance with a statistically significant difference in ranking (*P* = .045).

Female respondents ranked their concern about mentorship opportunities in IR significantly higher than their male counterparts (*P* = .010) (**Table 4**). Women also had a significantly different ranking of the importance of having a same-gender mentor in their specialty (*P* < .001); however, fewer women than men reported currently having such a mentor in their specialty of choice (*P* = .035) (**Table 5**). General impressions from the free-response section about what both male and female respondents hope to gain from a mentor include advice and guidance on career and work-life balance. Female respondents also specified they were seeking a female mentor as a role model, especially in leadership positions, and for social support.

The Women in IR (WIR) panel was held exclusively for female medical student attendees because of space and funding limitations. Of the 31 female respondents, 87% (27) attended the WIR panel in 2016 and/or 2017, of whom 63% (17) agreed that attending the WIR panel increased their likelihood of pursuing a career in IR; 4% (1) did not agree, and 33% (9) were neutral. These respondents evaluated the efficacy of the WIR panel in categories listed in **Table 6**. In the free-response section of the survey, respondents provided feedback about potential improvements to the WIR panel, including more networking time, providing an opportunity for male students to attend, hearing stories of the panelists' accomplishments, and discussing the "glass ceiling" perception for women in medicine. Of the 35 male students, 57% (20) said they would be interested in attending a WIR panel if it was available to them.

## DISCUSSION

The survey results highlight several factors that may influence medical students' career choice specific to the specialty of IR. The most concerning aspects about pursuing a career in IR among both female and male medical students

**Table 1.** Demographic Information of Female and Male Respondents Who Registered for the Midwest IR Student Symposium in 2016 and/or 2017

Category	Sex, n (%)			Total (%)
	Female	Male	<i>P</i> *	
Total responses	31 (47)	35 (53)	.008	66 (100)
Year in school				
M2	11 (35)	8 (23)	.506	19 (29)
M3	6 (19)	13 (37)		19 (29)
M4	12 (39)	11 (31)		23 (35)
PGY1	1 (3)	2 (6)		3 (5)
Other <sup>†</sup>	1 (1)	1 (3)		2 (3)
Medical school location				
Outside Midwest <sup>‡</sup>	2 (6)	2 (6)	1.00	4 (6)
Midwest	29 (94)	33 (94)		62 (94)
Specialty of choice				
Diagnostic radiology	5 (16)	5 (14)	.390	10 (15)
IR	9 (29)	17 (49)		26 (39)
Other <sup>  </sup>	3 (10)	3 (8)		6 (10)
Undecided	14 (45)	10 (29)		24 (36)
IR clerkship offered at school				
Yes	12 (39)	20 (57)	.316	32 (48)
No	6 (35)	8 (23)		19 (29)
Unknown	8 (26)	7 (20)		15 (23)

M2 = second-year medical student; M3 = third-year medical student; M4 = fourth-year medical student, PGY-1 = first-year resident.

\*Chi-square test or Fisher's exact test (if cell frequencies <5).

<sup>†</sup>Includes research year.

<sup>‡</sup>States outside the Midwest include: Florida (n = 1), Louisiana (n = 1), Tennessee (n = 1), Texas (n = 1).

<sup>||</sup>Other specialties include: anesthesiology (n = 1), emergency medicine (n = 1), general surgery (n = 1), interventional cardiology (n = 1), neurosurgery (n = 1), and pediatrics (n = 1).

involved its time-intensive nature (lifestyle/work hours and call) and "turf wars." Respondents did not differ significantly in their responses between sexes except for concerns expressed by females about the male-dominated workplace, which has been noted previously (2). Issues such as radiation exposure and the opportunity to raise a family, which have traditionally been considered deterrents for women, showed no significant difference. Less concern about exposure to radiation may be related to an increasing awareness about the better use of protective equipment and radiation hygiene technologies that reduce operator exposure to radiation.

