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Survey Study of Clerkship Curriculum on Learner’s Choice to Pursue Surgery: Positive Impact of Extracurricular Opportunities

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Abstract

OBJECTIVE: Prior studies have focused on the role of the learning environment on students’ decisions to pursue surgery, but few have analyzed the impact of the clerkship curriculum. This study assessed surgical clerkship curricula across United States (US) medical schools and their impact on students’ likelihood of pursuing a surgical residency.

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AUTHORS CONTRIBUTIONS

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DESIGN: A cross-sectional survey was developed to assess surgery clerkship characteristics. Questions included clerkship duration, number of offered and required surgical services, method of service assignment, and number of advanced clinical electives (e.g., fourth-year sub-internships) and additional surgical clinical opportunities (e.g., surgical elective rotations).

Survey results were merged by the Association of American Medical Colleges with the percentages of students who matched into a surgical specialty. Linear regression models estimated the association of covariates with the percentage of students who (1) matched in surgical specialties, (2) were interested in surgery at medical school matriculation and ultimately matched into surgical residency (retention rate), and (3) were not interested in surgery at medical school matriculation but ultimately matched into surgical residency (recruitment rate).

SETTING: The survey was distributed to clerkship directors and coordinators at 66 medical schools through the Association for Surgical Education (ASE) from 5/1/2021 to 8/1/2021.

PARTICIPANTS: All US medical schools in the ASE.

RESULTS: A total of 21 medical schools responded (34.8% response rate). The overall retention rate was 36.4%, and the overall recruitment rate was 25.0%. Clerkships were 4 to 12 weeks. In 81% of programs, students submitted preferences and were assigned services. The percentage of students applying to surgical specialties was not associated with clerkship duration ($p=0.79$) or the number of required services ($p=0.15$), subspecialty services offered ($p=0.33$), or advanced clinical electives ($p=0.24$) but was associated with a program's having additional surgical clinical opportunities ($p=0.02$). Most of these factors were not associated with retention or recruitment rates.

CONCLUSIONS: Offering more extracurricular surgical clinical opportunities was associated with having more students pursue surgical careers. Though limited by a relatively small sample size, our findings suggest that having shorter clerkships or limited subspecialty offerings may not have a significant influence on students' career choices.

Keywords

medical education; medical knowledge; surgical education; undergraduate medical education; curriculum

COMPETENCIES:

Patient Care; Professionalism

INTRODUCTION

Positive surgical clerkship experiences can influence students' desires to pursue a surgical career.¹ Experiences surrounding surgical culture, personalities, and mistreatment during the core clerkship can also contribute to whether or not an individual decides to pursue a career in surgery.^{2,3}

While many factors feed into choosing a field within medicine, previous studies have primarily focused on the impact of the learning environment. For instance, Peel et

al.'s systematic review demonstrated that gender discrimination and clinical exposure, particularly on increased understanding of lifestyle dynamics, deterred students from pursuing surgery.⁴ Schmidt et al.'s systematic review identified several domains that were associated with influencing a student's decision to pursue surgery, including mentorship, clerkship experiences, timing of exposure, and lifestyle contributors.⁵ Kassam et al.'s single-center survey study reported clerkship grades were associated with career interest, but similarities in personality attributes among medical students and residents were contributors to matching into surgery.⁶

Fewer studies have examined the heterogeneity in surgical clerkship curricula and how these clerkship structures impact students. While it may be anecdotally common to hear of medical schools with longer or shorter clerkships and different offerings on service, it is unknown how these elements of a surgical clerkship play into career choices. It is also unclear how much impact a given curriculum may have on the career choice of a particular student or group of students, specifically, on the recruitment of those who matriculated into medical school without an interest in surgery or the retention of those who had a pre-existing interest. In the United States (US), it is anticipated that there will be a shortage of surgeons by as many as 23,000 by 2032.⁷ With the anticipated increasing demand for surgeons in the future, curricular improvements to increase recruitment and retention are essential.⁸

In this study, we aimed to analyze current surgical clerkship curricula across medical schools in the US and assess the impact of these curricula on medical students' likelihood of pursuing a surgical residency. Given the findings of O'Herrin and colleagues who reported that medical students who successfully matched into categorical general surgery residencies saw significantly more abdominal and general surgical operations,⁹ we hypothesized that programs with longer clerkships and more surgical services would recruit more students into surgical careers. We accomplished our aims by collecting information on surgical curricula through surveys sent to clerkship coordinators and directors. To assess the impact of the curricula on career choice, we controlled for students with a pre-existing desire to pursue surgery using the Association of American Medical Colleges (AAMC) national data.

