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## Attitudes des étudiants en médecine canadiens à l'égard de la formation en chirurgie et obstacles perçus à la carrière dans la discipline : une enquête multicentrique

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Article abstract

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**Methods:** An anonymous survey was custom designed and distributed to medical students at the University of Alberta and University of Calgary. Survey questions characterized student interest in surgical specialties, barriers to pursuing surgery, and influence of surgical education opportunities on career interest.

**Results:** Survey engagement was 26.7% in 2015 and 24.2% in 2021. General surgery had the highest rate of interest in both survey years (2015: 38.3%, 2021: 39.2%). The most frequently reported barrier was worry about the stress that surgical careers can put on personal relationships (2015: 70.9%, 2021: 73.8%,  $p = 0.50$ ). Female respondents were significantly more likely to cite gender discrimination as a deterrent to surgical careers (F: 52.0%, M: 5.8%,  $p < 0.001$ ).

**Conclusions:** Despite substantial interest, perception of work-life imbalance was the primary reported barrier to surgical careers. Further, female medical students' awareness of gender discrimination in surgery highlights the need for continued efforts to promote gender inclusivity within surgical disciplines to support early career women interested in surgery.



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### Abstract

**Background:** Medical student interest in surgical specialties continues to decline. This study aims to characterize attitudes of Canadian medical students towards surgical training and perceived barriers to surgical careers.

**Methods:** An anonymous survey was custom designed and distributed to medical students at the University of Alberta and University of Calgary. Survey questions characterized student interest in surgical specialties, barriers to pursuing surgery, and influence of surgical education opportunities on career interest.

**Results:** Survey engagement was 26.7% in 2015 and 24.2% in 2021. General surgery had the highest rate of interest in both survey years (2015: 38.3%, 2021: 39.2%). The most frequently reported barrier was worry about the stress that surgical careers can put on personal relationships (2015: 70.9%, 2021: 73.8%,  $p = 0.50$ ). Female respondents were significantly more likely to cite gender discrimination as a deterrent to surgical careers (F: 52.0%, M: 5.8%,  $p < 0.001$ ).

**Conclusions:** Despite substantial interest, perception of work-life imbalance was the primary reported barrier to surgical careers. Further, female medical students' awareness of gender discrimination in surgery highlights the need for continued efforts to promote gender inclusivity within surgical disciplines to support early career women interested in surgery.

### Résumé

**Contexte :** L'intérêt des étudiants en médecine canadiens pour les spécialités chirurgicales est en diminution constante. Cette étude vise à caractériser leurs attitudes à l'égard de la formation en chirurgie et les obstacles qu'ils perçoivent à la poursuite d'une carrière dans cette discipline.

**Méthodes :** Un sondage anonyme conçu sur mesure a été distribué aux étudiants en médecine de l'Université de l'Alberta et de l'Université de Calgary. Les questions de l'enquête portaient sur leur intérêt pour les spécialités chirurgicales, sur ce qui les empêche de les choisir comme voie de carrière et sur l'influence des possibilités de formation en chirurgie sur leur intérêt à suivre une carrière dans ces spécialités.

**Résultats :** Le taux de participation à l'enquête était de 26,7 % en 2015 et de 24,2 % en 2021. La spécialité qui a recueilli le taux d'intérêt le plus élevé était la chirurgie générale, et ce pour les deux années d'enquête (2015 : 38,3 %, 2021 : 39,2 %). L'obstacle le plus fréquemment cité était la difficile conciliation entre la vie personnelle et les exigences des carrières chirurgicales (2015 : 70,9 %, 2021 : 73,8 %,  $p = 0,50$ ). Les femmes interrogées étaient significativement plus susceptibles de citer la discrimination fondée sur le sexe comme frein au choix d'une carrière chirurgicale (F : 52,0 %, M : 5,8 %,  $p < 0,001$ ).

**Conclusions :** Malgré un intérêt considérable, la perception d'un déséquilibre entre la vie professionnelle et la vie personnelle est le principal obstacle déclaré au choix d'une carrière dans le domaine de la chirurgie. De plus, la discrimination sexuelle perçue par les étudiantes dans la discipline souligne le besoin d'efforts soutenus pour promouvoir l'inclusivité des sexes dans les spécialités chirurgicales afin de soutenir les femmes en début de carrière qui s'intéressent à la chirurgie.

