Choosing a career in surgery: factors that influence Canadian medical students' interest in pursuing a surgical career

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Background: Interest in both general surgery and surgical subspecialties has been declining among Canadian medical students. Studies have shown that a student's desire to practise surgery is largely determined before entry into medical school. As part of a larger study of students' career preferences throughout medical school, we sought to identify the level of interest in surgical careers and the factors that influence a student's interest in pursuing a surgical career. **Methods:** We surveyed students from 18 different classes at Canadian medical schools at the commencement of their studies between 2001 and 2004. We asked the students to list their top career choices and the degree to which a series of variables influenced their choices. We also collected demographic data. We performed a factor analysis on the variables. **Results:** Of 2420 surveys distributed, 2168 (89.6%) were completed. A total of 21.0% of respondents named a surgical specialty as their first choice of career. We found that male students were more likely to express interest in a surgical specialty than female students, who were more likely to express interest in either family medicine or a medical specialty. Compared with students interested in a career in family medicine, those interested in a surgical or medical specialty were younger, more likely to be single and more likely to be influenced by prestige when making their career choices. Students interested in a career in surgery were less influenced by medical lifestyle and a varied scope of practice, less likely to demonstrate a social orientation and more likely to be hospital-oriented than students interested in either family medicine or a medical specialty. Male students interested in a career in surgery were more hospital-oriented and less likely to demonstrate a social orientation than female students interested in surgical careers. **Conclusion:** We identified 5 factors and a number of demographic variables associated with a student's interest in a surgical career.

Contexte : L'intérêt des étudiants en médecine du Canada pour la chirurgie générale et les spécialités chirurgicales est en déclin. Des études ont démontré que le désir de pratiquer la chirurgie chez un étudiant est déterminé en grande partie avant son arrivée à la faculté de médecine. Dans le contexte d'une étude de plus grande envergure sur les préférences des étudiants en matière de cheminement de carrière tout au long des études de médecine, nous avons cherché à déterminer le niveau d'intérêt porté aux carrières en chirurgie et les facteurs qui influencent l'intérêt pour une carrière en chirurgie chez les étudiants. **Méthodes :** Nous avons sondé les étudiants de 18 promotions de facultés de médecine canadiennes au début de leurs études, entre 2001 et 2004. Nous leur avons demandé d'énumérer leurs principaux choix de carrière et d'indiquer dans quelle mesure une série de variables influençait leur choix. Nous avons aussi recueilli des données démographiques. Nous avons procédé à une analyse factorielle des variables. **Résultats :** Sur 2420 questionnaires distribués, 2168 (89,6 %) ont été remplis. Au total, 21,0 % des répondants ont indiqué une spécialité chirurgicale comme premier choix de carrière. Nous avons constaté que les étudiants de sexe masculin étaient plus susceptibles de manifester de l'intérêt pour une spécialité chirurgicale que les étudiantes, et que celles-ci étaient plus susceptibles de s'intéresser à la médecine familiale ou à une spécialité de la médecine. Comparativement aux étudiants qui s'intéressent à une carrière en médecine familiale, ceux qui s'intéressent à une spécialité chirurgicale ou médicale sont plus jeunes, plus susceptibles d'être célibataires et d'être influencés par le prestige dans

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leur choix de carrière. Les étudiants intéressés à une carrière en chirurgie sont moins influencés par le style de vie du médecin et par le champ d'exercice varié, moins susceptibles d'avoir une orientation sociale et plus susceptibles d'être axés sur l'hôpital que les étudiants intéressés à la médecine familiale ou à une spécialité médicale. Les étudiants de sexe masculin qui s'intéressent à une carrière en chirurgie sont plus axés sur l'hôpital et moins susceptibles d'avoir une orientation sociale que les étudiantes intéressées par une carrière en chirurgie. **Conclusion :** Nous avons dégagé 5 facteurs et de nombreuses variables démographiques associées à l'intérêt qu'une carrière en chirurgie suscite chez les étudiants.

