

Formal versus Informal Surgical Mentorship Among Canadian Medical Students: An Exploratory Cross-Sectional Survey

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Abstract

Mentorship influences medical students' interest in surgical careers, yet it remains unclear whether mentorship arising through structured programs is experienced differently from mentorship that develops informally. Adapting the survey of the Mentorship Across Academic Programs in Surgery study, and guided by mentoring theory distinguishing career and psychosocial functions, we conducted an exploratory cross-sectional online survey of Canadian medical students. Of 84 respondents, 40 (47.6%) reported surgical mentorship (formal, $n = 18$; informal, $n = 22$) and formed the analytic sample. Global perceived mentorship quality, rated with a single item, did not differ significantly between formal and informal mentorship ($p = 0.291$). Higher perceived quality was associated with frequent meetings ($p = 0.025$), mentor-mentee specialty concordance ($p = 0.012$) and perceived compatibility ($p = 0.0002$). Overall, 77% of mentored students reported increased interest in a surgical career, with no characteristic significantly associated with this change. Students with informal mentors rated research opportunities and clinical skill development higher (median 5 versus 3). In this pilot sample, we identified characteristics that were possibly linked to how students rated their mentorship. These hypothesis-generating findings support formal programs that give mentees input into matching and structured research and clinical exposure, evaluated in larger cohorts.

Introduction

Mentorship has been long perceived as a largely beneficial factor in career success among medical professionals. [1] Particularly for medical students, mentorship can be pivotal in providing support while navigating personal, educational, and professional challenges during formative years of training. [2, 3] Surgery is known to be a highly competitive and intimidating field, often viewed as a group of specialties with long, gruelling and demanding hours, lack of work-life balance, perfectionism, and the persistence of gender biases. Students describe the decision to pursue surgery as a particularly daunting one. [4, 5] Mentorship for medical students interested in surgery is key to provide students with exposure to the nuances of the lifestyle as well as provide guidance while navigating the path to a surgical career. [6]

Furthermore, mentorship has been shown to benefit more than just the mentee. The bidirectional flow of influence and information between mentees and mentors is beneficial to all involved. [2, 3, 7] Literature reports mentor benefits such as intellectual stimulation, emergence of new ideas, creativity and participation and formation of professional relationships and personal friendships. [3, 7] Additionally, faculty receive valuable insight into the perspectives and challenges of medical students, providing an opportunity to receive valuable feedback and highlighting areas for improvement in curricula and mentorship programs. [8]

The two commonly defined types of mentorships are formal mentorship and informal mentorship. [9] Informal mentorship involves the development of the relationship spontaneously based on the mentor and the mentee's mutual interest and interpersonal comfort often meeting organically. Conversely,

formal mentorship involves the development of the relationship through a formal process or organization where mentee and mentor are assigned to one another. [10]

Many students struggle to find a mentor and develop an informal relationship, especially in the pre-clinical years of training. As well, access to opportunities to form informal mentorship relationships may disproportionately favor certain demographic and socioeconomic groups of mentees. [11] Therefore, formal mentorship programs may be more beneficial in connecting mentors to mentees especially in early years of training. [12] Additionally, throughout training, literature describes surgical mentorship as highly beneficial, illustrated by higher reported surgical autonomy, reduced burnout and reduced suicidality by residents having received meaningful mentorship – underlining the necessity of mentorship programs to foster mentorship relationships at all levels of surgical training. [11]

In a study by Yu et al. (2024), 333 surveys were collected from junior surgical faculty across 18 US academic surgery programs. Only 18.3% of respondents reported having a formal mentor. Semi-structured interviews identified six themes related to mentorship: preferred mentor characteristics, optimizing mentorship relationship, mentee burden and responsibility, informal mentorship, mentor-mentee fit, and the absence of mentorship infrastructure. [8] The same authors proposed a framework in which, instead of assigning mentors, they developed a system in which mentees are provided a mentorship director to have in-depth conversations with them to understand their professional and career goals and identifying a mentor that could be more suitable to the goals of the mentee. This study offers an interesting model for how mentorship relationships may be structured in early career training. This work served as the methodological reference for the present study: our questionnaire was adapted from the survey used by authors (see Methods), as there are parallels between junior faculty and medical students interested in surgical careers, both of whom must often seek out mentorship with little institutional structure. As well, the current study aims to inform a framework for medical students to establish meaningful mentorship relationships through well-structured programs.

Two further studies in surgery shaped our approach. Kibbe et al. found that only half of departments of surgery in the US had a mentorship program, and that most did not require evaluation of the mentor-mentee relationship or offer an exit strategy when a pairing failed.[13] Silver et al., surveying general surgery residents nationally, used a single item asking whether residents had a mentor who genuinely cared about them and their career. A perceived meaningful mentorship was associated with greater operative autonomy and lower burnout, thoughts of attrition and suicidality. [11] Together, these studies point to the quality of the relationship itself, rather than the mere presence of a mentor or a program, as a likely determinant of benefit. They focused on faculty and residents in the United States; comparable data for Canadian medical students, who often first encounter surgical mentorship in pre-clerkship, are lacking. The present pilot study aims to add this population to that body of evidence, with particular attention to the relational aspects of mentorship that these studies identify as important for successful pairings. We compare characteristics and impacts of formal vs. informal surgical mentorships for medical students across Canada, with the objective of helping inform new, and refining current, mentorship programs. We further explored associations between structural and relational characteristics

of mentorship and students' global perceived mentorship quality and change in surgical career interest. Given the study-specific questionnaire and convenience sample, analyses were intended to generate hypotheses that may inform the design and prospective evaluation of new and existing surgical mentorship programs.