MATERIAL AND METHODS

This study was reviewed and determined exempt by the Duke University and University of North Carolina Institutional Review Boards.

Clerkship Curriculum Survey

The study design is outlined in Figure 1. A cross-sectional online survey was developed to assess surgical clerkship curricula and surgical educational opportunities at US medical schools. Surgical specialties of interest included general surgery and surgical subspecialties (e.g., neurosurgery, plastic surgery, ophthalmology); OBGYN was excluded due to most programs' having a distinct rotation dedicated to OBGYN or women's health that is separate from general surgery and other surgical rotations. Survey questions included: (1) medical school institution; (2) duration of surgical clerkship; (3) number of surgical services required during clerkship; (4) number of offered surgical services during clerkship; (5) any required services for all students; (6) method of assignment to required services; (7) advanced

clinical electives offered by surgical specialties/sub-specialties; (8) additional surgical clinical opportunities offered by surgical specialties/sub-specialties; and (9) significant curricular changes since 2011, excluding changes made due to the COVID-19 pandemic. “Advanced Clinical Electives” were defined as fourth-year sub-internships or acting internships. “Additional Surgical Clinical Opportunities” included surgical elective rotations, scholarly concentrations, programs with another hospital system, or other forms of curricular engagement including nonaudit electives (e.g., surgical research elective) offered by surgical departments. The survey was developed in Qualtrics XM (Qualtrics, Provo, UT) and edited for content, language, and flow by a multidisciplinary team including medical students, medical school faculty, and survey experts.

The survey was submitted to the Association of Surgical Education (ASE) Surgical Education Research Committee and was approved. The survey was distributed to clerkship coordinators and directors at all ASE-participating programs (n=66) through an email listserv from May 1, 2021 to August 1, 2021. After the initial email, 2 reminder emails including the survey link were sent. The survey was voluntary and anonymous with no compensation.

Matriculation and Graduation Data

After the survey response period, the results were shared with the AAMC. The AAMC de-identified the survey results and linked the data with responses from the Matriculating Student Questionnaire (MSQ) and Graduation Questionnaire (GQ) sent to all students at allopathic medical schools in the US. The MSQ is distributed to first-year medical students after matriculation and the GQ is distributed in mid-February (around the time of the residency match) and closes in June after medical school graduation. We defined the “retention rate” as the proportion of students who reported being interested in surgery at medical school matriculation on the MSQ divided by the number of students who ultimately matched in a surgical residency as reported on the GQ. We defined the “recruitment rate” as the proportion of students who were not interested in surgery at medical school matriculation as reported on the MSQ divided by the number of students who ultimately matched in a surgical residency as reported on the GQ.

Statistical Analysis

Categorical variables were summarized with N (%) and continuous variables were summarized with median (interquartile range, IQR) for all programs. Geographic regions of programs were identified using the AAMC US regional categories of Pacific (AK, CA, HI, OR, WA), Mountain (AZ, CO, ID, MT, NM, NV, UT, WY), West North Central (IA, KS, MN, MO, NE, ND, SD), East North Central (IL, IN, MI, OH, WI), West South Central (AR, LA, OK, TX), East South Central (AL, KY, MS, TN), South Atlantic (DC, DE, FL, GA, MD, NC, PR, SC, VA, WV), Middle Atlantic (NJ, NY, PA), and New England (CT, ME, MA, NH, RI, VT).¹⁰

Linear regression was used to estimate the association of select covariates with the percentage of graduating medical students who apply to surgical subspecialties each year and the percentage of graduating medical students who match to surgical subspecialties each

year. Linear regression was also used to estimate the association of select covariates with the proportion of students indicating an interest in surgical subspecialties on the MSQ out of the number of students indicating an interest in surgical subspecialties on the GQ. Due to the small sample size, separate models were fit for each independent variable and parameter estimates; 95% confidence intervals are reported.