In North America, the popularity of general surgery and some surgical subspecialties among graduating medical students is declining.[1,2] The number of Canadian medical students identifying a surgical specialty as their first choice when applying for residency positions has decreased from 24.7% in 1998[3] to 21.7% in 2006.[4] The repercussions of this deficit will become more critical in the coming years as the population ages[5] and the demand for surgeons increases.

It is unclear what factors are responsible for the declining popularity of surgical careers. Some argue that over the past decade emphasis has been placed on selecting candidates more likely to pursue a career in primary care.[2] Also cited are the changing demographic composition of medical school classes[1,2] and the growing interest in "controllable lifestyle" careers.[6]

In recent years, various studies have examined the attitudinal factors associated with a student's decision to pursue a career in surgery. These studies indicate that students who choose a career in surgery tend to be more influenced by perceived career rewards such as income,[6–8] prestige,[6–8] job opportunities[6–8] and perceived career satisfaction.[9] McGreevy and Wiebe[10] suggest that surgeons have a distinct "surgical personality."

Others have examined the timing of career choices among medical students and have suggested that career interests formed before entry into medical school may be predictive of eventual career choices.[9,11–13] Kozar[9] found that a student's desire to practise surgery was largely determined before entry into medical school and that students who expressed interest in nonsurgical careers were less likely to have their areas of specialty solidified to the same extent at that time. Consequently, it is important to identify both the factors that influence a medical student's interest in pursuing a career in surgery at the time of entry into medical school and the demographic profiles of these students. Given the changing demographic environment of Canadian medical schools, it is also important to examine any attitudinal differences that may exist between men and women to further add to the body of literature addressing sex differences in the surgical profession.[14–20]

This paper comprises part of an ongoing study of students' career preferences throughout medical school and the demographic and attitudinal factors associated with career preferences. The influences on career interest in family medicine are reported elsewhere.[21] This paper focuses on career interest in surgical specialties. We report the level of interest in surgical careers among students entering medical school and describe the demographic variables and attitudinal factors that influence students' interest in a surgical career. We also examine the differences in both demographic variables and attitudinal factors between male and female students who expressed an interest in a career in surgery.

Methods

We distributed a 41-item survey to students in 18 classes from Canadian medical schools 2 weeks after the start of their medical studies. We selected the items based on a literature review and consultations with medical students, residents, physicians and leaders in education. We distributed the survey to medical students, residents, physicians and content experts to verify item comprehensiveness and appropriateness, piloted the survey with 1 class and then modified the survey following this validation process. We surveyed 4 classes each from the University of British Columbia and the University of Cangary (2001–2004), 2 classes each from the University of Toronto, McMaster University, Queen's University and the University of Western Ontario (2003–2004), and 1 class each from the University of Alberta (2002) and the University of Ottawa (2003).

The survey asked students to consider 8 career options — emergency medicine, family medicine, internal medicine, obstetrics and gynecology, pediatrics, psychiatry, surgery and "other" (a write-in choice) — and to indicate with a "yes" or "no" which they would consider to be a possible career. It also asked them to rank their top 3 career choices. Students were then asked to use a 5-point Likert scale to evaluate the extent to which 27 variables (Box 1) influenced their first choices, ranging from 1 (no influence) to 5 (major influence). We also collected demographic data.

To reduce the number of statistical comparisons between career choices, and thus the likelihood of false-positive results, we collapsed the responses into 3 groups (family medicine, medical specialties and surgical specialties) according to a classification used by the Canadian Institute for Health Information.[22] Surgical specialties included general surgery, cardiac and thoracic surgery, neurosurgery, obstetrics and gynecology, ophthalmology, otolaryngology, orthopedic surgery, plastic surgery and urology. We recorded responses listed as "other" within 1 of the 3 broad career options if possible.

