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Research Article

Evaluation of Factors that may Influence a Medical Student's Decision to Pursue a Career in Orthopaedic Surgery

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Abstract

Background: Women comprise over 50% of medical students and an increasing number are pursuing careers in surgical subspecialties. Despite improvements, orthopaedic surgery continues to have the lowest female representation among all surgical subspecialties.

Objective: The purpose of this study was to determine the most important factors that motivate and/or deter medical students from pursuing a career in orthopaedic surgery.

Methods: An anonymous electronic survey was distributed to PGY1-3 orthopaedic surgery residents at 5 ACGME accredited institutions, applicants to the orthopaedic residency program at the senior author's institution in 2017 and 2018, and all medical students at 3 LCME accredited institutions. The survey consisted of questions regarding demographics, motivations for pursuing careers in various fields, and factors that may have deterred a career in orthopaedics.

Results: A 25% response rate of medical students (455/1788) was attained. A 20% response rate of 152 orthopaedic surgery residents (152/780) was attained. Many students, 40%, and residents, 45%, indicated that experiences before medical school most heavily influenced their decision regarding desired specialty. Participants responded freely to a question regarding verbal deterrents received about a career in orthopaedic surgery. Medical students and residents indicated the competitive match process and lack of work-life balance were the strongest deterring factors, while patient care was the strongest motivating factor for pursuing a career in orthopaedic surgery. Many of the respondents also highlighted verbal deterrents received during their training.

Conclusion: Overall, men more commonly received deterrents regarding academic performance, while women received deterrents related to physical capabilities and gender.

Keywords: *Orthopaedics; Medical Student; Resident; Motivating Factors*

Abbreviations

ACGME: Accreditation Council for Graduate Medical Education; LCME: Liaison Committee on Medical Education; AAMC: American Association of Medical Colleges; IRB: Institutional Review Board; MSOP: Medical Student Outreach Program

Introduction

Female representation in medicine has steadily increased in the past 6 decades; however, the percentage of women in surgical subspecialties is still markedly lower than the percentage of men in those specialties [1]. In 2010, female medical students comprised 47.8% of the national student body [2]. Furthermore, in the 2018 - 2019 application cycle, the AAMC reported that more women (51.6%) than men (48.3%) matriculated into medical school [3]. As more women enter the medical field, an increasing number are pursuing careers in surgical subspecialties, such as urology, plastic surgery, and otolaryngology [4]. The number of female orthopaedic surgery residents and clinical faculty has more than doubled since 1995, with female residents accounting for 6.1% of total residents in 1995 and 14.5% in 2010 [5]. Despite these improvements, orthopaedic surgery continues to have the lowest percentage of female representation among all specialties, with only 14.8% of orthopaedic surgery residents being women [4,6].

Several studies have described factors that may influence a woman's decision to consider a career in orthopaedic surgery. In 2011, Baldwin., *et al*. surveyed medical students before, during, and following exposure to the field of orthopaedics to determine whether early exposure was a motivating factor [7]. The authors found that early exposure and access to a female mentor who was an orthopaedic surgeon were positive factors in encouraging female medical students to pursue a career in orthopaedics [7], a claim further supported by O'Connor and Hill., *et al.* [8,9]. A majority of medical schools do not have formal required musculoskeletal curricula, leaving many students without opportunities for exposure and a chance to learn about orthopaedics in the preclinical years. Additionally, a 2014 investigation of Israeli medical students demonstrated that female students were deterred from orthopaedic surgery due to its perceived "lack of challenge" as a specialty, its lack of "permitting time for family life," and the inability of the field to "provide the opportunity to work fewer hours" [10]. The challenges of maintaining work-life balance, long work hours, and years of extra training apply to all surgical specialties, hence it is unclear why orthopaedics lags behind other surgical fields in terms of the number of female residents.

Purpose of the Study

The purpose of this study was to determine the most important factors that motivate and/or deter medical students, particularly female medical students, from pursuing a career in orthopaedic surgery.

