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Citation

Larsen, A. M. G., Pories, S., Parangi, S., & Robertson, F. C. (2021). Barriers to pursuing a career in surgery: an institutional survey of Harvard medical school students. *Annals Of Surgery*, 273(6), 1120-1126. doi:10.1097/SLA.0000000000003618

Version: Publisher's Version

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Downloaded from: <https://hdl.handle.net/1887/4302183>

Note: To cite this publication please use the final published version (if applicable).

Barriers to Pursuing a Career in Surgery

An Institutional Survey of Harvard Medical School Students

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Objective: This study aimed to elucidate current medical student perceptions on barriers to a career in surgery, with a particular focus on gender-specific differences.

Summary Background Data: Although gender parity in medical school composition has been reached, women continue to be underrepresented in the field of surgery.

Methods: An anonymous, single-institution, internet-based survey conducted at Harvard Medical School.

Results: Approximately 720 medical students were surveyed and 261 completed the questionnaire (36.3%; 58.6% women, 41% men, 0.4% transgender). Overall, there was no significant gender difference in intention to pursue surgery (27% of men, 22% of women; $P = 0.38$). Sixty-nine percent of all students and 75% of those pursuing surgery reported verbal discouragement from pursuing a surgical career. Women were significantly more likely to perceive that the verbal discouragement was based on gender ($P < 0.0001$), age ($P < 0.0001$), and family aspirations ($P = 0.043$) compared to men. Surgical work hours and time for outside interests were the greatest deterrents for both genders. Significantly more women reported concerns about time to date or marry ($P = 0.042$), time to spend with family ($P = 0.015$), finding time during residency to have a child ($P < 0.0001$), taking maternity/paternity leave during residency ($P < 0.0001$), and being too old after residency to have a child ($P < 0.0001$).

Conclusions: Both men and women reported high rates of verbal discouragement, but more women perceived that the discouragement was gender-based. Concerns about marriage and childbearing/rearing significantly deterred more women than men. Family aspirations were also a significant factor for men to choose an alternative career path. Additional support within the surgical field is needed to mitigate these concerns and support trainees in both their career and familial aspirations.

Keywords: career selection, gender, medical student, surgery

(*Ann Surg* 2021;273:1120–1126)

Women continue to be underrepresented in the field of surgery. Although approximately 50% of medical students in the United States are women, they comprise only 23% of practicing surgeons.¹ Even with recent increases in rates of women entering the field and rising to leadership positions, it is estimated to take >120 years to achieve gender parity in surgery.^{2,3} This disparity is more pronounced in surgical subspecialties, where 8.0% of urologists, 7.8% of neurosurgeons, 6.0% of thoracic surgeons, and 5.0% of orthopedic surgeons are women.¹ These statistics cannot be attributed to differences in preference for specialty content alone; multiple systemic and social factors deter women from pursuing a surgical career.^{4–6} To strive toward gender parity within surgery, we must obtain a better understanding of gender-specific barriers.

Medical school is a critical moment in both specialty selection and this gender divide. Specialty interests evolve as medical students engage with current practitioners, understand the work hours and lifestyles of different specialties, find mentors, and partake in clinical work. A review of the orthopedic surgery literature revealed that women were more likely than men to have their career choice influenced by their medical school clinical rotations.⁷ A 2016 systematic review by Schmidt et al⁵ revealed 38 articles that explicitly explored factors influencing medical students' choice of a surgical career in the United States. Lack of exposure to women role models and perceived challenges of balancing a career and family has dissuaded many women medical students.^{8–10} Other studies have suggested that one's choice of surgical residency is contingent upon professional exposure, lifestyle features, work environment, field competitiveness, educational debt, length of training, salary expectations, and overall interest in the field, with variable differences by gender.^{11–13}

Although these studies have elucidated historical factors contributing to the disproportionate lack of women surgeons, recent societal movements for gender equality contribute to change in the professional climate. International campaigns that denounce glass-ceilings on career advancement (*Lean In: Women, Work, and the Will to Lead* in 2013¹⁴), physical stereotypes (#looklikeasurgeon twitter movement in 2015), and the acknowledgment of gender pay-gaps^{15,16} may be changing the culture of career consideration. Hence, we revisit the current state of medical student's perspectives of barriers to pursuing a career in surgery to appropriately navigate the evolving landscape of career aspirations.