We analyzed the data using SPSS software version 14.0 (SPSS Inc.). We compared age (the only continuous demographic variable) among career choices using the Kruskall–Wallis nonparametric test and between the sexes using the Mann–Whitney *U* test. We analyzed categorical demographic data using the χ^2 test of proportions. We performed factor analysis to reduce the 27 attitudinal variables into a smaller number of overarching factors. To be included into a factor, variables had to have an eigenvalue less than 1.0 and a correlation greater than 0.5. We used one-way analysis of variance with Scheffe's post-hoc test to identify differences in the resulting factors according to career, and we used unpaired *t* tests to identify differences in the factors according to sex. We deemed the results to be significant at $p < 0.05$.

Box 1. Results of factor analysis

Factor 1: medical lifestyle
• Flexibility outside of medicine
• Acceptable hours of practice
• Flexibility inside of medicine
• Acceptable on-call schedule
• Keeping options open
Factor 2: social orientation
• Health promotion important
• Long-term relationship with patients
• Focus on patients in the community
• Social commitment
• Interesting patient population
Factor 3: prestige
• High income potential
• Adequate income to eliminate debt
• Status among colleagues
• Stable/secure future
Factor 4: hospital orientation
• Focus on urgent care
• Focus on in-hospital care
• Results of interventions immediately available
• Prefer medical to social problems
Factor 5: role model
• Meaningful past experience with physician
• Emulate a physician
Factor 6: varied scope of practice
• Wide variety of patient problems
• Narrow variety of patient problems
Items that failed to correlate with a factor
• Good match to career
• Focus on nonurgent care
• Dislike of uncertainty
• Interest in research
• Short postgraduate training

Results

We achieved a response rate of 89.6%, with 2168 of a possible 2420 surveys completed. We excluded 72 surveys because they failed to indicate a specific career preference. On the remaining 2096 surveys, 441 respondents (21.0%) named a surgical specialty as their foremost career interest. A further 1208 respondents (57.6%) indicated that they would consider a career in surgery, though not as their primary career interest. Combined, almost 80% of students considered a surgical specialty as a possible career option. For all subsequent comparisons, we grouped the students according to their foremost career interests. Thus we included in the "interested" group only those students who indicated that a surgical specialty was their primary career interest.

Overall, valid survey respondents ranged in age from 18 to 49 years, with a mean age of 24.2 years. The majority of these respondents were female (57.0%), single (70.0%) and had entered medical school from a science background (91.5%). Most came from families in which the highest level of parental education was university education (75.8%), and a minority of respondents had close family members or friends who were practising medicine (40.0%) or in particular, a surgical specialty (12.4%). About 21.6% of respondents had spent the majority of their childhoods living in rural communities (self-defined), with one-third of respondents (33.3%) having completed high school in communities with populations of less than 100 000 people. Almost one-quarter of respondents (23.0%) had parents living in rural communities, and about one-fifth of respondents (19.3%) planned to work in communities with populations of less than 100 000 people after graduation. The vast majority of survey respondents (99.4%) had participated in some form of volunteer work before medical school.

Demographic comparison of students expressing interest in surgery and those expressing interest in other specialties

Compared with students who reported an interest in medical specialties, we found that more of those interested in surgical specialties were male than female, and that they were less likely to have close family members or friends practising medicine and more likely to have parents living in rural communities (Table 1).

Compared with students who reported an interest in family medicine, we found that students interested in surgical specialties were younger, more likely to be single, more likely to have university-educated parents, more likely to have close family members or friends practising specifically in surgery and less likely to have ties to a rural community and plans to work in a rural community after graduation (Table 1).