Conceptual framework

We defined surgical mentorship as a dyadic, developmental relationship in which a more experienced surgeon provides longitudinal professional and personal guidance to a medical student, acting as role model, teacher, advisor and, at times, sponsor.[13, 14] To describe what mentors provide, we used Kram's mentor role theory, which distinguishes career functions, such as sponsorship, exposure, coaching and access to challenging work, from psychosocial functions, such as role modelling, acceptance, counselling and friendship.[15] Although this theory originated in organizational research, it has since been applied in medicine. An instrument built on these two dimensions, the Ragins and McFarlin Mentor Role Instrument, showed strong internal consistency (Cronbach's alpha 0.82 to 0.97) and a confirmed two-dimension factor structure among 141 trainees at an academic medical center, 59% of whom were physicians, and both dimensions correlated with mentee satisfaction and perceived effectiveness ($r = 0.56$ to 0.71).[16] A systematic review of qualitative studies in academic medicine likewise described mentoring functions aimed at both academic and personal growth.[14] In surgery, medical students and trainees enrolled in a national otolaryngology mentorship program expected career, clinical and academic guidance as well as psychosocial and lifestyle support[17], which mirrors the same two dimensions.

The relational side of mentorship is less established in surgery. In workplace and academic settings, a meta-analysis of more than 40 000 protégés found that perceived similarity to the mentor was the strongest correlate of positive perceptions of the relationship, with effects in the same direction in workplace and academic mentoring,[18] and satisfaction with the relationship has been more closely related to career attitudes than whether mentoring was formal or informal. [19] Surgical studies point in the same direction without testing it directly: junior surgical faculty described mentor-mentee fit as a central theme[8], shared clinical or research interests were the most frequent matching criterion in surgical mentorship programs,[20] and residents' perception of having a mentor who genuinely cared about them was associated with better education and wellness outcomes.[11] To our knowledge, the association between these relational characteristics and perceived mentorship quality has not been examined among medical students with surgical mentors. We therefore organized our questionnaire domains along three related dimensions: (1) structural characteristics (formal or informal mentorship, stage of training, mentor gender, specialty concordance); (2) relational characteristics (meeting frequency, responsiveness and availability, perceived compatibility); and (3) perceived functions and outcomes, grouped as career functions (career guidance, research opportunities, clinical skill development, professional networking) and psychosocial functions (work-life balance, personal and emotional well-being), along with global perceived mentorship quality and change in surgical career

interest. This framework was used to organize and interpret our findings, based on the abovementioned conceptual framework, rather than as a validated measurement model.

Methods

Study Design and setting

We conducted an exploratory cross-sectional observational survey study to evaluate medical student experiences with formal and informal surgical mentorship and the perceived influence of mentorship on interest in pursuing surgical careers. Authors defined formal mentorship as mentorship established through a structured mentorship program, and informal mentorship was defined as mentorship relationships developed independently of formal programs.

Medical students enrolled at Canadian medical schools who reported having surgical mentorship were eligible for inclusion in the study. Students who started the survey and reported never having received mentorship were also quantified and a summary of demographic information for this group is presented in Table 1. We conducted recruitment through convenience sampling using national and local dissemination strategies (e.g. medical student social media groups). Various organizations also facilitated recruitment, including the Association of Women Surgeons (AWS) chapters across Canada, other surgical interest student-led groups, electronic newsletters, email communication and surgical residency program directors across Canada. As recruitment relied on open electronic dissemination and word of mouth, the number of eligible students who received or viewed the invitation could not be determined, and a conventional response rate could not be calculated.[21] We therefore report the number of respondents and the proportion who reported mentorship.

This study was approved by the McGill Research Ethics Board (REB file number 25-04-067). Participation was voluntary, anonymous and authors obtained informed consent electronically from all participants prior to survey completion.

Sample size

Since we conducted the current study based on mentorship experienced on a personal basis and as a cross-sectional, observational, survey-based design, a sample size was not calculated prior to recruitment. This study was designed as a pilot to describe the Canadian medical student landscape and to generate hypotheses for a larger study, and analyses were not powered to detect small or moderate differences between groups.

Survey development

We collected data through online questionnaires administered using Microsoft Forms. Participants completed the survey electronically without any identifying information collected.