This single-institution survey intended to provide a better understanding of current issue characteristics surrounding gender-based perceptions of barriers to a career in surgery. We focused on gender differences rather than sex. The terms sex and gender are often used interchangeably when categorizing people, but these represent different concepts. Sex is the categorization of males and females based on biological designation. Gender, however, encompasses the socially constructed roles for men and women, which vary largely by environmental, socioeconomic, and political contexts. Both sex and gender influence the experience of women in surgery; biological differences such as the ability to bear children are largely fixed, but the influence of gender—how women are treated compared to men—is modifiable. Therein, we report on gender inequity, inequalities that can be changed, with hopes to inform hospitals, residency training programs, and medical schools of ongoing challenges and elucidate actionable steps to affect change and achieve gender parity within surgery.

METHODS

An internet-based survey was completed by medical students at Harvard Medical School between May and July 2017. This study was approved by both the Harvard Academy for Research and the Institutional Review Board. All enrolled students received an email invitation and survey link through their school email address. The survey was also advertised on private, class-specific Facebook groups that are restricted to student members. Consent was obtained from all participants. SurveyMonkey Inc. (San Mateo, CA) software

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The authors report no conflicts of interest.

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ISSN: 0003-4932/19/27306-1120

DOI: 10.1097/SLA.0000000000003618

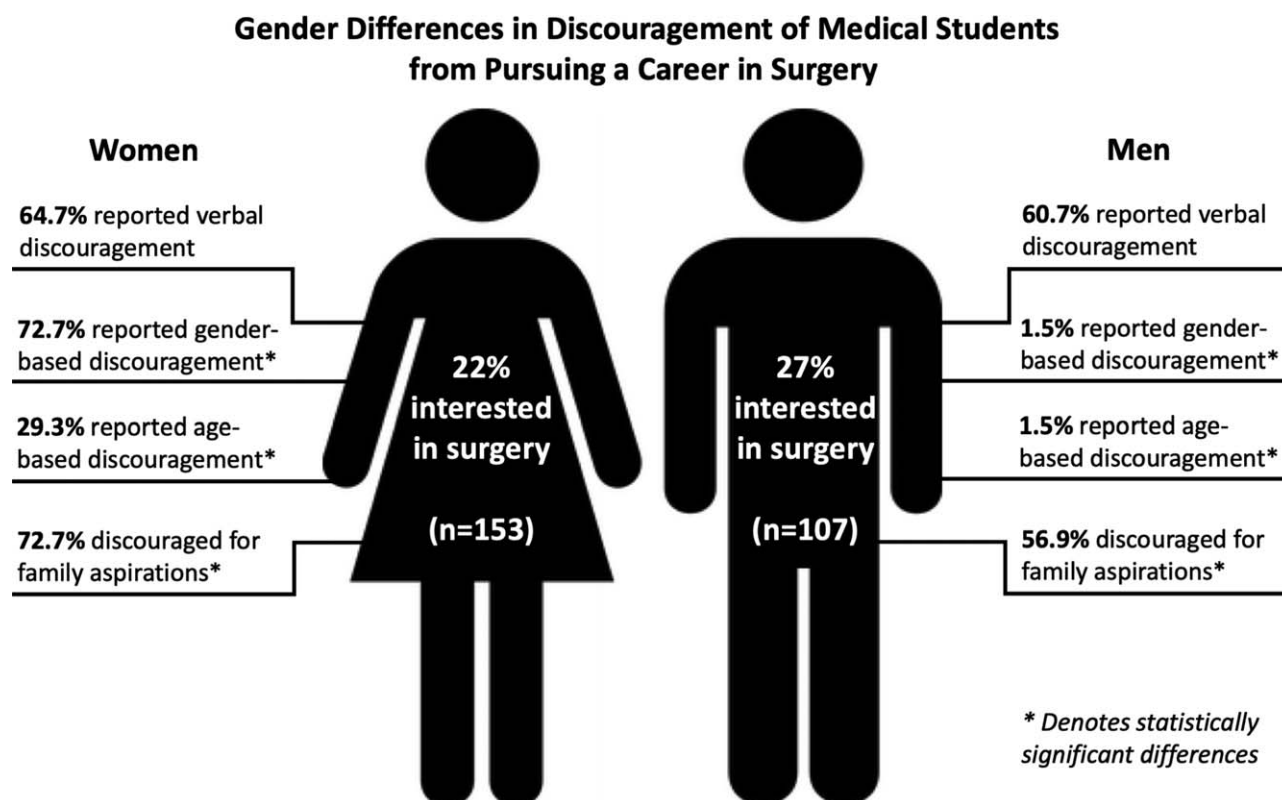


FIGURE 1. Gender Differences in Discouragement of Medical Students from Pursuing a Career in Surgery. Of 260 respondents, there was no significant difference between genders on overall discouragement from pursuing a career in surgery. In the 164 medical students who reported discouragement, there were significant differences between men and women based on gender, age, and family aspirations (statistical significance is indicated by an asterisk).

was used for data collection. The survey included questions of demographic information, clinical year experience, interest in surgery, exposure to surgery, mentorship, and lifestyle. MD-PhD students and students who took an additional enrichment year during medical school were included; dental students were excluded. Multiple question formats were used, including 5-point Likert scale and free response. Completed surveys were anonymous and no identifiable information was reported. Individuals who completed the survey were prompted to voluntarily enter their email for participation in a gift card raffle; to maintain anonymity, survey results were not connected with the email entered for raffle participation.