Students interested in surgical specialties were significantly less likely to have participated in volunteer work with children than students interested in either family medicine (71.7% v. 78.2%; $\chi^2_1 = 5.106$, $p = 0.024$) or medical specialties (71.7% v. 78.3%; $\chi^2_1 = 7.008$, $p = 0.008$). Students interested in surgical specialties were also significantly less likely to have worked with individuals with cognitive disabilities than students interested in either family medicine (23.3% v. 29.5%; $\chi^2_1 = 4.473$, $p = 0.034$) or medical specialties (23.3% v. 29.9%; $\chi^2_1 = 6.673$, $p = 0.010$). Compared with students interested in family medicine, those who expressed interest in surgery were more likely to have participated in volunteer work within hospitals (74.4% v.

67.2%; $\chi^2_1 = 5.632$, $p = 0.018$) but less likely to have participated in volunteer work in developing nations (17.8% v. 25.0%; $\chi^2_1 = 6.718$, $p = 0.010$).

Demographic comparison of male and female students who expressed interest in surgery

The characteristics of the respondents interested in surgical specialties varied significantly between male and female students (Table 2). Compared with male students, female students interested in surgical specialties were younger, less likely to have friends or family members who were practising medicine in general and surgery in particular, more likely to have ties to rural communities, and more likely to envision themselves working in smaller communities after graduation.

Factor analysis

Factor analysis on the Likert variables yielded 6 factors that included 22 of the 27 items listed; 5 items failed to correlate with any of the 6 factors. We named each factor based on the types of items that grouped together (Box 1). We defined the 6 factors as follows.

- Factor 1: medical lifestyle
- Factor 2: social orientation
- Factor 3: prestige
- Factor 4: hospital orientation
- Factor 5: role model
- Factor 6: varied scope of practice

Respondents who expressed interest in surgical specialties as their first career choices ranked factors 1, 2 and 6 as less important influences, and they ranked factor 4 as a more important influence on career choice than students interested in either family medicine or medical specialties (Table 3). In addition, respondents interested in surgical specialties ranked factor 3 as a more important influence than students who expressed interest in family medicine. These associations remained consistent for male students when considered separately; however, prestige was no more an important influence on career choice among female students interested in surgical specialties than among female students interested in family medicine or other medical specialties.

Among students interested in surgical specialties, female respondents ranked factor 2 as a greater influence on their career choices than did male respondents (Table 4). Male respondents ranked factors 3 and 4 as more important influences on their career choices than did female respondents.

Table 1

Demographic differences among survey respondents according to career choice

Characteristic	First choice career: Surgical specialty *n* = 441	Medical specialty *n* = 1110	Family medicine *n* = 545	Statistical analysis*	*p value*
Age, yr	23.6	23.9	—	$Z = -1.410$	0.158
	23.6	—	25.2	$Z = -6.119$	< 0.001
Sex, male	54.0	43.0	—	$\chi^2 = 15.356$	< 0.001
	54.0	—	34.0	$\chi^2 = 39.486$	< 0.001
Single, %	74.3	72.4	—	$\chi^2 = 0.566$	0.452
	74.3	—	61.6	$\chi^2 = 17.766$	< 0.001
Premedical education in science, %	92.2	92.3	—	$\chi^2 = 0.008$	0.928
	92.2	—	89.4	$\chi^2 = 2.233$	0.135
University-educated parent, %	76.5	77.9	—	$\chi^2 = 0.354$	0.552
	76.5	—	70.7	$\chi^2 = 4.202$	0.040
Family members/ friends in medicine, %	37.0	43.1	—	$\chi^2 = 4.846$	0.028
	37.0	—	36.3	$\chi^2 = 0.042$	0.838
Family members/ friends in surgery, %	16.6	12.9	—	$\chi^2 = 3.547$	0.060
	16.6	—	8.1	$\chi^2 = 16.761$	< 0.001
Home town population < 100 000, %	29.8	29.0	—	$\chi^2 = 0.085$	0.770
	29.8	—	45.0	$\chi^2 = 23.913$	< 0.001
> 50% of childhood in rural community, %	20.2	16.7	—	$\chi^2 = 2.345$	0.126
	20.2	—	32.4	$\chi^2 = 16.956$	< 0.001
Parents in rural community, %	22.8	16.8	—	$\chi^2 = 6.939$	0.008
	22.8	—	35.2	$\chi^2 = 16.513$	< 0.001
Proposed work in community of < 100 000 people, %	15.7	15.5	—	$\chi^2 = 0.009$	0.926
	15.7	—	52.3	$\chi^2 = 98.697$	< 0.001

*For all χ^2 results, df = 1.