The most positive aspects about pursuing a career in IR were commonly shared among female and male students. The areas of IR that are attractive to students include its innovative nature, dual diagnostic and therapeutic capabilities, intellectual stimulation, and use of imaging guidance for performing procedures. Males were also more attracted by the financial compensation than females. The results of this survey support prior research that exposing medical students to IR faculty and trainees through medical student IR clerkships, symposia, and interest group meetings may

**Table 2.** Level of Concern among Medical Students, Stratified by Sex, about Factors Relevant to Pursuing IR

Category	Sex	Level of Concern, n (%)					P*
		None	Minimal	Moderate	Very	Extreme	
Demanding call schedule	F	2 (6)	6 (19)	15 (48)	5 (16)	3 (10)	.124
	M	4 (11)	12 (34)	12 (34)	7 (20)	0 (0)	
	Total	6 (9)	18 (27)	27 (41)	12 (18)	3 (5)	
"Turf war" with other specialties	F	3 (10)	9 (29)	13 (42)	4 (13)	2 (6)	.779
	M	4 (11)	10 (29)	11 (31)	7 (20)	3 (9)	
	Total	7 (11)	19 (29)	24 (36)	11 (17)	5 (8)	
Lifestyle/hours	F	3 (10)	10 (32)	9 (29)	7 (23)	2 (6)	.918
	M	2 (6)	12 (35)	11 (32)	6 (18)	3 (9)	
	Total	5 (8)	22 (34)	20 (31)	13 (20)	5 (8)	
Opportunity to raise a family	F	6 (20)	8 (27)	8 (27)	6 (20)	2 (7)	.694
	M	5 (14)	10 (29)	11 (31)	5 (14)	4 (11)	
	Total	11 (17)	18 (28)	19 (29)	11 (17)	6 (9)	
Length of training	F	9 (29)	9 (29)	9 (29)	4 (13)	0 (0)	.947
	M	9 (26)	13 (37)	7 (20)	6 (17)	0 (0)	
	Total	18 (27)	22 (33)	16 (24)	10 (15)	0 (0)	
Patient contact time	F	13 (42)	7 (23)	2 (6)	9 (29)	0 (0)	.891
	M	11 (32)	12 (35)	6 (18)	3 (9)	2 (6)	
	Total	24 (37)	19 (29)	8 (12)	12 (18)	2 (3)	
Radiation exposure levels	F	6 (19)	8 (26)	13 (42)	4 (10)	1 (3)	.101
	M	9 (26)	14 (40)	11 (31)	1 (3)	0 (0)	
	Total	15 (22)	22 (33)	24 (36)	5 (7)	1 (1)	
Knowledge of physics	F	12 (39)	7 (22)	8 (26)	4 (13)	0 (0)	.367
	M	16 (46)	10 (29)	6 (17)	3 (9)	0 (0)	
	Total	29 (43)	17 (25)	14 (21)	7 (10)	0 (0)	
Male-dominated workplace	F	2 (6)	13 (42)	12 (39)	2 (6)	2 (6)	<.001
	M	16 (46)	15 (43)	4 (11)	0 (0)	0 (0)	
	Total	18 (27)	28 (42)	16 (24)	2 (3)	2 (3)	
Performing procedures	F	14 (45)	9 (29)	5 (16)	1 (3)	2 (6)	.643
	M	15 (45)	14 (42)	0 (0)	3 (9)	1 (3)	
	Total	29 (45)	23 (36)	5 (8)	4 (6)	3 (5)	
Financial compensation	F	15 (50)	10 (33)	5 (17)	0 (0)	0 (0)	.294
	M	13 (38)	13 (38)	6 (18)	2 (6)	0 (0)	
	Total	28 (44)	23 (36)	11 (17)	2 (3)	0 (0)	

Note—The categories are listed from most (top) to least (bottom) concerning based on aggregation of the rankings.

F = female, M = male.

\*Wilcoxon-Mann-Whitney test.

be beneficial tactics for increasing exposure to and interest in the specialty of IR (20). The survey also suggests that offering a robust IR medical student clerkship may be very important in generating interest in pursuing a career in IR.

Mentorship is a critical area of focus for both the professional and personal development of future interventional radiologists, as well as to grow the future leadership talent of IR (10). Women have reported a gap in mentorship and role models in academic medicine in general, which is likely even more pronounced in IR (11,12). Similar to other male-dominated specialties such as orthopedics, neurosurgery, and interventional cardiology, the paucity of female mentors in IR presents a challenge (13,14). The results of this survey indicate that female students consider female mentorship, especially in navigating a male-dominated field, to be an important opportunity for the specialty. Although increasing the number of female mentors may be logistically challenging until the number of female IR physicians increases,

it should nevertheless be an area of priority at both the local and national levels. The mentorship results may also be affected by the fact that male students find male IR mentors more easily because of sheer numbers; thus, they may not recognize having a same-gender mentor as a problem. As a relatively new field, limited exposure to IR during medical school may result in fewer women applying, especially if unanswered questions or misperceptions about work environment and radiation exposure persist. It is therefore imperative that recruitment start early and concerns about a career in IR be addressed early by medical student clerkships, IR interest groups, mentoring programs, and educational IR symposia.