Statistical analyses were performed with GraphPad Prism Software 7.0c (La Jolla, CA). Categorical variables were assessed with the Pearson chi-squared test and Fisher exact *t* test. Nonparametric continuous variables were compared with a Wilcoxon rank-sum test. Probability values <0.05 were considered significant. Given the small sample size of transgender/genderqueer (*n* = 1), this individual was excluded from the statistical analysis because of power and to preserve anonymity. However, responses were noted where appropriate, particularly regarding free-text response.

RESULTS

Approximately 720 medical students were surveyed and 261 completed the questionnaire (36.3% response rate). Demographics are reported in Table 1. Respondents were 58.6% women, 41% men, and 0.4% transgender.

Pursuing the Career

Of 260 individuals who reported career intent, 24.2% of students were pursuing a career in surgery, 53.5% were not, and 22.3% remained undecided. Responses for those pursuing a career in surgery encompassed individuals interested in all surgical fields and were not restricted to general surgery. Of those pursuing a career in surgery, respondents indicated their top 3 fields of surgical interest, which were in order of popularity general surgery (30.2%), orthopedic surgery (27.0%), plastic surgery (19.0%), thoracic surgery (17.5%), gynecological surgery (15.9%), otolaryngology (14.3%), urology (12.7%), pediatric surgery (11.1%), cardiac surgery (9.5%), ophthalmology (7.9%), and neurosurgery (7.9%). Overall, there was no significant difference between men and women in intention to pursue surgery (27% of men, 22% of women; *P* = 0.38). However, more women were undecided about pursuing a surgical career (15.9% of men, 26.8% of women; *P* < 0.05). There was no significant difference in when students made the decision to pursue a career in surgery between genders.

Of those pursuing a career in surgery, 54% were women (*n* = 34) and 44% were men (*n* = 29). A majority of these students reported verbal discouragement from pursuing a career in surgery (46/61; 75.4%). There was no significant gender difference, with 82% of women and 68% of men reporting discouragement (*P* = 0.24). This was similar to the overall population of respondents, from which 69% reported discouragement with no significant difference between genders (*P* = 0.67). In free-text response, multiple students reported being told: “You should only do surgery if you wouldn’t be

TABLE 1. Demographics

Variable	Total Respondents, <i>n</i> = 260; (%)	Men, <i>n</i> = 107 (41%)	Women, <i>n</i> = 153 (59%)
Average age	26	25.8	26.1
Race/ethnicity*	<i>n</i> = 290	<i>n</i> = 120	<i>n</i> = 170
American Indian or Alaskan Native	4 (1.4)	1 (0.8)	3 (1.8)
Asian/Pacific Islander	82 (28.3)	34 (28.3)	48 (28.2)
Black or African-American	19 (6.6)	8 (6.7)	11 (6.5)
Hispanic	29 (10.0)	14 (11.7)	15 (8.8)
White	148 (51.0)	60 (50.0)	88 (51.8)
Other	8 (2.7)	3 (2.5)	5 (2.9)
Year in medical school	<i>n</i> = 260	<i>n</i> = 107	<i>n</i> = 153
1st	58 (22.3)	23 (21.5)	35 (22.9)
2nd	45 (17.3)	17 (15.9)	28 (18.3)
3rd	42 (16.2)	22 (20.5)	20 (13.0)
4th	95 (36.5)	34 (31.8)	61 (39.9)
Additional degree/fellowship	20 (7.7)	11 (10.3)	9 (5.9)
Marriage status	<i>n</i> = 260	<i>n</i> = 111	<i>n</i> = 148
Single	227 (87.3)	92 (86.0)	135 (91.2)
Married	32 (12.3)	15 (14.0)	13 (8.8)
Divorced	1 (0.4)	0 (0)	0 (0)