Discussion

The reasons for the decline in popularity of surgery are likely numerous and complex. We sought to identify both the demographic and attitudinal factors associated with those Canadian medical students who identified surgery and the surgical subspecialties as their top career interests at the time of entry into medical school. Male students were more likely to express an interest in surgical specialties than female students, who were more likely to indicate any other career interest. In addition, students who expressed interest in careers in surgery were younger, more likely to be single and less likely to have rural ties than students who expressed interest in careers in family medicine. Students interested in surgical careers also showed differences in nearly all factors we identified compared with students interested in careers in either family medicine or medical specialties.

The importance that students ascribe to a favourable lifestyle has been cited as an important factor in the declining interest in surgery,[1] and

consistent with this, we found that students interested in surgery were much less concerned about issues of medical lifestyle than students interested in other careers at the time of entry into medical school. In contrast, although a number studies have stressed the importance of prestige and income potential as influences on students choosing careers in surgery,[6–8] we found the influence of prestige to be no greater among students interested in surgical specialties than among those interested in medical specialties. Erzurum and colleagues[23] reported that students interested in surgical careers were much more likely to be influenced by role models than students with little or no interest in surgery. In contrast, we found no difference at the time of entry into medical school in the importance of role models among students indicating interest in surgical specialties, family medicine or medical specialties. We found that students interested in surgical careers reported that social orientation and varied scope of practice were less important to them, whereas hospital orientation was more important to them than to students choosing other careers. In addition, we found that students interested in surgery showed a higher interest in hospital-based premedical volunteer activities. These differences between learners interested in surgical and nonsurgical careers have not been described elsewhere in the literature and build upon the concept of a surgical personality.[10]

Contrary to findings reported by Wendel and colleagues[14] and by Gargiulo and colleagues,[18] we found that statistically significant differences did exist between male and female students with respect to the factors influencing their interest in surgical careers. In our study, male students were more likely to be hospital-oriented, more likely to desire prestigious careers and less likely to be socially oriented than female students. In addition, we found that female students interested in surgery were younger, more likely to have rural ties and more likely to envision themselves working in rural settings than male students interested in surgery.

It is clear that the demographic composition of Canadian medical schools has changed dramatically over the past 50 years; women now make up more than 50% of the medical students in the country.[4,19] To adapt to the current demographic milieu, medical student recruitment programs aimed at promoting interest in surgery should take into

Table 2

Demographic differences according to sex among students naming surgical career choices

Characteristic	Sex: Male *n* = 238	Sex: Female *n* = 203	Statistical analysis*	*p value*
Age, yr	23.9	23.2	$Z = -2.433$	0.015
Family members/friends in medicine, %	42.4	30.5	$\chi^2 = 6.653$	0.010
Family members/friends in surgery, %	21.4	10.8	$\chi^2 = 8.897$	0.003
Home town population < 100 000, %	24.1	36.5	$\chi^2 = 8.044$	0.005
> 50% of childhood in rural community, %	15.3	25.8	$\chi^2 = 6.722$	0.010
Parents in rural community, %	17.2	29.3	$\chi^2 = 8.298$	0.004
Proposed work in community of < 100 000 people, %	9.0	23.9	$\chi^2 = 12.703$	< 0.001

*For all χ^2 results, df = 1.