The questionnaire (Online Resource 1) was adapted from the survey of the Mentorship Across Academic Programs in Surgery study by Yu et al., a 26-item instrument developed by five surgeons and reviewed for clarity, flow and appropriateness by study champions at participating institutions before distribution.[8] We retained its core structure: identification of formal and informal mentorship, meeting frequency, a single global rating of the mentorship received, and ratings of mentorship in specific domains (research, career guidance, emotional well-being, professional networking and clinical skills), each on a 5-point Likert-type scale. We adapted the instrument for medical students by replacing faculty-specific items (academic rank, years in practice) with year of training and completion of the core surgical clerkship rotation, and by adding items reflecting the relational and psychosocial dimensions of our framework: mentor responsiveness and availability, perceived compatibility with the mentor, guidance on work-life balance, mentor-mentee specialty concordance, mentor gender, and self-reported change in interest in a surgical career. The questionnaire was designed as a descriptive instrument rather than a psychometric scale. Domain items were not intended to measure a single underlying construct or to be summed into a composite score, and were analyzed individually. Internal consistency and factor structure were therefore not assessed, and we did not collect further validity evidence such as response-process or relationships-to-other-variables evidence.[22, 23] The validity argument for our interpretations rests on content drawn from a published instrument used in surgical mentorship research[8] and on the mapping of items to an established theory of mentoring functions.[15] Item responses are interpreted as students' perceptions of specific aspects of their mentorship, not as validated measures of mentorship effectiveness.

Global perceived mentorship quality: definition and rationale

Global perceived mentorship quality was measured with a single item asking students to rate the overall quality of the mentorship they received on a 5-point scale (1 = very poor, 5 = excellent). We chose a single global rating deliberately. In organizational psychology, the protégé's perception of the relationship is treated as a primary outcome of mentoring rather than a proxy for it.^{22, 23} The reference studied in surgery used the same approach: Yu et al. compared formal and informal mentorship using a single overall satisfaction item,¹¹ and Silver et al. defined meaningful mentorship with a single perception item.¹⁶ Because the item is ordinal and reflects a subjective judgment, it was summarized with medians and interquartile ranges and compared with nonparametric tests rather than means, and results are reported as students' perceptions rather than as an objective quality score.

Statistical Analysis

We analyzed data using JMP Version 19.1.2 (SAS Institute Inc., Cary, NC, USA). We used descriptive statistics to summarise participant demographics and survey responses. We reported categorical variables as frequencies and percentages. As we measured mentorship quality using 5-point Likert scales, we summarized these results using medians, interquartile ranges (IQRs) and nonparametric

statistical tests for group comparisons. We used the Mann-Whitney U test to compare perceived mentorship quality or surgical career interest between two groups ; as well as the Kruskal-Wallis test for comparisons involving three or more groups. We defined statistical significance as two-sided p-value < 0.05. Given the small sample and the number of comparisons, no adjustment for multiple comparisons was made; all p-values are considered exploratory and findings are interpreted as hypothesis-generating.

Results

Study participation and participant characteristics

We included for analysis a total of 40 medical students who reported having received surgical mentorship voluntarily during our recruitment period from June 2025 to June 2026. Among these, 17 students were enrolled at McGill University's faculty of medicine, three at Memorial University of Newfoundland, two at Queen's University, two at the University of Saskatchewan and one at the University of Montreal ; the rest of participants did not share their home school. We also included in our results information about other respondents having filled out the demographic information part of the survey but who then reported never having received mentorship (n = 44). (see Table 1) However, we did not include these students in further analysis. The majority of students were in the pre-clerkship years of training accounting for 67% (n = 56) of total respondents, and 65% (n = 26) of respondents reporting mentorship. (see Table 1) Most students having received mentorship (73%, n = 29) had not yet completed their core surgical clerkship rotation. (see Table 4) Due to low response rate, we advertised the survey at three different time points, at 3-month intervals, and via channels described above. Authors chose these time points to maximise response rate, as well as enable students to participate once they have had the opportunity to form mentorship relationships i.e. at the end of the clerkship year and after graduation, for 2 consecutive cohorts, therefore stretching the recruitment period over 1 year.

Table 1
Demographic and Clinical Characteristics of Medical Student Survey Participants

Characteristics	Total (N = 84)	No Mentorship (n = 44)	Mentorship (n = 40)
Gender			
Woman	67 (79.8%)	29 (65.9%)	38 (95.0%)
Man	16 (19.0%)	14 (31.8%)	2 (5.0%)
Prefer not to answer	1 (1.2%)	1 (2.3%)	0 (0.0%)
Ethnicity			
White	48 (57.1%)	21 (47.7%)	27 (67.5%)
Asian	10 (11.9%)	9 (20.5%)	1 (2.5%)
Black	6 (7.1%)	1 (2.3%)	5 (12.5%)
North African	6 (7.1%)	5 (11.4%)	1 (2.5%)
Middle Eastern	5 (6.0%)	3 (6.8%)	2 (5.0%)
Hispanic	2 (2.4%)	2 (4.5%)	0 (0.0%)
Other	6 (7.1%)	3 (6.8%)	3 (7.5%)
Prefer not to say	1 (1.2%)	0 (0.0%)	1 (2.5%)
Training Year			
Pre-Med	2 (2.4%)	2 (4.5%)	0 (0.0%)
First Year	33 (39.3%)	23 (52.3%)	10 (25.0%)
Second Year	21 (25.0%)	5 (11.4%)	16 (40.0%)
Third Year	20 (23.8%)	10 (22.7%)	10 (25.0%)
Fourth Year	8 (9.5%)	4 (9.1%)	4 (10.0%)
Medical School			
McGill University	37 (44.0%)	20 (45.5%)	17 (42.5%)
University of Saskatchewan	10 (11.9%)	8 (18.2%)	2 (5.0%)
Memorial University	6 (7.1%)	3 (6.8%)	3 (7.5%)
Université de Montréal	5 (6.0%)	4 (9.1%)	1 (2.5%)
Queen's University	3 (3.6%)	1 (2.3%)	2 (5.0%)