## Introduction

While the absolute number of Canadian medical students applying to surgical disciplines has remained stable, a relative decrease in student interest has occurred over the last decade.<sup>1</sup> Decreasing surgical specialty interest has prompted investigation of underlying causes and barriers to guide change and promote surgical matriculation.<sup>2-5</sup> While many American studies discuss this topic, the Canadian perspective remains comparatively underreported.<sup>6</sup>

The aim of this study is to characterize attitudes of Canadian medical students towards pursuing surgical training and perceived barriers to surgical careers. This includes a survey of interest in surgical fields, early exposure opportunities, and gender differences in career decisions.

## Methods

### Study design

This is a two-time, anonymized, voluntary response survey developed in accordance with the American Association for Public Opinion Research (AAPOR) Guidelines for Surveys.<sup>7</sup> The primary objective of this study was to characterize medical student interest in surgical specialties. Secondary outcomes assessed barriers to surgical careers. This study was approved by the associated Research Ethics Boards.

### Survey development

The 2015 survey was developed to characterize surgical interest, barriers to surgical careers, and influence of surgical education opportunities (Appendix A). The 2021 survey was based on the 2015 survey for temporal comparison, adding questions exploring the role of gender on the decision to pursue surgical training, as this has emerged as a topic of interest (Appendix A). Surveys used multiple choice answers with optional commentary if "other" was selected. The 2015 survey was sent to the University of Alberta (UofA), and the 2021 survey was sent to UofA and the University of Calgary (UofC).

### Respondent demographics

The surveys were emailed to all current medical students at the UofA and UofC in 2021. Anonymized survey responses were collected through Research Electronic Data Capture tools (Vanderbilt University, Nashville, TN, USA).

### Statistical analyses

Statistical analysis was performed using STATA 17 (StataCorp, TX, USA). Categorical data were expressed as

percentages. Bivariate analysis using chi-squared for categorical data was performed to determine differences between groups. Subgroup analyses evaluated clerkship students compared to non-clerkship students and females compared to males.

## Results

### Survey engagement

The response rate for the 2015 survey was 26.7% ( $n = 176$ ) based on the number of medical students enrolled at the UofA in 2014/2015.<sup>8</sup> The response rate for the 2021 survey was 24.2% ( $n = 282$ ) based on the average medical student enrollment at the UofA and UofC between 2010-2019.<sup>8</sup>

### Respondent demographics

Of the students who completed the 2021 survey, 75.4% were enrolled at the UofA. The survey completed in 2015 was only distributed to the UofA. Over two-thirds of respondents were considered pre-clerkship students in both the 2015 (73.3%) and the 2021 survey (70.8%). The largest group of respondents in 2021 were female (62.3%) with 103 (36.7%) males completing the survey. Other groups included those who identified as non-binary (2, 0.71%) or not disclosed (1, 0.36%).

### Surgery and surgical subspecialty interests

Respondents who stated that they were "Interested" or "Extremely Interested" were grouped as "interested" in our analysis. In 2015, respondents had the most interest in general surgery (38.3%), orthopedic surgery (21.3%), urology (20.0%), and plastic surgery (19.5%) (Figure 1). Respondents in 2021 had the highest level of interest in general surgery (39.2%), obstetrics and gynecology (36.4%), orthopedic surgery (28.0%), and plastic surgery (24.6%). None of the subspecialties had significantly different interest levels when comparing respondents from 2015 with respondents from the 2021 surveys (Figure 1).

### Perceived barriers to pursuing a surgical residency

The most frequently reported barriers to pursuing a surgical career were the stress that surgical careers can put on personal relationships (2015: 70.9%, 2021: 73.8%,  $p = 0.50$ ), weekly hours as a resident (2015: 68.2%, 2021: 68.4%,  $p = 0.95$ ), weekly hours as a surgeon (2015: 55.7%, 2021: 69.9%,  $p < 0.001$ ), and competitiveness of matching to a surgical residency (2015: 52.0%, 2021: 59.9%,  $p = 0.10$ ; Table 1). Between 2015 and 2021, there was a decrease in respondents perceiving job opportunities as a barrier from 72.4% to 48.2% ( $p < 0.001$ ). All other barriers were reported similarly between 2015 and 2021 cohorts.