*Respondents were able to indicate multiple races/ethnicities.

satisfied doing anything else,” and “It is not for the faint of heart.” Others noted verbal discouragement if they planned to become a physician-scientist or have a family.

There was no significant difference between surgical subspecialties in women and men reporting discouragement. High rates of verbal discouragement were reported among all fields of interest for those undecided or definitely pursuing a career in surgery. The verbal rates of discouragement for specific fields are: general surgery (75% of men, 66.7% of women; *n* = 39), plastic surgery (100% of men, 66.7% of women; *n* = 26), neurosurgery (62.5% of men, 100% of women; *n* = 10), cardiac surgery (66.7% of both men and women; *n* = 21), thoracic surgery (71.4% of men, 66.7% of women; *n* = 16), gynecological surgery (100% of men, 80% of women; *n* = 17), urology (80% of men, 85.7% of women; *n* = 12), otolaryngology (100% of men, 87.5% of women; *n* = 15), pediatric surgery (62.5% of men, 75% of women; *n* = 20), orthopedic surgery (62.5% of men, 75% of women; *n* = 28), and ophthalmology (75% of men, 66.7% of women; *n* = 16).

The percentage of students who reported receiving discouragement from pursuing a career in surgery was higher in the clinical and postclinical years. In the preclinical years (years 1 and 2), 64.2% of respondents reported having received discouragement. For those respondents in the clinical year (year 3), 65.8% reported having received discouragement. For those respondents who were past their primary clinical experience year (years 4 or more), 75% reported having received discouragement. The perpetrator of discouragement was not elucidated further in this study.

Importantly, there was a statistically significant difference between genders regarding perceived reasons for discouragement

(Figure 1, Table 2). Nearly 3-in-4 women (72/99, 72.7%) believed the verbal discouragement was based on gender, compared to 1 man (1.5%) ($P < 0.0001$). Women were also significantly more likely to attribute verbal discouragement to their age ($P < 0.0001$), and family aspirations ($P = 0.043$) compared to men. There was no significant difference between men and women receiving verbal discouragement based on personality ($P = 0.52$).

A subanalysis was performed to compare discouragement patterns between those pursuing, not pursuing, and undecided about pursuing surgery (Tables 2 and 3). For individuals pursuing a surgical career, women reported significantly more gender-based discouragement ($P < 0.0001$), but there was no significant difference between men and women in attribution of verbal discouragement to age, race/ethnicity, personality or family aspirations. However, in the cohort that was not pursuing a surgical career, significantly more women reported that both gender and age were causes of discouragement ($P < 0.0001$ and $P = 0.0056$, respectively). In the undecided cohort, discouragement based on gender and family aspirations was experienced more in women than men ($P < 0.0001$ and $P < 0.023$, respectively). Of these 23 undecided women, 91.3% and 82.6% reported verbal discouragement based on gender and family aspirations, respectively, which was the highest percentage of any cohort receiving verbal discouragement for a specific reason.