The WIR panel attendees said it was effective in dispelling negative perceptions about work-life balance and radiation exposure issues in IR. Several respondents gave feedback of wanting a longer session, including time for networking and discussion of different personal and

**Table 3.** Level of Importance among Medical Students, Stratified by Sex, about Factors Relevant to Pursuing IR

Category	Sex	Level of Importance, n (%)					P*
		None	Minimal	Moderate	Very	Extreme	
Intellectual stimulation	F	0 (0)	0 (0)	4 (13)	11 (37)	15 (50)	.381
	M	0 (0)	0 (0)	5 (14)	17 (49)	13 (37)	
	Total	0 (0)	0 (0)	9 (14)	28 (43)	28 (43)	
Therapeutic capabilities	F	0 (0)	0 (0)	3 (10)	17 (55)	11 (35)	.620
	M	0 (0)	2 (6)	4 (11)	17 (49)	12 (34)	
	Total	0 (0)	2 (3)	7 (11)	34 (52)	23 (35)	
Performing procedures	F	1 (3)	1 (3)	6 (19)	17 (55)	6 (19)	.332
	M	0 (0)	0 (0)	8 (23)	16 (46)	11 (31)	
	Total	1 (2)	1 (2)	14 (21)	33 (50)	17 (26)	
Use of imaging	F	2 (6)	0 (0)	8 (26)	13 (42)	8 (26)	.399
	M	0 (0)	3 (9)	9 (26)	19 (54)	4 (11)	
	Total	2 (3)	3 (5)	17 (26)	32 (48)	12 (18)	
Medical school clerkship experience	F	1 (3)	1 (3)	11 (35)	13 (42)	5 (16)	.913
	M	0 (0)	3 (9)	11 (31)	15 (43)	6 (17)	
	Total	1 (2)	4 (6)	22 (33)	28 (42)	11 (17)	
Diagnostic capabilities	F	0 (0)	4 (13)	6 (19)	19 (61)	2 (6)	.667
	M	0 (0)	2 (6)	11 (31)	16 (46)	6 (17)	
	Total	0 (0)	6 (9)	17 (26)	35 (53)	8 (12)	
Use of technology	F	1 (3)	1 (3)	14 (48)	11 (38)	2 (7)	.162
	M	1 (3)	3 (9)	8 (23)	18 (51)	5 (14)	
	Total	2 (3)	4 (6)	22 (34)	29 (45)	7 (11)	
Patient contact time	F	1 (3)	5 (16)	10 (32)	8 (26)	7 (23)	.857
	M	1 (3)	6 (17)	10 (29)	13 (37)	5 (14)	
	Total	2 (3)	11 (17)	20 (30)	21 (32)	12 (18)	
Lifestyle/hours	F	0 (0)	6 (19)	12 (39)	11 (36)	2 (6)	.316
	M	0 (0)	3 (9)	16 (47)	8 (24)	7 (21)	
	Total	0 (0)	9 (14)	28 (43)	19 (29)	9 (14)	
Research opportunities	F	1 (3)	6 (19)	9 (29)	9 (29)	6 (19)	.345
	M	4 (11)	8 (23)	8 (23)	10 (29)	5 (14)	
	Total	5 (8)	14 (21)	17 (26)	19 (29)	11 (17)	
Academic practice opportunities	F	0 (0)	10 (33)	6 (20)	9 (30)	5 (17)	.733
	M	3 (9)	8 (23)	8 (23)	12 (34)	4 (11)	
	Total	3 (5)	18 (28)	14 (22)	21 (32)	9 (14)	
Financial compensation	F	4 (13)	6 (19)	15 (48)	6 (19)	0 (0)	.045
	M	0 (0)	4 (11)	21 (60)	7 (20)	3 (9)	
	Total	4 (6)	10 (15)	36 (55)	13 (20)	3 (5)	
Prestige of specialty	F	2 (7)	14 (47)	7 (23)	7 (23)	0 (0)	.546
	M	5 (14)	9 (26)	12 (34)	6 (17)	3 (9)	
	Total	7 (11)	23 (35)	19 (29)	13 (20)	3 (5)	
Private practice opportunities	F	7 (23)	12 (39)	7 (23)	5 (16)	0 (0)	.076
	M	2 (6)	14 (40)	11 (31)	4 (11)	4 (11)	
	Total	9 (14)	26 (39)	18 (27)	9 (14)	4 (6)	

Note—The categories are listed from most (top) to least (bottom) important based on aggregation of the rankings.