Methods

This was a multicenter study with IRB approval received from each participating institution. Two separate surveys were created via SurveyMonkey (San Mateo, CA). One survey was designed specifically for medical students and the other was designed for PGY-1, PGY-2, and PGY-3 orthopaedic surgery residents. Each of the surveys included questions regarding the participants' medical school demographics, exposure to orthopaedic surgery during medical school, and reasons behind pursuing, or not choosing orthopaedics as a career (Supplemental Digital Content 1, Supplemental Digital Content 2). Surveys were distributed via email to all medical students at 3 LCME accredited institutions. All junior residents (PGY-1-3) at 5 ACGME accredited orthopaedic surgery residency programs during the 2018 - 2019 academic year were also included. Additionally, all applicants to the orthopaedic surgery residency program at the senior author's institution in 2017 and 2018 were invited to participate in the study. Collaborators at individual institutions distributed the survey to their medical students and junior residents in November 2018, with reminder emails sent at 2 weeks and 4 weeks after initial request to encourage more participation. Descriptive statistics were utilized to analyze the survey responses. Scoring for appropriate questions was determined on a 1-10 scale, with 10 being the largest negative influence, based on a participant's answer. These scores were then aver-

aged. Statistical analyses were performed to compare male and female students and male and female residents in a number of categories using chi-square statistics with significance at $p < 0.05$.

Results

Demographics

455 medical students (44% male [200/455] and 56% female [255/455]) responded to the survey. Of medical students responding, 107 (24%) were in their first year, 104 (23%) in their second, 116 (26%) in their third, and 125 (27%) in their fourth. The overall response rate for medical students was 25% (455/1788), with a survey completion rate of 91% (415/455). 152 PGY-1 and PGY-2 orthopaedic surgery residents (73% male [111/152] and 27% female [41/152]) responded to the survey, while 95% (149/152) completed the full survey. The overall response rate for residents was 20% (152/780). Survey questions are available in the Supplemental Digital Content.

Pre-medical school experience

184 of 455 (40%) medical students and 69 of 152 (45%) junior orthopaedic surgery residents indicated that experiences with physicians of various specialties before medical school most heavily influenced their decision regarding their desired specialty. 43% of residents, 65 of 152, also indicated that training in year 3 of medical school heavily influenced their decision, with 154 of 455 (34%) medical students indicating the same. Additionally, 86 of 455 (19%) students and 10 of 152 (6.6%) residents indicated included training in medical school years 1 and 2 most heavily influenced their career decision. 144 of 255 (56.5%) female students indicated that experience prior to medical school influenced their choice, while only 20 of 69 (29%) residents who indicated that experience prior to medical school was a factor were female.

Factors influencing the decision to pursue a career in orthopaedic surgery

194 of 455 (43%) medical students and 59 of 152 (39%) residents reported that the individuals who most influenced their specialty choice were faculty in their desired specialty. Students interested in orthopaedics reported that patient care was the most important factor in their decision to pursue a career in orthopaedic surgery (77%; 80/104). Male and female students did not significantly differ in this manner ($p = 0.617$). A majority of residents (71%; 109/152) indicated that patient care was the most important factor in deciding on a career in orthopaedic surgery. The reasons male and female residents were interested in orthopaedics did not significantly differ ($p = 0.07$). Details of "other" answer choices can be seen in Supplemental Digital Content and include healthcare providers before medical school, residents in the type of training program, and family member and/or family expectations.

Factors that deter medical students and residents from pursuing a career in orthopaedic surgery