All statistical analyses were conducted using SAS version 9.4 (SAS Institute, Cary NC). No adjustments were made for multiple comparisons. Only programs with complete data for all variables were included in each model, and effective sample sizes are reported for each analysis.

RESULTS

Twenty-three programs (21 MD and 2 DO) responded to the survey for a response rate of 34.8%. Two programs were removed by the AAMC due to being osteopathic schools, thus the analytic cohort consisted of 21 programs. There were 10 (47.6%) private and 11 (52.4%) public medical schools (Table 1). Geographic regions of programs were diversely represented with 5 (23.8%) programs from the Middle Atlantic region, 4 (19.0%) from the East North Central region, 3 (14.3%) from the South Atlantic and New England regions, 2 (9.5%) from the Pacific and West South Central regions, and 1 (4.8%) from the Mountain and East South Central regions. There were no responses from programs in the West North Central region (Indiana, Kansas, Minnesota, Montana, Nevada, North Dakota, South Dakota).

No Significant Association with Clerkship Duration and Assignments

Across all programs, surgical clerkships ranged from 4 to 12 weeks, with most programs (61.9%) having 8 to 10-week clerkships (Table 2). The number of required unique surgical services during the surgery clerkship ranged from 1 to greater than 5, with 2/3 of programs requiring either 2 (33.3%) or 3 (33.3%) services. Three (14.3%) programs only required 1 service and 3 (14.3%) programs required 4 services. Most programs (81.0%) assigned students to services by inquiring about student preferences and then assigning them to different surgical specialties and subspecialties. Two programs (9.5%) assigned services by random placement and 2 programs (9.5%) indicated “Other” for their method of assignment.

When asked about which surgical services a student may be assigned to (Table 2), all 21 programs offered a General/Trauma Surgery rotation. Most programs offered rotations in Surgical Oncology/Hepatobiliary (90.5%), Vascular Surgery (90.5%), Pediatric Surgery (81.0%), Thoracic Surgery (76.2%), Transplant Surgery (76.2%), Colorectal Surgery (76.2%), Endocrine Surgery (71.4%), Plastic Surgery (66.7%), and Urology (66.7%). Approximately half of programs offered Cardiac Surgery (52.4%), Orthopedic Surgery (47.6%), Neurological Surgery (42.9%), and Otolaryngology/Head and Neck Surgery (42.9%). Few programs (23.8%) offered Ophthalmology during the core clerkship.

Eleven (52.4%) programs indicated there were no surgical services that were required for all medical students during their clerkship, while 10 (47.6%) programs indicated having required services for all students. When asked about the number of days students spent

on these required services, 2 (9.5%) programs indicated requiring 1 day of General Surgery/Trauma Surgery for all students. There were also programs requiring General Surgery/Trauma Surgery for 2 days (4.8%), 20 days (4.8%), and 28 days (4.8%).

Positive Association with Additional Surgical Clinical Opportunities

Programs offered an Advanced Clinical Elective (e.g., sub-internship) in most surgical specialties: 20 programs (95.2%) had General Surgery/Trauma Surgery; 19 programs (90.5%) had Plastic Surgery; 18 programs (85.7%) had Orthopedic Surgery and Surgical Oncology/Hepatobiliary; 17 programs (81.0%) had Thoracic Surgery, Vascular Surgery, Pediatric Surgery, and Urology; and 16 programs (76.2%) had Neurological Surgery and Colorectal Surgery. Over half of the programs also offered an Advanced Clinical Elective in Cardiac Surgery (71.4%), Breast Surgery (61.9%), Endocrine Surgery (61.9%), Transplant Surgery (71.4%), Otolaryngology/Head and Neck Surgery (71.4%), and Ophthalmology (66.7%). When asked about surgical specialties that offered Additional Surgical Clinical Opportunities (e.g., nonsub-internship surgical elective), 18 programs (85.7%) had General Surgery/Trauma Surgery. The distribution for the remaining specialties was: 15 programs (71.4%) had Urology, 14 programs (66.7%) had Plastic Surgery, Surgical Oncology/Hepatobiliary, and Otolaryngology/Head and Neck Surgery, 13 programs (61.9%) had Orthopedic Surgery, Thoracic Surgery, Breast Surgery, Pediatric Surgery, and Vascular Surgery, followed by 12 programs (57.1%) with Neurological Surgery, Cardiac Surgery, Transplant Surgery, and Ophthalmology.