Race

Twenty-nine people who completed this survey indicated they identified with American Indian or Alaskan Native, Black or African American, or Hispanic as their race/ethnicity (Table 1). One-hundred

TABLE 2. Discouragement Toward a Surgical Career By Gender in Those Pursuing a Surgical Career

	Total, <i>n</i> = 164; (%)	Men, <i>n</i> = 65 (%)	Women, <i>n</i> = 99 (%)	<i>P</i>	Total, <i>n</i> = 46; (%)	Men, <i>n</i> = 19 (%)	Women, <i>n</i> = 27 (%)	<i>P</i>
Discouragement Based On:	All Respondents Who Reported Discouragement				Respondents Who Reported Discouragement and Are Pursuing a Career in Surgery			
Gender	73	1 (1.5)	72 (72.7)	<0.0001	20	1 (5.3)	19 (70.4)	<0.0001
Age	30	1 (1.5)	29 (29.3)	<0.0001	10	3 (15.8)	7 (25.9)	0.49
Personality	82	35 (53.8)	47 (47.5)	0.52	14	7 (36.8)	7 (25.9)	0.52
Family Aspirations	109	37 (56.9)	72 (72.7)	0.043	36	15 (78.9)	21 (77.8)	>0.99

TABLE 3. Discouragement Toward a Surgical Career By Gender in Those Not Pursuing a Surgical Career and Undecided

Discouragement Based On:	Total, n = 83; (%)	Men, n = 34 (%)	Women, n = 49 (%)	P	Total, n = 35; (%)	Men, n = 12 (%)	Women, n = 23 (%)	P
	Respondents Who Reported Discouragement and Are Not Pursuing a Surgical Career				Respondents Who Reported Discouragement and Are Undecided About a Surgical Career			
Gender	32	0 (0)	32 (65.3)	<0.0001	21	0 (0)	21 (91.3)	<0.0001
Age	18	2 (5.9)	16 (32.7)	0.0056	10	4 (33.3)	6 (26)	0.71
Personality	45	18 (52.9)	27 (55.1)	>0.99	23	10 (76.9)	13 (56.5)	0.15
Family Aspirations	49	17 (50.0)	32 (65.3)	0.18	24	5 (41.7)	19 (82.6)	0.022

percent of these individuals reported they had been verbally discouraged from pursuing a career in surgery. However, only 1 male (7.7%) and 1 female (6.3%) respondent indicated this was because of race/ethnicity. Similar to other demographics, 81.3% of minority women, compared to 71.9% of white and 68% of Asian women, felt they were dissuaded because of their gender. One student noted “Although I cannot think of a clear, specific encounter in which someone discouraged me from surgery because of my race/ethnicity, I have been discouraged from surgery based on the community I would like to serve (which also happens to be Latino, Native, low-income, rural communities).”

Exposure to the Field Beyond the Curriculum

The level of exposure to surgery outside of the medical curriculum was also assessed (Table 4). Overall, there was no significant difference between genders with regards to previous personal experience with surgery, belief that clinical year is too late to decide to pursue a career in surgery, enjoyment of technical work/working with hands, work-related experience in a surgical field, attendance at a surgical skill and/or simulation workshop, leadership position within a surgical interest group, attendance at surgical grand rounds, or research conducted within the field of surgery. However, women were significantly more likely to join a national surgical

organization than men ($P < 0.01$). In a subanalysis by year in medical school, there was no significant difference in belief between genders that deciding to pursue surgery during or after the clinical year is too late.

Regarding mentorship, men were more likely to believe they could find a mentor of their own gender ($P < 0.01$). There was no significant difference overall or stratified by gender for the number of personal surgical mentors or feeling there was someone to speak with regarding concerns pursuing a career in surgery.

Surgical Rotation

Participants were asked to rate their experience in their surgical rotation from strongly disagree (1) to neutral (3) to strongly agree (5) (Table 5). During the clinical year, there was no significant difference between genders in reporting the enjoyment of the rotation, engagement in the operating room, experience with residents or attendings, feeling valued as a member of the team, and that gender or race influenced treatment while on rotation. Only 24.2% of men and 38.4% of women responded they would agree or strongly agree with the statement that they were a valued member of the team. Only 44.7% of women, compared to 60.6% of men, responded they would agree or strongly agree that gender did not influence their treatment on the team. Although many students added commentary with praises