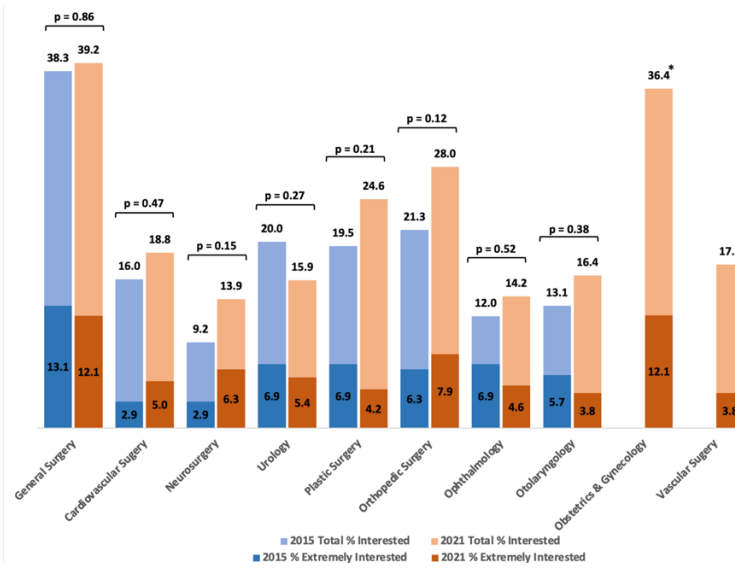


Figure 1. Medical student interest based on surgical specialty and subgrouping of specialties considered greatest area of interest (\*interest in obstetrics and gynecology and vascular surgery was only assessed in 2021)

Table 1. Barriers to pursuing surgical specialties.

Perceived Barriers to Surgical Career Pursuit					
Barriers	Total n(%)	2015 Survey n(%)	2021 Survey n(%)	Difference (%)	p value*
Worried about strain that surgical careers can put on personal relationships	332 (72.5)	124 (70.9)	208 (73.8)	2.9	0.50
Weekly hours as a resident	313 (68.3)	120 (68.2)	193 (68.4)	0.2	0.95
Weekly hours as a surgeon	295 (64.4)	98 (55.7)	197 (69.9)	14.2	0.00
Job opportunities	262 (57.2)	126 (72.4)	136 (48.2)	24.2	0.00
Competitiveness/difficulty matching into residency	260 (56.8)	91 (52.0)	169 (59.9)	7.9	0.10
Gender discrimination	98 (34.8)	-	98 (34.8)	-	-
Length of residency	140 (30.6)	49 (27.8)	91 (32.3)	4.5	0.32
Societal and cultural expectations of conventional gender roles	62 (22.0)	-	62 (22.0)	-	-
Not interested in surgery	80 (17.5)	32 (18.2)	48 (17.0)	1.2	0.75
Gender Subgroup Analysis					
Barriers	Female, n(%)	Male, n(%)	Difference (%)	p value*	
Worried about strain that surgical careers can put on personal relationships	128 (73.1)	77 (74.8)	1.7	0.77	
Weekly hours as a resident	117 (66.9)	73 (70.9)	4.0	0.49	
Weekly hours as a surgeon	119 (68.0)	75 (72.8)	4.8	0.40	
Job opportunities	74 (42.3)	61 (59.2)	16.9	0.01	
Competitiveness/difficulty matching into residency	114 (65.1)	54 (52.4)	12.7	0.04	
Gender discrimination	91 (52.0)	6 (5.8)	46.2	0.00	
Length of residency	51 (29.1)	37 (35.9)	6.8	0.24	
Societal and cultural expectations of conventional gender roles	52 (29.7)	9 (8.7)	21.0	0.00	
Not interested in surgery	29 (16.8)	18 (17.5)	0.8	0.85	
Clerkship Status Subgroup Analysis					
Barriers	Pre-Clerk, n(%)	Clerk, n(%)	Difference (%)	p value*	
Worried about strain that surgical careers can put on personal relationships	237 (72.5)	95 (73.4)	0.9	0.80	
Weekly hours as a resident	215 (65.6)	98 (76.0)	10.4	0.03	
Weekly hours as a surgeon	219 (66.8)	76 (58.9)	7.9	0.11	
Job opportunities	183 (56.1)	79 (61.2)	5.1	0.32	
Competitiveness/difficulty matching into residency	207 (63.3)	53 (41.1)	22.2	0.00	
Gender discrimination	70 (35.2)	28 (34.2)	1.0	0.87	
Length of residency	101 (30.8)	39 (30.2)	0.6	0.91	
Societal and cultural expectations of conventional gender roles	45 (22.6)	17 (20.7)	1.9	0.73	
Not interested in surgery	56 (17.0)	24 (18.6)	1.6	0.70	

\*p-values represent results from Chi-squared comparison between groups in each table subsection.

In subgroup analysis of female (F) and male (M) respondents, both groups similarly identified hours as a surgeon (F: 68.0%, M: 72.8%,  $p = 0.40$ ) and strain on personal relationships (F: 73.1%, M: 74.8%,  $p = 0.77$ ) as barriers (Table 1). Female respondents more frequently identified competitiveness (F: 65.1%, M: 52.4%,  $p = 0.04$ ), gender discrimination (F: 52.0%, M: 5.8%,  $p < 0.001$ ), and conventional gender roles (F: 29.7%, M: 8.7%,  $p < 0.001$ ) as barriers to pursuing surgery. Employment opportunity was more commonly cited by males (F: 42.3%, M: 59.2%,  $p = 0.01$ ; Table 1).