Excluding curricular changes made due to the COVID-19 pandemic, most programs (57.1%) indicated that the total duration of their surgical clerkships had changed since 2011. Five (23.8%) programs reported that the number of required surgical services had changed. Four (19.0%) programs indicated that the available surgical services for sub-internships or acting internships had changed, and 3 (14.3%) programs said the total number of available surgical services assignments had changed.

Linear regression revealed that the percentage of students applying to surgical specialties was not associated with clerkship duration ($p=0.79$), the number of required services during surgery clerkship ($p=0.15$), the number of surgical services offered ($p=0.33$), or the number of advanced clinical electives an institution offered ($p=0.24$; Figure 2). A program's having more additional surgical clinical opportunities (e.g., nonsub-internship surgical elective) was associated with an increase in the percentage of students applying into surgical specialties (+0.62% for each additional clinical opportunity, 95% CI 0.09-1.16, $p=0.02$).

No Significant Association with Recruitment and Retention Rates

Analysis from the AAMC data revealed the overall retention rate (i.e., interest in surgery per MSQ/matched in a surgery residency per GQ) was 36.4% and the recruitment rate (i.e., no interest in surgery in MSQ/matched in surgery residency per GQ) was 25.0%. Linear regression of curriculum data with AAMC MSQ and GQ data revealed surgical clerkship duration ($p=0.53$ and $p=0.82$), number of services required ($p=0.79$ and $p=0.32$), number of advanced clinical electives ($p=0.52$ and $p=0.10$), and number of additional surgical clinical opportunities ($p=0.18$ and $p=0.69$) were not associated with retention or recruitment rates,

respectively (Table 3). The number of surgical subspecialty choices offered was similarly not associated with recruitment rates ($p=0.35$); however, having more surgical subspecialty services was associated with lower recruitment rates (-1.35% for each additional surgical service, 95% CI -2.64 to -0.07 , $p=0.04$).

DISCUSSION

In this analysis of surgical clerkship curricula and their impact on pursuing a surgical residency, we found that neither the structure nor the duration of the formal surgical clerkship was significantly associated with recruitment or retention into surgery. However, having a greater number of additional surgical clinical opportunities, such as career-exploration electives or surgical research electives, was associated with a program's having more students apply into surgical residency. Our hypothesis was not consistent with our analysis, and this may be due to our study's inclusion of more diverse programs compared to prior studies.

Our findings suggest the potentially vital role that nonaudition electives (in contrast to "audition" electives, i.e., surgical sub-internship or acting internship, where a student is expected to act at a higher level and is compared in performance to the on-service intern) may play in increasing students who apply and ultimately match into surgical residencies. One possible explanation for this is that students who are already committed to pursuing surgery are less likely to be influenced by the number or types of sub-internships that a program offers. Yet, for students who are undifferentiated or less committed to surgery, having more options to explore surgery—outside the context of an audition rotation—may be crucial for decision-making. Such courses may include shorter career-exploration courses in surgical subspecialties (e.g., 2-week exploration course on thoracic surgery) or a research elective in a surgical department. Literature on the specific role of nonaudition electives in career choice are limited, but it is plausible that these courses enable students to explore career interests without significant performance or grade pressure, create an opportunity to identify mentors, have more flexibility for work-life integration, and ultimately positively influence students towards a surgical career.