TABLE 4. Exposure to Surgery By Gender

Variable	Men Yes/Total Responses (%)	Women Yes/Total Responses (%)	P
Personal experience with surgery as a patient	44/97 (45.4)	52/145 (35.9)	0.14
Belief that clinical year is too late to decide to pursue a career in surgery	14/97 (14.4)	22/145 (15.2)	>0.99
Enjoyment of technical work/working with hands	87/97 (89.7)	131/145 (90.3)	>0.99
Work related experience in a surgical field	18/96 (18.8)	24/145 (16.6)	0.73
Attendance at a surgical skill and/or simulation workshop	79/97 (81.4)	116/145 (80.0)	0.87
Participation in a surgical interest group	26/97 (26.8)	27/145 (18.6)	0.15
Leadership position within a surgical interest group	10/82 (12.2)	12/112 (10.7)	0.82
Member of national surgical society	4/96 (4.2)	21/145 (14.5)	0.0097
Attended surgical grand rounds	66/97 (68.0)	88/145 (60.7)	0.28
Conducted research within the field of surgery	36/97 (37.1)	48/145 (33.1)	0.58

TABLE 5. Experience on Surgical Rotation

Variable	% who Agree or Strongly Agree		P
	Men	Women	
Positive experience on my surgical rotation	67.7	63.5	0.50
Felt engaged in the operating room and during procedures	49.2	55.8	0.13
Positive experience with the residents on my surgical rotation	69.4	69.4	0.19
Positive experience with the attending's on my surgical rotation	71.0	65.9	0.13
Valued member of the team	24.2	38.4	0.31
Felt that my gender did not influence how I was treated during my surgical rotation	60.6	44.7	0.31
Felt that my race did not influence how I was treated during my surgical rotation	63.9	67.9	0.063

TABLE 6. Effect of Surgical Characteristics on Pursuing a Surgical Career

Variable	Men			Women			P
	Neg. %	Neut. %	Pos. %	Neg. %	Neut. %	Pos. %	
Work hours	85.9	14.1	0.0	93.9	5.1	1.0	0.16
Stress levels	66.1	32.3	1.6	79.1	19.8	1.1	0.085
Medico-legal implications	10.4	89.6	0.0	11.0	89.0	0.0	0.89
Time for outside interests	90.6	9.4	0.0	93.4	4.7	1.9	0.86
Personality fit	54.3	28.3	17.4	65.3	12.5	22.2	0.69
Expected income	4.0	66.0	30.0	1.1	72.3	26.6	0.96
Competitiveness	23.4	73.4	3.1	28.7	68.3	3.0	0.49
Length of residency	58.1	41.9	0.0	75.0	24.0	1.0	0.043
Educational debt	7.6	87.9	4.5	7.0	87.8	5.2	0.81

of the rotation, the majority of free-text elaborations demonstrated a negative opinion of surgeons and the operating room, citing surgeons' personalities, hierarchy, formalized hazing, and hours spent in the hospital.

Characteristics of Surgery Itself

All participants were asked to rate how characteristics of the career itself influenced their decision to, or not to, pursue a career in surgery (Table 6). Work hours and time for outside interests were reported as a negative concern for the highest number of individuals in groups of both genders, with 85.9% of men and 93.9% of women reporting a negative impact of work hours, and 90.6% of men and 93.4% of women reporting a negative impact of lack of time for outside interests. Significantly more women (75.0%) than men (58.1%) reported that the length of residency negatively impacted their career decision ($P = 0.04$). There was no significant difference between the genders in terms of impact of work hours, stress levels, medicolegal implications, time for outside interests, personality fit, expected income, competitiveness, and educational debt.

Women were significantly more likely to report concern about time to date or marry ($P = 0.04$), time available to spend with family ($P = 0.02$), finding a good time during residency to have a child ($P < 0.0001$), taking maternity/paternity leave during residency ($P < 0.0001$), and being too old after residency to have a child ($P < 0.0001$) (Table 7). Overall 86.2% of women and 83.2% of men in the survey reported that one of the aforementioned reasons dissuaded them or somewhat dissuaded them from pursuing a career in surgery entirely.

DISCUSSION

This single-institution study at Harvard Medical School provides a detailed examination of factors influencing medical student specialty selection of a career in surgery. The survey elucidated factors relating to timing of decision to pursue surgery, discouragement of that decision, experiences during the clinical surgical rotation, extracurricular exposure to the field, and characteristics of a surgical career that attract or deter potential surgeons.