221 of 415 (53%) medical students indicated that the competitive match process was the biggest reason why they decided not to pursue a career in orthopaedic surgery. Additionally, 71 of 152 (47%) current junior residents indicated that they temporarily considered pursuing another career due to the competitive match process for orthopaedics. However, the strongest deterring factor for students once interested in orthopaedics was the lack of work-life balance (an average score of 6.09/10). Of note, female residents recorded receiving significantly more verbal deterrents about having a career in orthopaedics than their male counterparts ($p = 0.009$). However, among students, there was not a difference between males and females regarding verbal deterrents ($p = 0.29$). Additionally, all responses to "other" from residents (Table 1) and students (Table 2) who responded freely to a question regarding verbal deterrents for considering a career in orthopaedic surgery from faculty, family, friends, or others were recorded. A majority (7 of 8 resident responses; 4 of 6 student responses) of verbal deterrents that female participants reported focused largely on a lack of perceived physical ability and an inability to sustain a family life while pursuing a career in orthopaedic surgery. Although a small sample size of 3 residents and 2 medical students, male respondents reported verbal deterrents regarding academic rigors matching into the specialty.

Resident Responses	Individual Resident Demographics: Gender, PGY, Residency Program Geographic Location
Discouraged due to demands of the profession and being told that as a woman it will be very challenging to pursue a career in ortho and have a family at the same time.	Female, PGY-1, South - East South Central (AL, KY, MS, TN)
Recommended select a sub-specialty with an "easier life" compared to the rigors of Orthopedics from a senior Orthopedic surgeon while I was a 3rd year medical student	Male, PGY-3, Midwest - West North Central (IA, KS, MN, MO, NE, ND, SD)
Verbal deterrents from faculty outside of orthopaedics saying go into something else or questioning if I had the capabilities to make it in the orthopaedic field	Male, PGY-1, Midwest - West North Central (IA, KS, MN, MO, NE, ND, SD)
A nice girl like me should go into plastics not ortho	Female, PGY-3, Northeast - Middle Atlantic (NJ, NY, PA)
"Do you think you can handle it? Will you be able to keep up with the boys?"	Female, PGY-3, South - South Atlantic (DE, DC, FL, GA, NC, SC, VA, WV)
Faculty advisor strongly was against a career in orthopaedics (cited difficulty raising a family, male dominated field)	Female, PGY-2, Northeast - Middle Atlantic (NJ, NY, PA)
Verbal deterrents: it's a grueling residency: hard life swinging hammers all day and holding heavy legs, emergency cases bad for lifestyle, hard to start a family in the midst of all the above	Female, PGY-3, Midwest - East North Central (IN, IL, MI, OH, WI)
Physicians from non-orthopaedic specialties would tell me I "look like an OB-GYN, peds, family med, etc." and in general gave the impression I was "too nice for ortho".	Female, PGY-2, South - South Atlantic (DE, DC, FL, GA, NC, SC, VA, WV)
I still wanted to do ortho, but many people recommended against it - including people I just met who were in medicine. They seemed to feel that I hadn't considered "how challenging it is to be a woman in orthopaedics" despite the fact that I was very well informed about the specialty.	Female, PGY-3, Midwest - East North Central (IN, IL, MI, OH, WI)
Was told I was never going to see my wife/girlfriend, would make family life difficult	Male, PGY-3, Midwest - East North Central (IN, IL, MI, OH, WI)
As a female applicant, your choice to pursue orthopedics is heavily questioned by others - "are you sure about that? why would you ever want to do that? have you thought about what your life will be like once you have a family?" These sorts of questions are rarely posed to our male colleagues.	Female, PGY-1, Northeast - Middle Atlantic (NJ, NY, PA)

Table 1: *Resident responses to question regarding verbal deterrents from faculty/family/friends.*