Table 3

Comparison of influences on first career choices of respondents

Factor	First career choice*: a. Surgical specialty *n* = 441	b. Medical specialty *n* = 1110	c. Family medicine *n* = 545	*F*	*p value*
1: medical lifestyle	3.13[b,c]	3.58[a,c]	3.86[a,b]	93.50	< 0.001
2: social orientation	3.09[b,c]	3.47[a,c]	4.14[a,b]	281.53	< 0.001
3: prestige	2.15[c]	2.05[c]	1.80[a,b]	24.50	< 0.001
4: hospital orientation	3.42[b,c]	2.96[a,c]	2.30[a,b]	233.98	< 0.001
5: role model	2.66	2.77	2.83	2.44	0.088
6: varied scope of practice	2.93[b,c]	3.19[a,c]	4.16[a,b]	247.59	< 0.001

*Superscripts are associated with individual row variables and indicate the career choice from which a cell value differs according to Scheffe's post-hoc test, where a = surgical, b = medical and c = family medicine.

Table 4

Comparison of influences on career choice in surgery according to sex

Factor	Sex: Male *n* = 238	Sex: Female *n* = 203	*t*	*p value*
1: medical lifestyle	3.16	3.10	0.785	0.433
2: social orientation	2.91	3.31	5.636	< 0.001
3: prestige	2.33	1.95	4.629	< 0.001
4: hospital orientation	3.61	3.19	5.389	< 0.001
5: role model	2.66	2.64	0.175	0.861
6: varied scope of practice	2.96	2.89	0.714	0.476

account the different needs and interests of male and female students who are interested in surgery. Furthermore, such programs should address the negative perceptions of the surgical profession that have been shown to dissuade female students. In a recent study, Park and colleagues[20] found that many female medical students believed a career in general surgery was incompatible with raising children and having a happy family life. We found that female students who indicated interest in nonsurgical careers were more influenced by lifestyle than those who chose surgical careers. Moreover, a number of studies have reported that women reject surgical careers because of the presence of a male bias, negative attitudes and a lack of female role models.[11,12,16,17] Interestingly, we found no difference in the influence of role models between female students who did and those who did not express interest in surgical careers.

In total, 441 (21%) respondents in our study identified surgical specialties as their primary career choices at the time of entry into medical school. This level of interest in surgical careers is similar to that in recent surgical residency matches reported by the Canadian Resident Matching Service (ranging from 23.8% in 2004 to 21.7% in 2006).[4] However, the fact that more than three-quarters (78.7%) of students in this study indicated that they would consider careers in surgery does provide hope to those concerned about the number of students interested in the surgical subspecialties[1,2] and raises the possibility that curricula may be modified to encourage more students to choose careers in surgery. If students' interests at the time of entry into medical school predict their ultimate career choices,[9,11–13] then medical school admissions committees might consider tailoring their policies in such a way to ensure the admission of an adequate number of individuals interested in pursuing careers in surgery. If the ultimate number of students interested in surgical careers at graduation is seen to decline from our observed interest at the time of entry into medical school, then undergraduate educators may wish to examine the reasons for this change during medical school.

Limitations

There are limitations to our study. Although the survey underwent a thorough development and validation process, other important influences on career interest may not have been included. Moreover, the ultimate career choices of the students we surveyed are as yet unknown. However, our study provides a window into the characteristics of students entering medical school who are interested in careers in surgery. We are following the medical school classes that participated in this study until graduation. We have distributed follow-up surveys to the students at the end of their preclinical years, and we will distribute further follow-up surveys at the time of their residency matches. Once the data have been collected for each of the classes, we will perform further analyses to better understand the decision-making process from entry into medical school to residency.

Conclusion

We identified 5 factors and a number of demographic characteristics associated with career interest in surgery at the time of admission to medical school. We are following the students from the 18 different classes surveyed through to graduation to determine their ultimate career choices. In this study, we have laid out groundwork that may be an important component in devising a sustainable strategy to understand and perhaps counteract the observed declining interest in surgery, thereby meeting our population's need for surgical procedures.

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