The role of additional surgical clinical opportunities are supported by the literature which shows the positive impact of early extracurricular surgical opportunities on increasing interest and successful match into surgical residencies.¹¹⁻¹⁶ Anderson et al. reported on an introductory surgical skills training and surgical environment preparation course for preclinical medical students.¹¹ In their ten-year follow-up, they found significant increases in students who participated in the course and matched into surgical specialties.¹¹ Agarwal et al. described a 4-phase program to increase student interest in neurosurgery which included first, increasing surgical exposure during the third-year clerkship; second, creation of student interest groups; third, departmental efforts to recruit preclinical students into research projects; and fourth, developing new clinical electives.¹² After implementation, the number of students successfully matching into neurosurgery significantly increased.¹² Medical schools offering electives for career exploration have also reported success in solidifying students' decisions in specialty selection, developing new skills, building rapport with residents and faculty, advancing self-efficacy, and increasing match rates.¹³⁻¹⁶ The

success of these learning opportunities may also be partially attributable to their exposure outside of the time constraints, grading, and assessment stresses of the formal curriculum.

Another consideration is that medical students who ultimately pursue surgical residencies and careers may be more likely to start and propagate extracurricular opportunities at their home institutions. There is a line-age of student-led initiatives in surgical fields that have been successful, including interest groups,¹⁷⁻¹⁹ surgical skills sessions,²⁰⁻²² anatomy education,²³⁻²⁵ clerkship support,²⁶ and mentorship.^{27,28} Salna et al. reported a 3-fold increase in students entering surgical residencies after establishing a student-led surgery interest group, and this increase was sustained over more than 8 years.¹⁷ Similarly, a cross-sectional analysis in Canada revealed that student-led surgery interest groups not only improved surgical skills and increased student comfort in surgical culture, but also increased students' interest in pursuing surgical careers.¹⁸ Elective coursework are often developed out of student interest or demand and it is possible that increased student engagement inspires a positive feedback cycle. These findings suggest an important role that medical student culture—in addition to that among faculty and residents—may play in recruiting students into surgical careers.

We also found that having more surgical subspecialties was associated with a decrease in recruitment of students into surgery. This, and the general negative trends appreciated in recruitment factors (Table 4), suggests the overall difficulty of recruiting students into surgery. We hypothesize that offering more subspecialty services likely means students are spending more of their clerkship time on highly specialized services (e.g., urology, ophthalmology). The content of these specialties is typically less tested upon on shelf exams and Step 2 compared to the contents of general surgery services (e.g., trauma, surgical oncology) and therefore students may be less prepared for their subspecialty services. This, in combination with the nature of these subspecialties (e.g., more consult services, more minimally invasive cases) may also mean students are not able to participate in cases as much as they would on a general surgery service (e.g., exploratory laparotomy) which has been reported to increase student interest in surgery.⁹

Our findings suggest that even if the curriculum itself has minimal impact on career choice, an extant culture supportive of choosing surgery may be an important contributor to choosing surgery as a specialty. While the extent to which an institutional culture is supportive of students' experiences during surgical clerkships is inherently difficult to evaluate, the impact may nonetheless be measurable. McKinley et al.'s recent analysis of medical student perspectives on their core surgical clerkship underscored the importance of learning expectations, culture, environment, and team dynamics.²⁹ Conversely, Kemp et al.'s study on mistreatment also demonstrated how poor experiences during surgical clerkship may deter students from pursuing surgical careers.³ It is very possible that these experiences play a greater role in learners' decision-making than do the number of weeks on service or the specific rotation requirements.

Overall, our findings suggest that programs wishing to increase recruitment or retention of medical students in surgery should focus on increasing opportunities for students to electively explore surgical careers outside of the constraints of the formal clerkship or

sub-internships and acting internships. Programs should continue to improve the general departmental culture and day-to-day experiences for clerkship students, but they can also be reassured that the limitations of subspecialty offerings or capacity to increase clerkship duration may not be significant contributors to career choices.