Pre-clerkship (P) and clerkship (C) subgroup analysis identified that most barriers were perceived at a similar rate (Table 1). Pre-clerkship respondents identified competitiveness as a barrier more frequently (P: 63.3%, C: 41.1%,  $p < 0.001$ ), while clerkship respondents more commonly identified weekly hours as a resident as a barrier (P: 65.6%, C: 76.0%,  $p = 0.03$ ).

#### Impact of surgical discovery and early surgical experiences

The 2021 survey revealed 2.5% respondents had participated in a Surgical Exploration and Discovery (SEAD) program and 31.4% respondents participated in other surgical exploration. Of respondents who had early surgical experiences, 39.3% perceived an increased interest in pursuing surgery, 9.4% perceived less interest, and 51.4% perceived that these experiences did not influence their choice to pursue surgical training.

## Discussion

While there is a substantial interest in surgery among medical students, most students consider work-life imbalance in surgical specialties as a barrier to pursuit. Additionally, despite efforts to increase gender equality in surgery, over half of female respondents reported gender discrimination as a barrier to pursuing surgical specialties.

The perceived inability to achieve work-life balance in surgical training remains a major barrier to pursuing surgery, and other studies report similar findings.<sup>9-11</sup> Interestingly, students' perceptions of poor work-life balance in general surgery compared to other specialties are not substantiated by current Canadian Medical Association workforce data. The self-reported balance of personal and professional commitments among general surgeons has been shown to be comparable to that of family physicians, while job satisfaction of general surgeons was rated more highly.<sup>12</sup> The bravado of working long hours in an acute care setting is commonly

discussed;<sup>13</sup> however, highlighting satisfaction in surgical careers during conversations with students should be an important part of medical student surgical experiences.

Gender discrimination remains a substantial barrier to pursuing surgery for females. A recent systematic review reports contributing factors to gender discrimination in surgery, including unfavourable work environments for female surgeons and trainees, male-dominated culture, and added societal pressures.<sup>14</sup> Continued action to support female surgeons in leadership roles as same-gender role models are important to encourage early career women with interest to pursue surgical careers.<sup>5,15-18</sup> In an open-text comment, respondents reported concerns about being judged for taking parental leave. Motherhood in medicine remains a challenge, and recent surveys of female physicians and surgeons show that a substantial proportion struggle with infertility and family planning, both of which may require taking leave time.<sup>14,19-23</sup> The implementation of readily accessible parental leave policies and supports including improved same-gender mentorship may improve accessibility of surgical training for female students.<sup>24-27</sup> A follow-up study exploring gender differences in accessibility of surgical training would be valuable to further inform equity and diversity interventions.

Further to these supports, SEAD programs provide real-life surgical experiences, potentially decreasing certain perceived barriers for females.<sup>28</sup> We also hypothesize that these early career training experiences may increase the likelihood of finding a same-gender mentor within surgery and provide opportunities to discuss parental leave, amongst other important gender specific concerns. While only about a third of respondents had participated in any sort of surgical career exploration event, nearly 40% reported that these events made them more likely to pursue surgery. Others have found that students who participate in these programs report increased confidence in procedural skills and improved access to mentorship opportunities.<sup>29-33</sup> Further research is needed to determine the value of such programs and whether they may assist with career decision making.<sup>29-31</sup>

This study has multiple limitations. The response rate was 26.7% in 2015 and 24.2% in 2021. Selection bias is a concern, as students with an interest in surgery, and females who noted gender discrimination in surgery may be more likely to respond. We sampled two of the 15 anglophone medical schools in Canada, which affects generalizability of the results. Additionally, UofA and pre-

clerkship students responded more frequently and may bias our results. The 2021 survey included supplementary questions discussing the role of gender, and we are not able to assess perspective shifts over time on this topic, which may be of interest for future studies. Finally, this study doesn't evaluate students' personal relationships with surgeons, which may be of interest for future studies.

## Conclusion

We identified perceptions of poor work-life balance as the primary barrier for medical students to pursue surgical careers. Similarly, over half of females reported concerns with gender discrimination as a barrier to surgical career pursuit. While interest in surgery among medical students is substantial, interventions including promoting personal and job satisfaction amongst surgeons, and continuing to improve surgical gender equality with mentorship for females may decrease barriers for some students.

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