Characteristics	Total (N = 84)	No Mentorship (n = 44)	Mentorship (n = 40)
Gender			
Université Laval	3 (3.6%)	3 (6.8%)	0 (0.0%)
Université de Sherbrooke	1 (1.2%)	1 (2.3%)	0 (0.0%)
Not disclosed	19 (22.6%)	4 (9.1%)	15 (37.5%)
Completed Surgical Core Rotation			
Yes	23 (27.4%)	11 (25.0%)	12 (30.0%)
No	61 (72.6%)	33 (75.0%)	28 (70.0%)

Mentorship Characteristics

Authors summarized mentorship characteristics in Table 2. Most student reported infrequent mentor interaction, with 65% (n = 26) meeting their mentor fewer than 5 times during the preceding 12 months. Two thirds of mentors were women (67%, n = 26). (see Table 2) The majority of students (82%, n = 32) reported having a mentor practicing within their surgical specialty of interest. (see Table 2) Overall, 77% (n = 30) of students reported that their mentorship experience increased their interest in pursuing a surgical career. (see Table 2)

Table 2

Mentorship Characteristics Among Canadian Medical Students Who Received Mentorship (n = 40)

Mentorship Attributes	N	%
Type^a		
Formal (through program)	18	45
Informal	22	55
Frequency^a		
Infrequent (< 5 times)	26	65
Frequent (monthly/weekly)	14	35
Mentor Gender^b		
Woman	26	67
Man	13	33
Surgical Concordance^b		
Concordance	32	82
Non-concordance	7	18
Surgical Interest^b		
Increased interest	30	77
No change	9	23
Percentages may not sum to 100% due to rounding. ^a n=40 respondents who reported receiving mentorship. ^b n=39 respondents due to one non-response. Surgical specialty concordance refers to whether the mentor practiced in the same surgical specialty as the student's expressed interest. Surgical interest post-mentorship reflects self-reported change in interest in pursuing a surgical career following mentorship experience.		

Global Perceived Mentorship Quality

Global perceived mentorship quality did not differ significantly between students participating in formal mentorship programs (n = 18) and those engaged in informal mentorship relationships (n = 22) (p = 0.291). (Table 3) Ratings of individual mentorship domains are presented descriptively in Table 3; students with informal mentors rated research opportunities and clinical skill development higher than students with formal mentors (median 5 versus 3 for both). We presented associations between mentorship characteristics and global perceived mentorship quality in Table 4. Students who reported frequent mentor interactions rated mentorship quality significantly higher than those with infrequent interactions (p = 0.025). Similarly, mentorship quality ratings were significantly higher among students whose mentors practiced within their surgical specialty of interest compared with those whose mentors

practiced in a different specialty ($p = 0.012$). Perceived mentor–mentee compatibility was also strongly associated with mentorship quality ($p = 0.0002$). No significant associations were observed between mentorship quality and mentorship type, mentor gender, year of medical training, or completion of a core surgical rotation. Given the number of comparisons and the sample size, these associations should be considered exploratory.

Table 3

Ratings of Individual Mentorship Domains and Global Perceived Mentorship Quality, Formal Versus Informal Mentorship Among Canadian Medical Students

Domain	Formal Mentorship Median (IQR) n = 18	Informal Mentorship Median (IQR) n = 22	Responses, n/N (%)	p value
Career guidance	5 (4–5)	5 (4–5)	35/39 (90%)	
Research opportunities	3 (3–5)	5 (3–5)	28/39 (72%)	
Clinical skills	3 (3–4)	5 (3–5)	26/39 (67%)	
Work life balance	4 (3–5)	4 (3–5)	34/39 (87%)	
Professional networking	4 (4–4)	4 (3–5)	33/39 (85%)	
Personal/emotional wellbeing	4 (3–5)	5 (4–5)	31/39 (79%)	
Responsiveness/availability	5 (3–5)	5 (3–5)	35/39 (90%)	
Compatibility with mentor	4 (3–5)	5 (4–5)	35/39 (90%)	
Global perceived mentorship quality (single item)	4 (3–5)	5 (3.75-5)	40/40 (100%)	0.291
Data presented as median (IQR). Students rated each domain and perceived mentorship quality on a 5-point Likert scale (1 = Very Poor, 5 = Excellent). Responses reflects the number of students who responded to each domain out of 39 mentored students. Lower response counts in certain domains reflect students who selected “not applicable” as their mentorship did not cover that area. Global perceived mentorship quality is a separate single item, answered by all 40 mentored students; it was not calculated from or combined with the domain ratings. Overall quality of mentorship was compared between formal and informal mentorship groups using the Mann-Whitney U test. Domains are presented descriptively. IQR = interquartile range.				

