

Examining the equity and diversity characteristics of academic general surgeons hired in Canada

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Background: Job competition and underemployment among surgeons emphasize the importance of equitable hiring practices. The purpose of this study was to describe some of the demographic characteristics of academic general surgeons and to evaluate the gender and visible minority (VM) status of those recently hired.

Methods: Demographic information about academic general surgeons across Canada including gender, VM status, practice location and graduate degree status was collected. Location of residency was collected for recently hired general surgeons (hired between 2013 and 2020). Descriptive statistics were performed on the demographic characteristics at each institution. Pearson correlation coefficients and hypothesis testing were used to determine the correlation between various metrics and gender and VM status.

Results: A total of 393 general surgeons from 30 academic hospitals affiliated with 14 universities were included. The percentage of female general surgeons ranged from 0% to 47.4% and the percentage of VM general surgeons ranged from 0% to 66.7% at the hospitals. This heterogeneity did not correlate with city population (gender: $r = 0.06$, $p = 0.77$; VM: $r = 0.04$, $p = 0.83$). The percentage of VM general surgeons at each hospital did not correlate with the percentage of VM population in the city ($r = 0.13$, $p = 0.49$). Only 34 of 120 recently hired academic general surgeons (28.3%) did not have a graduate degree. The percentage of recently hired academic general surgeons who did not have a graduate degree was approximately 1.5 times higher among male hires than female hires. With respect to academic promotion, the percentage of female full professors ranged from 0% to 40.0% and did not correlate with the percentage of female general surgeons at each institution ($r = 0.11$, $p = 0.70$). The percentage of VM full professors ranged from 0% to 44.4% and was moderately correlated with the percentage of VM surgeons at each institution ($r = 0.40$, $p = 0.16$).

Conclusion: The academic general surgery workforce appears to be somewhat diverse. However, there was substantial heterogeneity in diversity between hospitals, leaving room for improvement. We must be willing to examine our hiring processes and be transparent about them to build an equitable surgical workforce.

Contexte : Les processus d'accès aux postes et le sous-emploi en chirurgie rappellent l'importance d'adopter des pratiques d'embauche équitables. Cette étude avait pour but de décrire certaines des caractéristiques démographiques de la main-d'œuvre en chirurgie générale dans les hôpitaux universitaires et d'établir le statut à l'égard du genre et de l'appartenance à une minorité visible (MV) chez les personnes récemment embauchées.

Méthodes : Des renseignements démographiques ont été recueillis auprès des personnes embauchées en chirurgie générale dans des établissements universitaires au Canada, incluant le genre, l'appartenance à une MV, le lieu de pratique et le niveau d'études. Le lieu de résidence a été noté pour les personnes récemment embauchées en chirurgie générale (entre 2013 et 2022). Des statistiques descriptives ont été compilées sur les caractéristiques démographiques dans chaque établissement. Nous avons utilisé le coefficient de corrélation de Pearson et le test d'hypothèse pour déterminer la corrélation entre divers paramètres, et le genre et l'appartenance à une MV.

Résultats : En tout, 393 personnes embauchées en chirurgie générale dans 30 hôpitaux affiliés à 14 universités ont été incluses. Le pourcentage de femmes en chirurgie générale variait de 0% à 47,4%; et le pourcentage provenant d'une MV variait de 0% à 66,7% dans les hôpitaux. Cette hétérogénéité n'était pas en corrélation avec la population des villes (genre : $r = 0,06$, $p = 0,77$; MV : $r = 0,04$, $p = 0,83$). Le pourcentage appartenant à une MV dans chaque hôpital n'était pas en corrélation avec le

pourcentage appartenant à une MV dans les villes ($r = 0,13$, $p = 0,49$). Seulement 34 personnes sur les 120 récemment embauchées en chirurgie générale dans ces hôpitaux universitaires n'avaient pas de diplômes d'études supérieures et leur pourcentage était environ 1,5 fois plus élevé chez les hommes que chez les femmes. En ce qui concerne les promotions au sein du corps professoral, le pourcentage de professeures titulaires variait de 0 % à 40,0 % et n'était pas en corrélation avec le pourcentage de femmes en chirurgie générale dans chaque établissement ($r = 0,11$, $p = 0,70$). Le pourcentage de professeures et de professeurs titulaires appartenant à une MV variait de 0 % à 44,4 % et était en corrélation modérée avec le pourcentage de chirurgiens et chirurgiennes appartenant à une MV dans chaque établissement ($r = 0,40$, $p = 0,16$).