The majority of respondents decided whether or not to pursue surgery during the latter half of medical school. At this point, they have completed their surgical rotation, engaged in extracurricular activities, conferred with peers, mentors, and their families, and have a personal perspective on the field. In our study, there was gender parity in surgical interest. This may reflect increased public attention and effort to encourage more women to pursue surgery. Medical students of both genders with an interest in surgery were equally likely to engage in multiple extracurricular surgical activities, identify surgical mentors, and conduct research, although men were more likely to shadow in the operating room and women were more likely to join a national surgical society. Provided that many national surgical societies offer formalized mentorship programs, such as the Association of Women Surgeons,¹⁷ and significantly less women believed they could identify a mentor of the same gender, pursuit of mentorship may explain greater surgical society involvement by women.³ Continued emphasis should be placed on engaging students in extracurricular activities in surgery such as surgical interest groups and resident or attending mentor programs, which improve students' understanding of the field and prepare them for a more successful and enjoyable clinical rotation.^{18,19}

TABLE 7. Concern Level Regarding Personal Life During a Surgical Residency

Concern Level	Men (All)					Women (All)					P
	Not/Likert 1 (%)	Likert 2 (%)	Somewhat/Likert 3 (%)	Likert 4 (%)	Very/Likert 5 (%)	Not/Likert 1 (%)	Likert 2 (%)	Somewhat/Likert 3 (%)	Likert 4 (%)	Very/Likert 5 (%)	
Having time to date or get married	21.9	5.2	31.3	20.8	20.8	14.3	7.9	22.9	22.1	32.8	0.042
Time available for a surgeon to spend with family	2.1	6.2	17.7	27.1	46.9	0.0	2.2	14.4	24.4	59.0	0.015
Finding a good time during residency to have a child	7.3	13.5	30.2	20.9	28.1	5.0	6.4	15.0	17.9	55.7	<0.0001
Taking maternity or paternity leave during residency	9.5	14.7	29.5	21.1	25.3	5.0	9.3	11.4	22.9	51.4	<0.0001
Being too old after residency to have a child	26.3	24.2	16.8	13.7	19.0	5.0	5.0	14.3	20.0	55.7	<0.0001

Regarding the surgical rotation, both genders expressed positive and negative reflections. Negative comments were largely focused on the time-demand, hierarchy, and culture of surgery. The negative impression of medical student work hours during the surgical rotation compared to other clinical rotations had been described previously^{20,21,22} and is a growing concern as more emphasis is placed on the importance of lifestyle and balance in career choice.²³ Interestingly, some authors proposed modifying the surgical clerkship to shield the realities of resident work hours and lifestyle,^{24–27} but misleading trainees under false pretenses could easily translate to dissatisfaction during residency, burnout, and attrition.²⁸ Importantly, the increased prevalence of sharing clinical responsibilities with mid-level providers is likely to decrease the double-burden surgical residents face in managing both the operating room and floor.²⁹ Nonetheless, the time demands of surgery continue to be a deterrent for career choice.

Another key finding was the prevalence of verbal discouragement experienced by all medical students. Nearly 70% of medical students reported being discouraged from pursuing the field, the highest prevalence in the subset of women during the clinical and research/fellowship years. Despite statistically equal discouragement among all subgroups, the women perceived that the verbal remarks were gender-based. Additionally, the cohort of undecided medical students appeared to be most susceptible to familial-related discouragement, as 82.6% of undecided women reported that the majority of verbal discouragement was based on family aspirations. These findings likely associate with our findings on the characteristics of surgery that showed women reporting a significantly higher level of concern about finding a time during residency date or get married, have a child (with the risk of being too old to have children after residency), take maternity or paternity leave, and spend with family in general. The underrepresentation of women in surgical disciplines is related to a multitude of factors, including personal experience, environment, mentorship, and role models. Verbal discouragement of individuals against pursuing a career in surgery is likely to have an impact on all these factors that contribute to medical students lived experience and decision to pursue a career in surgery.