Table 4
Association Between Mentorship Characteristics and Perceived Mentorship Quality

Variable	N (%)	Median Global Perceived Mentorship Quality (Q1–Q3)	<i>p</i> value
Mentorship Type			0.291
Formal (through a program)	18 (45%)	4 (3–5)	
Informal	22 (55%)	5 (4–5)	
Meeting Frequency			0.025*
Frequent (weekly/monthly)	16 (41%)	5 (4–5)	
Infrequent (< 5 meetings)	23 (59%)	4 (3–5)	
Mentor Gender			0.721
Woman	26 (65%)	4.5 (3–5)	
Man	14 (35%)	5 (3–5)	
Year of Medical Training			0.969
First Year	10 (25%)	4.5 (4–5)	
Second Year	16 (40%)	5 (3–5)	
Third Year	10 (25%)	4.5 (4–5)	
Fourth Year	4 (10%)	4 (3–5)	
Completed Surgical Core Rotation			0.617
No	28 (70%)	4.5 (3–5)	
Yes	12 (30%)	5 (3–5)	
Surgical Specialty Concordance			0.012*
Same surgical interest as mentor	32 (82%)	5 (4–5)	
Different surgical interest	7 (18%)	3 (3–4)	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Statistical significance was set at $p < 0.05$. *p* values derived from Mann-Whitney U test for two group comparisons and Kruskal-Wallis test for three or more group comparisons. Students rated global perceived mentorship quality on a 5-point Likert scale (1 = Very Poor, 5 = Excellent). Frequent meetings defined as monthly or weekly contact; infrequent defined as fewer than 5 meetings total. Surgical specialty concordance refers to whether the mentor practiced in the same surgical specialty as the student's expressed interest. Mentor-mentee compatibility was self-reported by the mentee. N reflects available responses per variable. Percentages may not sum to 100% due to rounding. All *p* values are exploratory and unadjusted for multiple comparisons.

Variable	N (%)	Median Global Perceived Mentorship Quality (Q1–Q3)	<i>p</i> value
Mentorship Type			0.291
Compatibility with Mentor			0.0002*
Poor	4 (11%)	3 (2–3)	
Neutral	4 (11%)	4 (4–4)	
Good	7 (20%)	3 (3–5)	
Excellent	20 (57%)	5 (5–5)	
<p>*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Statistical significance was set at $p < 0.05$. <i>p</i> values derived from Mann-Whitney U test for two group comparisons and Kruskal-Wallis test for three or more group comparisons. Students rated global perceived mentorship quality on a 5-point Likert scale (1 = Very Poor, 5 = Excellent). Frequent meetings defined as monthly or weekly contact; infrequent defined as fewer than 5 meetings total. Surgical specialty concordance refers to whether the mentor practiced in the same surgical specialty as the student's expressed interest. Mentor-mentee compatibility was self-reported by the mentee. N reflects available responses per variable. Percentages may not sum to 100% due to rounding. All <i>p</i> values are exploratory and unadjusted for multiple comparisons.</p>			

Factors Associated with Surgical Career Interest

We present associations between mentorship characteristics and self-reported changes in surgical career interest in Table 5. We identified no statistically significant associations between increased surgical career interest and mentorship type ($p = 0.465$), meeting frequency ($p = 0.696$), specialty concordance between mentor and mentee ($p = 0.309$), global perceived mentorship quality ($p = 0.464$), or completion of a core surgical rotation ($p = 0.416$).

Table 5

Association Between Mentorship Characteristics and Self-Reported Change in Surgical Interest Among Mentored Canadian Medical Students

Variable	Increased Surgical Interest n (%)	No change in Surgical Interest n (%)	p value
Mentorship Type			0.465
Formal	12 (70.6%)	5 (29.4%)	
Informal	18 (81.8%)	4 (18.2%)	
Meeting Frequency			0.696
Frequent	10 (71.4%)	4 (28.6%)	
Infrequent	20 (80.0%)	5 (20.0%)	
Specialty Concordance			0.309
Same	24 (75.0%)	8 (25.0%)	
Different	6 (100%)	0 (0%)	
Perceived Global Mentorship Quality Median (IQR)			0.464
	5 (3.75-5)	4 (3-5)	
Completion of surgical core			0.416
Completed	22 (81.5%)	5 (18.5%)	
Not completed	8 (66.7%)	4 (33.3%)	
<p><i>p</i> values derived from Mann-Whitney U test for two group comparisons. All <i>p</i> values are exploratory and unadjusted for multiple comparisons. Surgical interest reflects self-reported change following mentorship experience categorized as increased interest or no change. Students rated global perceived mentorship quality on a single 5-point Likert scale (1 = Very Poor, 5 = Excellent). Group compared using the Mann-Whitney U test. Surgical specialty concordance refers to whether the mentor practiced in the same surgical specialty as the student's expressed interest. Authors set statistical significance at $p < 0.05$. Percentages may not sum to 100% due to rounding.</p>			

Discussion

Table 4 illustrates that a majority of participants were still in their pre-clinical years, a majority not having completed their core surgical clerkship rotation. Students at an earlier stage in their curriculum reported a majority of formal mentorship, while informal mentorship was more commonly reported by participants at a later stage in their curriculum. While the formal–informal distinction has been examined previously by other authors among junior surgical faculty, where informal mentorship predominates and yields higher satisfaction [8], and among medical students at single timepoints [24,

25], no prior study has characterised how the predominant mentorship modality may evolve across undergraduate medical training. [25] Importantly, we did not detect a difference in global perceived mentorship quality between modalities in our cohort, and ratings were high in both groups. While this does not demonstrate equivalence, it suggests that formal programs may be less an inferior substitute for spontaneous mentorship, than a valuable entry point that may serve as the scaffold from which later informal relationships develop.