Conclusion : La main-d'œuvre en chirurgie générale dans les centres hospitaliers universitaires semble assez diversifiée. Toutefois, on observe une hétérogénéité substantielle entre les hôpitaux au plan de la diversité, ce qui laisse place à l'amélioration. Nous devons accepter de revoir nos processus d'embauche et faire preuve de transparence à cet égard pour nous doter d'une main-d'œuvre réellement égalitaire en chirurgie.

The supply of Canadian graduating surgeons currently outweighs demand, resulting in a climate of underemployment and substantial credential creep in the hiring process.¹⁻⁶ The competition for employment emphasizes the importance of ensuring an equitable hiring process. In addition, ensuring that the hired surgical workforce is diverse and inclusive is crucial to trainee development, delivering health equity and building innovative and high-performing institutions.^{7,8}

In recent years there has been an increasing focus on promoting equity, diversity and inclusion in surgery.^{9,10} The Canadian Medical Association's 2020 background document for its policy statement on equity and diversity highlighted that with respect to the medical profession "the opportunities available do not currently depend solely on individual merit but on many elements of identity and other personal characteristics, culture and previous circumstance, sometimes through generations."¹¹ It is well established that efforts are needed to eliminate barriers and reduce bias related to gender, ethnicity, sexuality, socioeconomic status and other types of minority status.¹²⁻¹⁴ Inequity has been shown across many aspects of general surgery and other medical professions, including areas such as selection,^{15,16} training,¹⁷⁻¹⁹ promotion^{20,21} and salary.^{22,23} The job hiring process, however, has not been as extensively studied with respect to equity, diversity and inclusion, probably because of its unstructured and subjective nature.

Both objective and subjective factors are considered when selecting a surgeon to hire, whether consciously or subconsciously. Objective factors may include graduate degrees, publication record and completion of a fellowship, among others.^{6,24} The subjective factors that have been described as the most important in selecting surgeons for hire include personal knowledge of the referee, interview performance, appearance during the interview and personal reputation among peers, operating room (OR) and ward staff.²⁵ Understanding the factors that may play into securing employment is crucial to demonstrating a transparent hiring process and working toward one that is equitable and reliable.

The objective of this study was to describe the demographic characteristics of academic general surgeons across Canada and evaluate recently hired surgeons with respect to equity and diversity, which is an issue of widespread concern in academic surgery. Gaining a better understanding of the degree of equity and diversity among recently hired Canadian surgeons is an essential step to answering the calls for more research, infrastructure and leadership with respect to surgical workforce planning.^{2,3}

METHODS

This was a cross-sectional observational study describing the demographic characteristics and qualifications of general surgeons at academic hospitals across Canada. This study did not undergo research ethics board review as all data were collected from publicly available sources.

Study participants

All general surgeons working at academic hospitals in each Royal College of Physicians and Surgeons of Canada accredited general surgery program with English as a working language were included, with a primary focus on those hired between 2013 and 2020. The year 2013 was used as the starting point for data collection to build on the most recent national report on Canadian general surgery graduates' employment and their demographic characteristics, which included surgeons who completed residency from 2009 to 2013.²⁶

Academic hospitals were defined on the basis of the program's website; when a hospital's status was unclear, it was confirmed with members of the division. Lists of general surgeons practising at these sites were created with information available on program and institutional websites, then members of each program were contacted to ensure the accuracy of the lists generated (member-checking). Retired surgeons were excluded, surgeons practising at

multiple sites were included if at least 1 of their sites of practice was an academic hospital, and surgeons practising at multiple academic sites were included only once.