Student Responses	Student Demographics: Sex, Year, Medical School Geographic Location
A lot of people told me "it's very bro-y"	Male, MS3, South - West South Central (AR, LA, OK, TX)
"Primary care would be better for you"	Female, MS3, South - West South Central (AR, LA, OK, TX)
My female mentor works in urgent care and told me she was all set to match into orthopaedics, but the male-dominant atmosphere was something she really struggled with; that was maybe 15-20 years ago but we're alike in a lot of our thinking, and that cautions me as well.	Female, MS2, South - West South Central (AR, LA, OK, TX)
Friends thinking, I can't be a good mother and wife. Orthopedic surgeon telling me I would have a hard time finding a husband who's supportive of my career.	Female, MS1, South - West South Central (AR, LA, OK, TX)
While rotating with orthopaedic surgery, the residents often joked or indirectly suggested I wasn't tall enough or physically strong enough compared to them. They were skeptical to assign me tasks like holding up the leg before setting up the drapes in the OR, and overall, it just made me feel less welcome and included as part of the team. Overall, I think it negatively impacted my experience. There were also almost no female residents (maybe 2 out of 30 or 40), and I didn't work with any women on the rotation, exacerbating the divide between me and the male residents and faculty.	Female, MS4, South - West South Central (AR, LA, OK, TX)
Family have expressed concerns of it being a male-dominated field	Female, MS2, Northeast - Middle Atlantic (NJ, NY, PA)
I was told that women entering orthopedic surgery will be confined to hand surgery due to physical limitations of being typically smaller than their male counterparts.	Female, MS4, Northeast - Middle Atlantic (NJ, NY, PA)
You're too nice to be a surgeon	Male, MS1, Northeast - Middle Atlantic (NJ, NY, PA)

Table 2: *Student responses to questions regarding verbal deterrents from faculty/family/friends.*

Discussion

Our study demonstrated that medical students and current junior residents with early exposure to orthopaedic surgery were more likely to pursue a career in this field than those who had not been exposed to orthopaedics early in their medical training. Junior residents also indicated that experiences during their third year of medical school heavily influenced their decision to pursue orthopaedics. Additionally, our study found that females experienced verbal deterrents surrounding their gender and social factors, whereas males experienced verbal deterrents related to their academic abilities and the difficulty of the specialty; however, the sample size for this finding is small. Although female medical students outnumber male medical students, orthopaedic surgery still lags behind all other surgical subspecialties in female representation [1,3]. Several previous studies have attempted to understand what factors influence a medical student's decisions to pursue a career in orthopaedic surgery [7,8,10-14].

Previous studies have also indicated that early exposure to the field of orthopaedics and access to a female mentor who was an orthopaedic surgeon were motivating factors in encouraging female medical students to pursue a career in orthopaedics [7-9]. The Perry Initiative is a pipeline program, which has been successful in introducing orthopaedic surgery to female high school and medical students. The Medical Student Outreach Program (MSOP), part of the Perry Initiative, is designed to expose first- and second-year medical students to orthopaedic surgery. A 2016 study by Lattanza., *et al*. demonstrated that the orthopaedic surgery match rate for program participants was 31% for the first graduating class (5 of 16 participants in 2015) and 28% in the second class (20 of 72 participants in 2016) [15]. Thus, the early results of this program are promising [15]. Efforts should be made to ensure that these opportunities are supported and made available to medical students. Another important aspect, not mentioned explicitly in the present study but indicated in previous studies, is salary [11].

A recent study by Larsen., *et al*. surveying 720 medical students regarding career aspirations at a single institution (261 responses, of which 58.6% were female) demonstrated that women were significantly more likely to receive verbal deterrents related to gender, age and family aspirations as compared to their male counterparts [16]. This study also identified factors that were deterrents for both female and male medical students interested in pursuing a career in surgery, including work hours and time for outside interests. Despite women and men receiving verbal deterrents, women perceived them to be more gender-based [16]. The findings from Larsen., *et al*. corroborate the results of our study. An important aspect of our study was the ability for participants to add comments and examples of verbal deterrents they received from family, friends, or faculty members. As described in table 1 and 2, respondents, many of whom were female, indicated that they had received verbal deterrents regarding their ability to physically participate in orthopaedic surgeries as well as lifestyle-based deterrents, specifically regarding family and free time. The deterring comments came not only from within medicine, but also from friends, family, and acquaintances outside of the medical field. A few male respondents indicated they also received verbal deterrents, however, many of the comments surrounded the culture and lifestyle of orthopaedic surgery, rather than being focused on their gender. As described in the results section, female residents received significantly more verbal deterrents than their male counterparts, however, the same was not discovered between male and female students. Additionally, several previous studies identified lifestyle and lack of work-life balance of orthopaedic surgery as a deterring factor for both men and women [12,13].