F = female, M = male.

\*Wilcoxon-Mann-Whitney test.

professional paths that women have taken to become successful clinicians, researchers, and mothers. Medical students will likely benefit from open discussions about how to manage the dynamic of working in a male-dominated space and what female interventional radiologists have learned in these efforts until the environment can become more gender balanced. These conversations may help to dispel inaccurate perceptions, while also enhancing the recruitment of qualified females into IR and empowering the next generations to address this disparity. Furthermore, exposure of males who plan to pursue a career in IR to the concerns of females may

help increase mutual understanding and further facilitate growth in diversity, and the survey suggests that many would be amenable to this opportunity.

Limitations of this study include potential response bias because of its voluntary nature and the targeted survey population, which was limited to medical students who registered for MIRMSS. Because these students were pre-selected by attending an IR symposium and most attended schools in the Midwest, the results of this survey cannot be extrapolated to the general medical student population or account for potential regional differences across the United

**Table 4.** Comparison of Mentorship Issues between Female and Male Medical Students

Question	Sex	Rank, n (%)					P*
		None	Minimal	Moderate	Very	Extreme	
How concerned are you about mentorship opportunities in IR? (n = 66)	F	3 (10)	8 (26)	15 (48)	4 (13)	1 (3)	.010
	M	14 (40)	10 (29)	6 (17)	2 (6)	3 (9)	
	Total	17 (26)	18 (27)	21 (32)	6 (9)	4 (6)	
How important is having a mentor of your gender in your specialty? (n = 66)	F	1 (3)	1 (3)	3 (10)	16 (52)	10 (32)	<.001
	M	17 (49)	4 (11)	6 (17)	4 (11)	4 (11)	
	Total	18 (27)	5 (8)	9 (14)	20 (30)	14 (21)	

F = female, M = male.

\*Wilcoxon-Mann-Whitney test.

**Table 5.** Comparison of Female and Male Responses about Current Mentorship

Question	Sex	Response, n (%)		P*
		Yes	No	
Do you currently have a mentor of your gender in your specialty of choice? (n = 65)	F	11 (37)	19 (63)	.035
	M	22 (63)	13 (37)	
	Total	33 (51)	32 (49)	

F = female, M = male.

\*Chi-square test.

States; however, having multiple institutions represented helps to avoid bias. In addition, the students likely had an existing interest in and/or level of knowledge about IR, although they may have also been better able to express their interests in and concerns about the field and provide more nuanced answers and more specific comments. Furthermore, a significantly larger proportion of female registrants responded to the survey in comparison to their male counterparts, which may skew the overall data and overrepresent the female responses in the target population. The responses were separated between male and female students and compared based on relative frequencies to avoid this error. The limited time allowed for students to respond to the survey and the relatively low response rate of 13% were additional limitations; however, this response period was similar to prior surveys of medical students (7,8), and a low response rate does not necessarily invalidate the data (15). Future research should assess the long-term efficacy of symposia such as MIRMSS and roundtable discussions, and whether IR symposium attendance, participating in an IR clerkship, or belonging to an IR interest group as a medical student is associated with a higher likelihood of pursuing IR as a career. There is also a need to better understand the effect of mentorship gaps and female-minority workplace environment on the recruitment of female medical students into IR. Recruitment tools can emphasize positive factors while allowing frank discussions about the other issues that become apparent.