Data collection

For each surgeon, the following data were collected: gender, visible minority (VM) status, location of residency, practice location and graduate degree status. Gender was determined as male or female and confirmed through program or institutional websites (e.g., “she completed a PhD”) or checking with divisional staff and trainees (member-checking) or both. Visible minority status was defined by the *Employment Equity Act*, which defines visible minorities as “persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour” and according to Statistics Canada consists mainly of the following groups: South Asian, Chinese, Black, Filipino, Latin American, Arab, Southeast Asian, West Asian, Korean and Japanese. Three authors (N.G., K.P., K.V.) independently determined VM status for each surgeon on the basis of publicly available websites, and any disagreement or unknown statuses were resolved by confirmation with a member of their division at their institution (member-checking). Location of residency and location of practice were also determined from program and institutional websites. Surgeons’ graduate degree status was determined using Theses Canada, current publications and university websites as well as through direct contact. Any uncertainty was resolved by consensus among the 3 authors (N.G., K.P., K.V.) and member-checking. The above process was also used to collect information on the gender and VM status of general surgery residents. City population values were determined using 2016 Census data from Statistics Canada.²⁷ Hospitals and universities were assigned a random number in ascending order of the number of general surgeons in the institution for the purpose of reporting deidentified data.

Statistical analysis

Descriptive statistics were performed, first focusing on the proportions of female and VM staff at each of the institutions. Pearson correlation coefficients and subsequent hypothesis testing were used to determine correlations between city size, defined by city population in hundreds of thousands, and the proportion of female general surgeons and VM general surgeons at each academic hospital. Pearson correlation coefficients were also used to determine correlations between the proportion of VM population, defined by the VM population of a city in hundreds of thousands divided by the overall population of that city in hundreds of thousands, and the proportion of VM general surgeons at each academic hospital. Descriptive statistics and Pearson correlation coefficients were also used to report the proportions of female and

VM residents and to compare these proportions with the corresponding proportions among staff surgeons at each institution, respectively. To ensure confidentiality, percentages but not raw numbers were reported whenever data were tabulated by institution.

Next, we focused on the characteristics of the cohort of surgeons hired since 2013, recording the gender, graduate degree status, VM status and location of residency training relative to location of practice of the recently hired surgeons. Similar information was evaluated for the cohort of surgeons hired before 2013, although information on location of residency training relative to location of practice was not collected for this group. A two-tailed Z test was completed using Excel version 16.56 (Microsoft) to determine significant differences between proportions. Finally, we focused on the demographic characteristics of recently hired academic surgeons without a graduate degree; we reported frequencies without statistical comparisons because of the small sample size. We considered *p* values less than 0.05 to be statistically significant. Statistical analysis was completed using Prism version 9.1.2 (GraphPad).

RESULTS

Diversity by hospital and institution

The 30 hospitals included in this study were Vancouver General Hospital, St. Paul’s Hospital (University of British Columbia); Foothills Medical Centre and Peter Lougheed Centre (University of Calgary); University of Alberta Hospital and Royal Alexandria Hospital (University of Alberta); Royal University Hospital and Regina General Hospital (University of Saskatchewan); Winnipeg Health Sciences Centre and Saint Boniface Hospital (University of Manitoba); Victoria Hospital and University Hospital (University of Western Ontario); Hamilton General Hospital, Juravinski Hospital and St. Joseph’s Healthcare (McMaster University); Sunnybrook Health Sciences Centre, Toronto General Hospital, Toronto Western Hospital, St. Michael’s Hospital and Mt. Sinai Hospital (University of Toronto); Health Sciences North and Thunder Bay Regional Health Sciences Centre (Northern Ontario School of Medicine); Kingston General Hospital (Queen’s University); The Ottawa Hospital General Campus and The Ottawa Hospital Civic Campus (University of Ottawa); Royal Victoria Hospital, Jewish General Hospital and Montreal General Hospital (McGill University); Queen Elizabeth II Health Sciences Centre (Dalhousie University); and Health Sciences Centre and St. Clare’s Mercy Hospital (Memorial University of Newfoundland). These hospitals included a total of 393 general surgeons, of whom 120 (30.5%) were hired between 2013 and 2020.