In 2018, Mulcahey., *et al*. demonstrated that mentoring medical students may help diversify the field of orthopaedic surgery [14]. Students and junior orthopaedic surgery residents in our study indicated that the individuals who most influenced their specialty choice were faculty in their desired specialty. As described above and in the recent literature, faculty that motivate or deter a student from a particular specialty seem to weigh heavily on a student's career choice.

There are several limitations to this study. First, this was a survey-based study, and hence is subject to all of the limitations inherent to this study design. We acknowledge that a certain level of variability exists in how questions and responses are interpreted by respondents, however all surveys and responses were kept anonymous. A response bias may also exist, as residents and applicants could choose to respond to various questions. Second, the response rates for medical students (25%) and residents (20%) are in the acceptable range

for survey studies; however, these low rates may decrease the external validity of the study. A nonresponse bias may also exist, indicating potentially significant differences between those who responded and those who did not. Additionally, as we only surveyed residents at 5 institutions, our findings may not be reflective of all medical students or junior orthopaedic residents throughout the United States. Finally, recall bias is an important factor to consider in any survey-based study. Despite these limitations, we believe that this can be representative of influential factors throughout the country. A similar study comparing other subspecialties, especially those with challenging work-life balance, would be interesting and may further explain our results if not uniform.

Conclusion

Medical students and current junior orthopaedic surgery residents both indicated that the competitive match process and perceived lack of work-life balance were the strongest deterring factors for pursuing a career in orthopaedic surgery, while aspects of patient care were identified as the strongest motivating factor. Additionally, many of the respondents highlighted verbal deterrents they had received during medical school. While males received verbal deterrents regarding difficulty of the specialty and grades, female medical students received many more verbal deterrents related to physical capabilities and family life (e.g. "keeping up with the guys"). It was shown that female residents received more verbal deterrents than their male counterparts; however, this difference was not seen in medical students. This is a possible demonstration of the impact of mentorship and female representation in orthopaedics for students, particularly female students, interested in a career in orthopaedics. This study highlights and adds to the current literature describing motivating and deterring factors for medical students interested in pursuing a career in orthopaedic surgery.

Conflict of Interest

The authors declare they have no competing interests and report no external funding source for this study.

Supplemental Digital Content 1: Student Survey

1. What year are you in medical school?
    a. First
    b. Second
    c. Third
    d. Fourth
    e. Other (please specify)
2. What is your sex?
    a. Male
    b. Female
3. What is your age group?
    a. 21-24

b. 25-28

c. 29-32

d. 33+

4. In what geographic region is your medical school located?

a. Northeast - New England (CT, ME, MA, NH, RI, VT)

b. Northeast - Middle Atlantic (NJ, NY, PA)

c. Midwest - East North Central (IN, IL, MI, OH, WI)

d. Midwest - West North Central (IA, KS, MN, MO, NE, ND, SD)

e. South - South Atlantic (DE, DC, FL, GA, NC, SC, VA, WV)

f. South - East South Central (AL, KY, MS, TN)

g. South - West South Central (AR, LA, OK, TX)

h. West - Mountain (AZ, CO, ID, NM, MT, UT, NV, WY)

i. West - Pacific (AK, CA, HI, OR, WA)

5. How many students are in your medical school class?

a. ≤ 50

b. 51 - 100

c. 101 - 150

d. 151 - 200

e. 201+

6. How many students in the 4th year class are applying for orthopaedic residency?

a. 1 - 2

b. 3 - 4

c. 5 - 6

d. 7 - 8

e. > 8

f. I don't know

7. My decision regarding area of medicine in which I would like to specialize has been most heavily influenced by:*

    a. Experiences before medical school

    b. Training in medical school years 1 and 2

    c. Training in medical school year 3

    d. Other (please explain)

8. The individuals that have most influenced my specialty choice are:* (Please check all that apply)

    a. Health care providers before medical school

    b. Residents in the type of training program for which I plan to apply

    c. Faculty in the type of training program for which I plan to apply

    d. Family member and/or family expectations

    e. Other (please explain)