Our study extends to undergraduate medical trainees the formal - informal comparison characterised among junior surgical faculty by Yu et al., who reported that informal mentorship was far more prevalent (84.2% vs. 18.3%) than with formal mentors and yielded higher overall satisfaction.[8] In contrast, our medical student cohort showed a near-even distribution between formal ($n = 18$) and informal ($n = 22$) mentorship, and perceived quality did not differ between the two modalities ($p = 0.291$). Notably, whereas Yu et al. found levels of satisfaction higher in informal mentorship, our finding of equivalent perceived quality across modalities suggests that at the student level, formal programs are not inferior substitutes to informal mentorship. Both studies used a single global rating of the mentorship received, which makes the contrast more directly comparable.

Taken together, these findings support the meaningfulness of implementing structured mentorship programs early in surgical training, when students are least likely to have formed informal connections independently.

What makes mentorship meaningful?

It is worth noting that a vast majority of respondents subjectively ranked their surgical mentorship to be of high quality (4 or 5 ranking on a 5-point Likert scale). Overall perceived mentorship quality did not differ significantly between formal and informal mentorship ($p = 0.291$). Instead, quality was significantly associated with meeting frequency ($p = 0.025$), specialty concordance between mentor and mentee ($p = 0.012$), and perceived mentor-mentee compatibility ($p = 0.0002$). Mentor gender, year of training, and completion of a core surgical rotation showed no significant association with ranked quality. This provides valuable insight as to what students value most: the mentorship relationship itself rather than the context of their curriculum when receiving mentorship. These findings are consistent with the organizational psychology literature, in which perceived similarity between mentor and protégé is the strongest correlate of positive perceptions of the relationship and interaction frequency is linked to psychosocial support,[18] and in which satisfaction with the relationship matters more than whether it was formal or informal.[19] This provides valuable insight towards design and quality assessment elements for mentorship programs across the country.

Individual domain analysis added further nuance: students with informal mentorship rated their access to research opportunities (median 5/5 vs. 3/5) and clinical skill development (median 5/5 vs. 3/5) notably higher than students in formal programs. Although the survey did not inquire about ranking of each domain, this pattern may indicate that in the case of mentorship programs, there might exist a need

for structurally organized access to research as well as clinical exposure opportunities (i.e. shadowing, meeting your mentor in the clinical context and being able to discuss cases together). Conversely, it is possible to infer that the organic nature of informal mentorship may lead to better acquaintance, comfort and willingness of a mentor to supervise research or to welcome their mentee in the clinical environment, notably, the operating room.[8, 12]

Insights for mentorship programs

By identifying elements that are associated with global perceived mentorship quality by students, our results can serve towards better-built surgical mentorship programs. The important areas identified are (i) ensuring access of mentorship programs to all medical students, (ii) the choice of mentor and ensuing match with mentee (compatibility, specialty concordance), and (iii) providing research opportunities and clinical exposure. [26–28]

Sixty-seven percent (n = 27) of respondents having received mentorship self-identified as White, leaving a minority of participants self-identifying as other ethnicities such as Asian (2.5%, n = 1), Black (12.5%, n = 5) and North African (2.5%, n = 1), among others. (see Table 1) Disparities in surgical mentorship and among surgical residency programs related to ethnicity have been previously reported in the literature. [11, 29–31] We suggest that programs may need to consider how the recruitment of mentees is done to help address this disparity, perhaps reaching the student body through different, systematic channels, to enable students from all backgrounds to benefit from surgical mentorship.

Additionally, the literature also suggests that allowing mentees to choose their mentor might result in the most successful pairing due to characteristics linked to mentorship quality relating directly to relationship aspects (specialty concordance, compatibility). As described by Kibbe et al., allowing the mentee to select someone with shared values and relevant experience, may lead to higher involvement and engagement from both mentee and mentor. [13]

Finally, offering resources or potential research supervisors looking for students within the structure of the mentorship program could enable students accessing mentorship through a program to benefit from research opportunities and clinical skill development increasingly. Therefore closing the gap between them and students experiencing informal mentorship on these domains, as reported above. A similar offer system could exist for shadowing opportunities within capacity of surgical departments whether with the chosen mentor or with another, available faculty surgeon interested in having a shadow student for a given day.

Limitations

Our pilot study has several limitations. Firstly, our sample population was small and recruited by convenience. The open recruitment strategy did not allow a response rate to be calculated. With 40 mentored students, the study was underpowered to detect modest differences; a non-significant result cannot be taken as evidence of equivalence, and some significant associations may be chance findings. [14] This limitation is shared by much of the mentorship literature in academic medicine, where 87% of

studies in a systematic review were cross-sectional self-report surveys, often with small samples. Although the answers we received were insightful, validated conclusions on this topic would require a larger population sample. A strategy we propose would be to conduct a similar study with a more targeted cohort, for example, by studying mentorship within a university-affiliated surgical department, among clerkship students completing their core rotations, and enrolling them prospectively through a mentorship program created and led by that same department. We could not recruit participants in the current study this way due to ethical considerations and a lack of collaboration from medical school curriculum administration.

Secondly, participation was likely shaped by self-selection among participants. Students who do not feel they received mentorship, or who simply have not experienced any, likely chose not to enroll in the study. This suggests that existing relationships between students and faculty surgeons may not lead to meaningful mentorship, a gap that, as our results suggest, may be addressed through the formation of well-designed mentorship programs.