Limitations

This study was limited by sample size and therefore may be underpowered to identify some significant associations. To increase our response rate, we worked closely with the ASE, an organization that has rapport with many clerkship directors and administrators and which sent multiple email reminders. The low response rate may be attributable to survey fatigue and increased administrative demand during the COVID-19 pandemic. We also did not independently contact clerkship directors who were not members of the ASE, which may have introduced selection bias (approximately 40% of US allopathic programs were ASE members at the time of survey distribution). Comparing ASE participating vs nonparticipating programs was outside of the scope of this study and would be an important target in future studies. Further, assessing programs that did vs did not respond to our survey was not feasible under the agreements made with the ASE and AAMC; we acknowledge these circumstances limit the generalizability of our findings. Surveys are inherently prone to recall bias, though we tried to mitigate this by creating visually accessible matrices and display logics in Qualtrics. The reported lack of advanced clinical electives in certain specialties (e.g., urology) may suggest recall bias. These results may also be related to clerkship directors often being trained in general surgery specialties and therefore having less familiarity with other departmental offerings. We did not give programs the option to specify their “Additional Surgical Clinical Opportunities”, and thus were unable to differentiate which elements were most influential. Finally, we report the results of a cross-sectional analysis, and our findings represent associations and do not imply causation.

Future studies may benefit from correlating curricular components with match results or further downstream metrics of career outcomes (e.g., fellowship match, successful recruitment into a faculty-level position). Qualitative analysis through interviews with students and surgical faculty may reveal more nuanced elements of the clerkship and learning experience (e.g., evaluations, grades) that are most salient in students’ career choices. Following these studies with quality improvement studies and educational programming are important to ensure improved recruitment and retention of students.

CONCLUSION

While surgical clerkship curricula vary broadly, the percentage of students pursuing surgical careers was not associated with clerkship duration, the required number of services, or the number of available subspecialty services or advanced clinical electives made available. Offering more surgical learning opportunities outside of the formal curriculum (e.g., nonsub-internship electives such as career-exploration rotations and surgical-research electives) was associated with an increase in the proportion of students who pursue surgical careers, but this finding may reflect extant cultures supportive of choosing surgery. This study’s limitations include a small sample size and findings that require further validation. Future

studies should look to understand aspects of elective and extracurricular experiences and their impact on learners' career choices.

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Abbreviations

IQR	interquartile range
HPB	hepatobiliary

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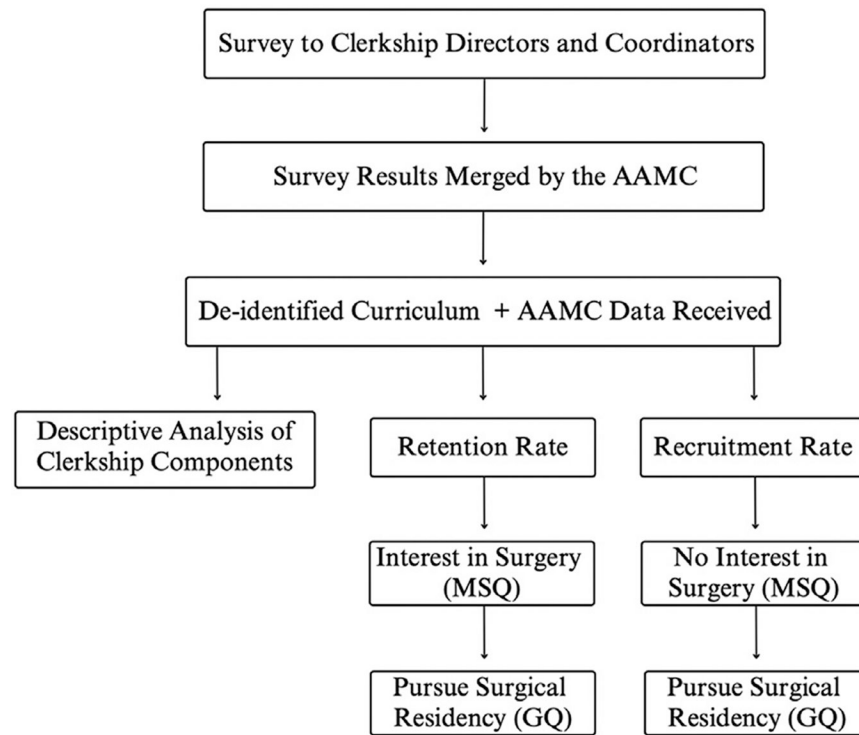


FIGURE 1.

Forest plot of curricular factors associated with graduating medical students applying to surgical specialties.