9. Have you ever been interested in pursuing a career in orthopaedics?

    a. Yes

    b. No

10. If "yes" to Q9, are you still considering a career in orthopaedics?

    a. Yes

    b. No

11. If "yes" to Q10, which of the following factors is MOST important in your decision to pursue orthopaedic surgery?*

    a. Patient care aspects

    b. Lifestyle

    c. Income

    d. Pressure from family and/or peers

    e. Basic science/research aspect

    f. Other (please specify)

12. If "no" to Q10, what factors have deterred you from continuing to pursue orthopaedics?

a. Male-Dominated Field

b. Difficult to manage work-life balance

c. Verbal Deterrents from Faculty (please specify)

d. Verbal Deterrents from Family (please specify)

e. Verbal Deterrents from Friends (please specify)

f. Influential Same Sex Mentor

g. Influential Opposite Sex Mentor

h. Technical Demands of the Field

i. Other (please explain)

13. On a scale of 1 - 10 (10 being the largest negative influence), how much do the following factors have a deterring influence on you pursuing a career in orthopaedics?

a. Male-Dominated Field

b. Work-Life Balance

c. Verbal Deterrents from Faculty (please specify)

d. Verbal Deterrents from Family (please specify)

e. Verbal Deterrents from Friends (please specify)

f. Influential Same Sex Mentor

g. Influential Opposite Sex Mentor

h. Technical Demands of the Field

i. Other (please explain)

*Questions from Johnson AL, Sharma J, Chinchilli VM, Emery SE, McCollister Evarts C, Floyd MW, Kaeding CC, Lavelle WF, Marsh JL, Pellegrini VD Jr, Van Heest AE, Black KP. Why do medical students choose orthopaedics as a career? *J Bone Joint Surg Am* 2012; 94(11): e78.

Supplemental Digital Content 2: Resident Survey

1. Are you an orthopaedic surgery resident?

a. Yes

b. No

2. What year are you in residency?
    a. PGY-1
    b. PGY-2
    c. PGY-3
    d. PGY-4
    e. PGY-5
    f. Other (Please specify):_____
3. What is your sex?
    a. Male
    b. Female
4. What is your age group?
    a. 25 - 28
    b. 29 - 32
    c. 33 - 36
    d. 37+
5. My decision regarding area of medicine in which I wanted to specialize was most heavily influenced by:*
    a. Experiences before medical school
    b. Training in medical school years 1 and 2
    c. Training in medical school year 3
    d. Other (please explain)
6. The individuals who most influenced my specialty choice are:* (Please check all that apply)
    a. Health care providers before medical school
    b. Orthopaedic residents during medical school
    c. Orthopaedic faculty during medical school
    d. Family member and/or family expectations
    e. Other (please explain)

7. Did you experience any of the following potential deterrents for pursuing orthopaedics as a career while you were in medical school? Please check all that apply.

    a. Male-Dominated Field

    b. Difficult Work-Life Balance

    c. Verbal Deterrents from Faculty (please specify)

    d. Verbal Deterrents from Family (please specify)

    e. Verbal Deterrents from Friends (please specify)

    f. Influential Same Sex Mentor

    g. Influential Opposite Sex Mentor

    h. Technical Demands of the Field

    i. Other (please explain)

8. Which of the following factors was MOST important in your decision to pursue orthopaedic surgery? *

    a. Patient care aspects

    b. Lifestyle

    c. Income

    d. Pressure from family and/or peers

    e. Basic science/research aspect

    f. Other (please specify)

*Questions from Johnson AL, Sharma J, Chinchilli VM, Emery SE, McCollister Evarts C, Floyd MW, Kaeding CC, Lavelle WF, Marsh JL, Pellegrini VD Jr, Van Heest AE, Black KP. Why do medical students choose orthopaedics as a career? *J Bone Joint Surg Am* 2012; 94(11): e78.

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