Thirdly, the questionnaire was adapted from a published instrument but was not formally validated in our population. Domain items were analyzed individually rather than as a scale, and global perceived mentorship quality was captured with a single item, which cannot separate the components of a student's judgment. Responses should therefore be read as students' perceptions of their mentorship rather than validated measures of mentorship effectiveness. Future studies should prospectively develop or adapt a mentorship instrument and gather content, response-process, internal-structure and relationships-to-other-variables evidence in an adequately powered sample.[22, 23]

Lastly, it is important to consider that self-selection bias could have skewed our data positively. Motivated students interested in a surgical career are likely the ones who dedicated the energy, time, and resourcefulness to find and sustain mentorship. They are also likely the same students who self-selected to participate in this study by voluntarily completing our online survey.

Conclusion

Surgical mentorship, whether formal or informal, was highly valued by the medical students who received it, and in this exploratory pilot sample, we did not detect a difference in global perceived mentorship quality between the two. Mentorship quality was found to be driven mostly by relational factors such as compatibility, specialty concordance and meeting frequency; mentorship program structures should pay specific attention and attempt to formalize these elements. Disparities in access, particularly across multiethnic backgrounds, further underscore the need for intentional mentee recruitment. Finally, mentorship programs should encourage and support meaningful pairing, by letting mentees and mentors choose each other as well as provide structured opportunities for research and clinical exposure. It is important to note that this study had multiple limitations leading to low response rate and many analyses being underpowered. Further studies should aim at recruiting a larger cohort

and at investigating in more detail elements identified as meaningful in the current paper, using theory-informed instruments with established validity evidence.

Declarations

Competing Interests:

The authors declare no conflicts of interest.

Ethics Approval:

The study was conducted in accordance with the Declaration of Helsinki and approved by the McGill University Research Ethics Board (file number 25-04-067; date of approval May 14th, 2025, renewed May 7th, 2026).

Consent to Participate:

Informed consent was obtained electronically from all participants involved in the study.

Consent for Publication:

Not applicable.

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Author Contribution

Conceptualization, I.B., A.G. and S.F.; methodology, I.B., A.G., S.F.; investigation, I.B., N.B.; formal analysis, I.B., O.K., N.B., M.B.; writing (original draft), all authors; writing (review and editing), all authors; supervision, S.F.

Data Availability

The data presented in this study are available on reasonable request from the corresponding author. The data are not publicly available to protect participant anonymity.

References

1. Gaeta ED, Gilbert M, Johns A, Jurkovich GJ, Wieck MM. Effects of Mentorship on Surgery Residents' Burnout and Well-Being: A Scoping Review. *J Surg Educ*. 2024;81(11):1592–601. 10.1016/j.jsurg.2024.08.001.
2. Wilder FG, Han JJ. Finding the Right Mentor. *Thorac Surg Clin*. 2024;34(1):1–7. 10.1016/j.thorsurg.2023.08.010.
3. Sachdeva AK. Preceptoring, proctoring, mentoring, and coaching in surgery. *J Surg Oncol*. 2021;124(5):711–21. <https://doi.org/10.1002/jso.26585>.
4. Grandis JR, Gooding WE, Zamboni BA, Wagener MM, Drenning SD, Miller L, et al. The gender gap in a surgical subspecialty: analysis of career and lifestyle factors. *Arch Otolaryngol Head Neck Surg*. 2004;130(6):695–702. 10.1001/archotol.130.6.695.
5. Wong GM, Williams JD, Smith KF, Buck P, Bryant JP, Nair MN. Concerns, Perceptions, and Career Considerations of Female Medical Students Interested in Neurosurgery: A Qualitative Case Study. *World Neurosurg*. 2024;189:264–71. 10.1016/j.wneu.2024.06.121.
6. O'Connor MI. Medical School Experiences Shape Women Students' Interest in Orthopaedic Surgery. *Clin Orthop Relat Res*. 2016;474(9):1967–72. 10.1007/s11999-016-4830-3.
7. Rosen JE, Chen S, Britt R, Fox A, Downard C, Moalem J. Goal-Oriented Surgical Mentoring Yields Long-Term Benefits for Both Mentor and Mentee. *Am Surg*. 2026;92(1):209–15. 10.1177/00031348251358434.
8. Yu J, Ruhi-Williams P, de Virgilio C, Bazargan-Hejazi S, Ovsepyan HE, Wexner SD, et al. Mentorship of Junior Surgical Faculty Across Academic Programs in Surgery. *JAMA Surg*. 2024;159(11):1252–60. 10.1001/jamasurg.2024.3390.
9. Entezami P, Franzblau LE, Chung KC. Mentorship in surgical training: a systematic review. *Hand (N Y)*. 2012;7(1):30–6. 10.1007/s11552-011-9379-8.
10. Bingmer K, Wojnarski CM, Brady JT, Stein SL, Ho VP, Steinhagen E. A Model for a Formal Mentorship Program in Surgical Residency. *J Surg Res*. 2019;243:64–70. 10.1016/j.jss.2019.04.068.
11. Silver CM, Yuce TK, Clarke CN, Schlick CJR, Khorfan R, Amortegui D, et al. Disparities in Mentorship and Implications for US Surgical Resident Education and Wellness. *JAMA Surg*. 2024;159(6):687–95. 10.1001/jamasurg.2024.0533.
12. Chen T, Silver JA, Seikaly H, Nguyen LHP, Chan Y. Mapping the Mentorship Landscape in Otolaryngology-Head and Neck Surgery Training Programs: A Cross-Canadian Survey. *Otolaryngol Head Neck Surg*. 2025;172(5):1617–24. 10.1002/ohn.1166.
13. Kibbe MR, Pellegrini CA, Townsend CM Jr., Helenowski IB, Patti MG. Characterization of Mentorship Programs in Departments of Surgery in the United States. *JAMA Surg*. 2016;151(10):900–6. 10.1001/jamasurg.2016.1670.
14. Sambunjak D, Straus SE, Marusic A. A systematic review of qualitative research on the meaning and characteristics of mentoring in academic medicine. *J Gen Intern Med*. 2010;25(1):72–8. 10.1007/s11606-009-1165-8.