Abbreviations: MSQ (matriculating student questionnaire), GQ (graduation questionnaire)

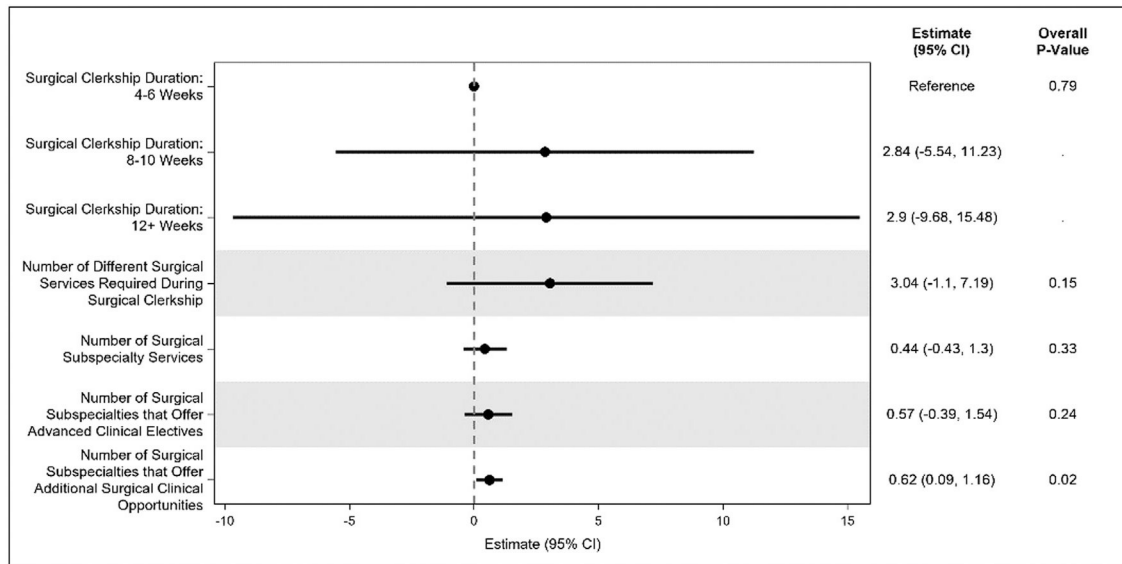


FIGURE 2.

Forest plot of curricular factors associated with graduating medical students applying to surgical specialties. Each model was fit separately with a single independent variable.

Abbreviations: CI=confidence interval.

TABLE 1.

Characteristics of Survey Respondents

	Total Programs
Total respondents (N)	21
Institution type (N, %)	
Private	10 (47.6%)
State	11 (52.4%)
Geographic region (N, %)	
Pacific	2 (9.5%)
Mountain	1 (4.8%)
West North Central	0 (0%)
East North Central	4 (19.0%)
West South Central	2 (9.5%)
East South Central	1 (4.8%)
South Atlantic	3 (14.3%)
Middle Atlantic	5 (23.8%)
New England	3 (14.3%)

Geographic categories defined by the AAMC

Pacific: AK, CA, HI, OR, WA

Mountain: AZ, CO, ID, MT, NM, NV, UT, WY

West North Central: IA, KS, MN, MO, NE, ND, SD

East North Central: IL, IN, MI, OH, WI

West South Central: AR, LA, OK, TX

East South Central: AL, KY, MS, TN

South Atlantic: DC, DE, FL, GA, MD, NC, PR, SC, VA, WV

Middle Atlantic: NJ, NY, PA

New England: CT, ME, MA, NH, RI, VT

TABLE 2.