Given that the verbal discouragement and trainees' concerns are largely based on family aspirations, additional support within the surgical field is needed to mitigate these concerns and support trainees in both their career and familial goals. Family aspirations were also a significant factor for men to choose an alternative career path. Our data corroborate a study by Sanfey et al that demonstrated men and women were equally discouraged from a career in surgery by the opinions of a spouse, family member, or significant other, but a higher percentage of women than men were discouraged by their decision to have a family.²⁶ Importantly, there is an undeniable biological premise in which women are physically the ones to have children, unless surrogacy or adoption is sought, and this becomes more challenging with age. At present, women surgeons delay childbearing and have an increased risk for infertility from both this temporal delay and the stress of their career.^{30–32} Many women are attempting to mitigate this challenge by planning pregnancy during a research year; however, biology is not always compliant (many women resort to in vitro fertilization and are still unable to become pregnant in that narrow time window) and this is not a sufficient solution.^{30,31}

The challenges that trainees face in achieving their familial goals in concert with their career aspirations predominantly arise from the length of training, its concurrence with female fertility years, and limited flexibility in taking time off to bear a child.³³ To expound on this structural problem, a recent study by Rangel et al surveyed surgeons who had ≥ 1 pregnancies during an accredited US general surgery residency program.³² Of 347 women surgeons, 297

(85.6%) worked an unmodified schedule until birth, and 220 (63.6%) were concerned that their work schedule adversely affected the health of themselves or their unborn child. After delivery, only 34.9% of residents reported having maternity leave policies. The duration of leave—when given—a majority < 6 weeks—was perceived to be inadequate by 72.0% of women, and institutional support for childcare upon return to work was rare. This greatly impacted the morale of women surgeons, as nearly 40% strongly considered leaving residency and one-third said they would discourage female medical students from a surgical career.³² The significant deterrents found in our medical student survey combined with the surgeons' study by Rangel et al have been reported in other resident populations as well,³⁴ and highlight major issues with the current structure of training and reasons why the sentiment that wanting a family is incongruent with a career in surgery among residents and medical students.

These data and challenges call for systemic change. Clear institutional policies regarding maternity and paternity leave for surgical residents should be established by each hospital or department, and open communication between trainees and faculty regarding family planning should be welcomed. Cultural changes, such as paternity leave and more equitable family roles, would enhance support for female surgeons who have a child during residency or early in their career. In addition, providing more institutional childcare has proven beneficial some residency programs, and should be expanded.³⁵ Finally, mentorship for overcoming the challenges of child bearing and rearing during key career development stages should be expanded.³⁶

Although this survey provides a recent, cross-sectional examination of medical students' perceptions of a career in surgery, there are important limitations. As a single-institution study at a private, urban, research institution, these results may not reflect the results at other medical universities. The response rate of 37% limits generalizability; however, the demographic distributions of respondents with respect to interest in surgery, age, and class year were comparable, and stratification of result by gender was done to mitigate bias involving a higher response by women. Additionally, there was no control group in the survey, such as comparing discouragement from surgery to that of internal medicine, which obfuscates understanding of dissuasion in other fields. However, many previous studies have reported on higher rates of gender discrimination in surgical specialties compared to medical specialties, predominantly against women in the all surgical subspecialties, except for obstetrics and gynecology, where more men report gender-based discrimination.^{37–39} Another study limitation is the absence of data characterizing the individuals responsible for verbal discouragement, which greatly limits the ability to plan interventions. In an upcoming study, we intend to investigate which roles—such as clinical faculty, residents, peer students, and academic advisors—are the greatest influencers and means of encouragement and discouragement for students' career choice. Inquiring about the influence of nursing and patients may also be worthwhile, as a recent study showed that nurses and patients were the highest perpetrators of gender-based discrimination toward residents.⁴⁰ The gender of the advice giver could also inform the percent of discouragement by women versus male surgeons. This information is important to understand the boundaries of influence over medical student career choice and help rectify the discouragement students receive and perceived barriers they have against pursuing a career in surgery.

CONCLUSION

This institutional survey of medical students' experiences and perceptions relating to a career in surgery underscores progress in increasing the number of women interested in entering the field, but

highlights ongoing gender-specific challenges. Both women and men are discouraged from pursuing a career in surgery at high rates. For women, there was a significant perception that this verbal discouragement was gender-based. In addition, all of the students who identified with a racial/ethnic minority group indicated they had received verbal discouragement against pursuing a surgical career. Perceived barriers for women in surgery remain closely linked to the lack of infrastructure and support for family planning and care, such as finding a time during residency to have a child, spend time with family, and being too old to have a child after residency. Other critical deterrents to the field are the hierarchy and environment of the surgical rotation and culture. By addressing these factors through institutional support programs and continued investment in mentoring medical students, we believe the field can not only move toward gender parity, but also decrease burnout, and improve quality of life for surgeons, which we hope will translate into better patient care.

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