In conclusion, the results of this study indicate that both female and male medical students have persistent concerns about the time-intensive clinical practice of IR, while also

**Table 6.** Evaluation of the Effectiveness of the WIR Panel in Answering Questions about Specific Topics, Ranked from 1 (Not at All Effective) to 5 (Extremely Effective)

Topics	Level of Effectiveness, n (%)				
	None	Minimal	Moderate	Very	Extreme
Opportunity to raise a family (n = 27)	0 (0)	1 (4)	4 (15)	12 (44)	10 (37)
Performing procedures (n = 26)	0 (0)	2 (8)	5 (19)	10 (39)	9 (35)
Radiation exposure (n = 27)	0 (0)	3 (11)	3 (11)	13 (48)	8 (30)
Male-dominated workplace (n = 27)	2 (7)	1 (4)	7 (26)	9 (33)	8 (30)
Lifestyle/hours (n = 26)	0 (0)	5 (19)	5 (19)	10 (39)	6 (23)
Demanding call schedule (n = 27)	0 (0)	6 (22)	7 (26)	10 (37)	4 (15)
Female mentorship (n = 26)	0 (0)	4 (15)	10 (38)	10 (38)	2 (8)
Length of training (n = 27)	0 (0)	6 (22)	7 (26)	8 (30)	6 (22)
Patient contact time (n = 26)	0 (0)	8 (31)	9 (35)	6 (23)	3 (12)
"Turf war" with other specialties (n = 27)	0 (0)	10 (37)	8 (30)	6 (22)	3 (11)
Financial compensation (n = 26)	4 (15)	8 (31)	6 (23)	6 (23)	2 (8)
Knowledge of physics (n = 27)	2 (7)	14 (52)	4 (15)	3 (11)	4 (15)

Note—The topics are listed from most (top) to least (bottom) effective based on aggregation of the rankings.

WIR = women in IR.

being excited about the unique diagnostic and imaging-guided therapeutic capabilities. Female medical students expressed concerns about entering a field such as IR with a male-dominated workplace and a lack of female mentors. Growing the diversity and prioritizing mentorship opportunities should remain important areas of focus in IR. Increasing interest in IR among medical students necessitates further study and a greater understanding of barriers

that limit how medical students access information and knowledge about the specialty.

## REFERENCES

1. Higgins MCSS, Hwang W-T, Richard C, et al. Underrepresentation of women and minorities in the United States IR Academic Physician Workforce. *J Vasc Interv Radiol* 2016; 27:1837–1844.
2. Perez YV, Kesselman A, Abbey-Mensah G, Walsh J. A glance at gender-specific preferences influencing interventional radiology selection. *J Vasc Interv Radiol* 2016; 27:142–143.
3. 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.
4. Shaikh M, Shaygi B, Asadi H, et al. The introduction of an undergraduate interventional radiology (IR) curriculum: impact on medical student knowledge and interest in IR. *Cardiovasc Interv Radiol* 2016; 39:514–521.
5. Commander CW, Pabon-Ramos WM, Isaacson AJ, Yu H, Burke CT, Dixon RG. Assessing medical students' knowledge of IR at two American medical schools. *J Vasc Interv Radiol* 2014; 25:1801–1807.
6. 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.
7. 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.
8. DePietro DM, Kiefer RM, Redmond JW, Hoffmann JC, Trerotola SO, Nadolski GJ. The 2017 integrated IR residency match: results of a national survey of applicants and program directors. *J Vasc Interv Radiol* 2018; 29:114–124.
9. Sullivan GM, Artino AR. Analyzing and interpreting data from Likert-type scales. *J Grad Med Educ* 2013; 5:541–542.
10. Keller EJ, McGee KA, Resnick SA, et al. Who we are and what we can become: an analysis of professional identity formation in IR. *J Vasc Interv Radiol* 2017; 28:850–856.
11. Edmunds LD, Ovseiko PV, Shepperd S, et al. Why do women choose or reject careers in academic medicine? A narrative review of empirical evidence. *Lancet* 2016; 388:2948–2958.
12. Lightfoote JB, Deville C, Ma LD, Winkfield KM, Macura KJ. Diversity, inclusion, and representation: it is time to act. *J Am Coll Radiol* 2016; 13:1421–1425.
13. Jagsi R, Griffith KA, DeCastro RA, Ubel P. Sex, role models, and specialty choices among graduates of US medical schools in 2006–2008. *J Am Coll Surg* 2014; 218:345–352.
14. Schmidt LE, Cooper CA, Guo WA. Factors influencing US medical students' decision to pursue surgery. *J Surg Res* 2016; 203:64–74.
15. Morton SMB, Bandara DK, Robinson EM, Carr PEA. In the 21st century, what is an acceptable response rate? *Aust NZ J Public Health* 2012; 36:106–108.