Surgical Clerkship Survey Responses

	All Programs (N=21)
Clerkship duration	
4-6 weeks	5 (23.8%)
8-10 weeks	13 (61.9%)
12+ weeks	3 (14.3%)
Required number of surgical services	
1	3 (14.3%)
2	7 (33.3%)
3	7 (33.3%)
4	3 (14.3%)
5+	1 (4.8%)
Median (IQR) *	3 (2 - 3)
Method of assignment to surgical services	
Random placement	2 (9.5%)
Students submit preferences, then are assigned service(s)	17 (81%)
Other	2 (9.5%)
Surgical subspecialties that offer advanced clinical electives at your institution	
General surgery/Trauma surgery	20 (95.2%)
Neurological surgery	16 (76.2%)
Orthopedic surgery	18 (85.7%)
Plastic surgery	19 (90.5%)
Cardiac surgery	15 (71.4%)
Thoracic surgery	17 (81%)
Breast surgery	13 (61.9%)
Surgical oncology/HPB	18 (85.7%)
Endocrine surgery	13 (61.9%)
Transplant surgery	15 (71.4%)
Pediatric surgery	17 (81%)
Ophthalmology	14 (66.7%)
Otolaryngology/Head and neck surgery	15 (71.4%)
Urology	17 (81%)
Vascular surgery	17 (81%)
Colorectal surgery	16 (76.2%)
Other	3 (14.3%)
Surgical subspecialties that offer additional surgical clinical opportunities	
General surgery/Trauma surgery	18 (85.7%)
Neurological surgery	12 (57.1%)
Orthopedic surgery	13 (61.9%)
Plastic surgery	14 (66.7%)

	All Programs (N=21)
Cardiac surgery	12 (57.1%)
Thoracic surgery	13 (61.9%)
Breast surgery	13 (61.9%)
Surgical oncology/HPB	14 (66.7%)
Endocrine surgery	11 (52.4%)
Transplant surgery	12 (57.1%)
Pediatric surgery	13 (61.9%)
Ophthalmology	12 (57.1%)
Otolaryngology/Head and neck surgery	14 (66.7%)
Urology	15 (71.4%)
Vascular surgery	13 (61.9%)
Colorectal surgery	10 (47.6%)
Other	1 (4.8%)
None	1 (4.8%)

Data presented as N (%) unless otherwise specified.

Percentages may not add up 100 due to rounding or missing values.

* To estimate the median number of different surgical services required, "5+" was included as "5".

Abbreviations: IQR, interquartile range; HPB, hepatobiliary.

TABLE 3.

Linear Regression for Outcome of % of Respondents Who Indicated Interest in Surgical Subspecialties on the MSQ out of those Who Indicated Interest in Surgical Subspecialties on the GQ (Retention Rate)

Model Sample Size	Independent Variable	Estimate (95% CI)	p-Value	Overall p-Value
20	Surgical clerkship duration (Days)			0.53
	4-6 weeks	REF		
	8-10 weeks	-3.44 (-12.50, 5.62)	0.46	
	12+ weeks	2.15 (-10.28, 14.59)	0.73	
20	Number of different surgical services required during surgical clerkship	0.53 (-3.30, 4.36)	0.79	0.79
20	Number of surgical subspecialty services	0.44 (-0.49, 1.37)	0.35	0.35
20	Number of surgical subspecialties that offer advanced clinical electives	0.32 (-0.66, 1.30)	0.52	0.52
20	Number of surgical subspecialties that offer additional surgical clinical opportunities	0.40 (-0.18, 0.99)	0.18	0.18

Each model was fit separately with a single independent variable.

Abbreviations: CI, confidence interval; MSQ, matriculating student questionnaire; GQ, graduating questionnaire.

Linear Regression for Outcome of % of Respondents Who Indicated Interest in Nonsurgical Subspecialties on the MSQ out of those Who Indicated Interest in Surgical Subspecialties on the GQ (Recruitment Rate)

TABLE 4.

Model Sample Size	Independent Variable	Estimate (95% CI)	p-Value	Overall p-Value
20	Surgical clerkship duration (days)			0.82
	4-6 weeks	REF		
	8-10 weeks	-4.39 (-18.23, 9.45)	0.53	
	12+ weeks	-2.04 (-21.02, 16.95)	0.83	
20	Number of different surgical services required during surgical clerkship	-2.83 (-8.43, 2.77)	0.32	0.32
20	Number of surgical subspecialty services	-1.35 (-2.64, -0.07)	0.04	0.04
20	Number of surgical subspecialties that offer advanced clinical electives	-1.17 (-2.56, 0.22)	0.10	0.10
20	Number of surgical subspecialties that offer additional surgical clinical opportunities	-0.19 (-1.10, 0.72)	0.69	0.69