15. Kram KE. Mentoring at work: developmental relationships in organizational life. Glenview, IL: Scott, Foresman; 1985.
16. Dilmore TC, Rubio DM, Cohen E, Seltzer D, Switzer GE, Bryce C, et al. Psychometric properties of the mentor role instrument when used in an academic medicine setting. *Clin Transl Sci*. 2010;3(3):104–8. 10.1111/j.1752-8062.2010.00196.x.
17. Abrar R, Stapleton E. Participant expectations in a national otolaryngology mentorship programme. *J Laryngol Otol*. 2023;137(6):614–21. 10.1017/S0022215122001852.
18. Eby LT, Allen TD, Hoffman BJ, Baranik LE, Sauer JB, Baldwin S, et al. An interdisciplinary meta-analysis of the potential antecedents, correlates, and consequences of protégé perceptions of mentoring. *Psychol Bull*. 2013;139(2):441–76. 10.1037/a0029279.
19. Ragins BR, Cotton JL, Miller JS. Marginal mentoring: the effects of type of mentor, quality of relationship, and program design on work and career attitudes. *Acad Manag J*. 2000;43(6):1177–94. 10.2307/1556344.
20. Kehagias D, Popoiu T, Dimitrakopoulou E, Hampe LZ, Elkeleny MR, Portelli M. Mentee - mentor matching in surgical practice and training - A systematic review of the literature and single-arm meta-analysis. *Am J Surg*. 2026;257:116949. 10.1016/j.amjsurg.2026.116949.
21. Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *J Med Internet Res*. 2004;6(3):e34. 10.2196/jmir.6.3.e34.
22. Artino AR Jr., La Rochelle JS, Dezee KJ, Gehlbach H. Developing questionnaires for educational research: AMEE Guide 87. *Med Teach*. 2014;36(6):463–74. 10.3109/0142159X.2014.889814.
23. Cook DA, Beckman TJ. Current concepts in validity and reliability for psychometric instruments: theory and application. *Am J Med*. 2006;119(2):e1667–16. 10.1016/j.amjmed.2005.10.036.
24. Park JJH, Adamiak P, Jenkins D, Myhre D. The medical students' perspective of faculty and informal mentors: a questionnaire study. *BMC Med Educ*. 2016;16:4. 10.1186/s12909-016-0526-3.
25. Aagaard EM, Hauer KE. A cross-sectional descriptive study of mentoring relationships formed by medical students. *J Gen Intern Med*. 2003;18(4):298–302. 10.1046/j.1525-1497.2003.20334.x.
26. Feeley AA, Feeley IH, Sheehan E, Carroll C, Queally J. Impact of Mentoring for Underrepresented Groups in Undergraduate Medical Education: A Systematic Review. *J Surg Educ*. 2024;81(3):353–66. 10.1016/j.jsurg.2023.11.015.
27. Bonifacino E, Ufomata EO, Farkas AH, Turner R, Corbelli JA. Mentorship of Underrepresented Physicians and Trainees in Academic Medicine: a Systematic Review. *J Gen Intern Med*. 2021;36(4):1023–34. 10.1007/s11606-020-06478-7.
28. Minor S, Bonnin R. What Do Medical Students Want From a Mentor? PRiMER. 2022;6:36. 10.22454/PRiMER.2022.552177
29. Osseo-Asare A, Balasuriya L, Huot SJ, Keene D, Berg D, Nunez-Smith M, et al. Minority Resident Physicians' Views on the Role of Race/Ethnicity in Their Training Experiences in the Workplace. *JAMA Netw Open*. 2018;1(5):e182723. 10.1001/jamanetworkopen.2018.2723.

30. Kim Y, Kassam AF, McElroy IE, Lee S, Tanious A, Chou EL, et al. The current status of the diversity pipeline in surgical training. *Am J Surg.* 2022;224(1 Pt B):250–6. 10.1016/j.amjsurg.2021.11.006.
31. Koech H, Albanese J, Saeks D, Habashi K, Strawser P, Hall M Jr., et al. Minority Resident Physicians' Perspectives on the Role of Race/Ethnicity, Culture, and Gender in Their Surgical Training Experiences. *J Surg Educ.* 2023;80(6):833–45. 10.1016/j.jsurg.2023.03.009.

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