The study hospitals had an average of 13 general surgeons (range 5–22 per hospital). The national percentage of female

general surgeons was 27.0% (ranging from 0.0% to 47.4% in individual hospitals). The national percentage of VM general surgeons was 25.7%, ranging from 0.0% to 66.7% of general surgeons at each hospital (Table 1). There was no significant correlation between city size and the percentage of female general surgeons at each hospital ($r = 0.06$, $p = 0.77$) or between city size and the percentage of VM general surgeons at each hospital ($r = 0.04$, $p = 0.83$). There was also no significant correlation between the percentage of a given city's VM population and the percentage of VM general surgeons in each hospital in that city ($r = 0.13$, $p = 0.49$).

Canadian general surgery residency programs had a total of 238 female residents, constituting 55.2% of all general surgery residents (Table 2). The percentage of female residents in each residency program ranged from 40.6% to 81.8%. There was no significant correlation between the number of female residents in each program and the number of female staff ($r = 0.19$, $p = 0.51$). Similarly, Canadian

general surgery residency programs had a total of 192 VM residents (44.5%). The percentage of VM residents ranged from 0% to 67.4% and was moderately correlated with the number of VM staff ($r = 0.46$, $p = 0.10$).

With respect to academic promotion, the percentage of female full professors ranged from 0% to 40.0% of female general surgeons. The percentage of VM full professors similarly ranged from 0% to 44.4% (Appendix 1, available at canjsurg.ca/lookup/doi/10.1503/cjs.006122/tab-related-content). The percentage of female general surgeons was not significantly correlated with the percentage of female full professors ($r = 0.11$, $p = 0.70$). There was a moderate correlation between the percentage of VM general surgeons and VM full professors ($r = 0.40$, $p = 0.16$). The analysis of gender and VM status by assistant, associate and full professor status for each institution can be found in Appendix 1. With respect to leadership positions, only 1 division of general surgery had a female division head and 3 had a VM division head. Similar percentages were noted for department of surgery chairs, with 2 female chairs and 3 VM chairs across Canada. Finally, with respect to all surgical divisions, the percentage of female division heads at each institution ranged from 0% to 18.2% and the percentage of VM division heads ranged from 0% to 45.5%.

Diversity and graduate degrees among recently hired general surgeons

Among the 120 general surgeons hired between 2013 and 2020, 43 were female (35.8%). Of these, 34 (79.1%) had completed a graduate degree. By comparison, 52 of the 77 male general surgeons (67.5%) hired had completed a graduate degree ($p = 0.18$).

Table 1. Percentages of general surgeons who were female or who were members of visible minorities, by deidentified hospital

Hospital ID no.	No. of staff	No. (%) of female staff	No. (%) of visible minority staff
1	5	0 (0.0)	2 (40.0)
2	5	2 (40.0)	1 (20.0)
3	7	2 (28.6)	2 (28.6)
4	8	2 (25.0)	0 (0.0)
5	9	3 (33.3)	5 (55.6)
6	9	4 (44.4)	6 (66.7)
7	10	0 (0.0)	2 (20.0)
8	11	1 (9.1)	4 (36.4)
9	11	5 (45.5)	5 (45.5)
10	11	5 (45.5)	4 (36.4)
11	12	5 (41.6)	2 (16.7)
12	12	3 (25.0)	1 (8.3)
13	12	3 (25.0)	3 (25.0)
14	13	5 (38.5)	3 (23.1)
15	14	3 (21.4)	5 (35.7)
16	13	1 (7.7)	4 (30.8)
17	14	4 (28.6)	4 (28.6)
18	14	2 (14.3)	1 (7.1)
19	13	3 (23.1)	0 (0.0)
20	14	5 (35.7)	7 (50.0)
21	14	3 (21.4)	2 (14.3)
22	15	6 (40.0)	5 (33.3)
23	15	3 (20.0)	1 (6.7)
24	16	2 (12.5)	6 (37.5)
25	17	1 (5.9)	3 (17.6)
26	17	7 (41.2)	4 (23.5)
27	19	6 (31.6)	4 (21.1)
28	19	9 (47.4)	7 (36.8)
29	22	8 (36.4)	5 (22.7)
30	22	3 (13.6)	3 (13.6)
Total	393	106 (27.0)	101 (25.7)

ID = identification.

Table 2. Percentages of staff and residents of general surgery residency programs who were female or who were members of visible minorities, by deidentified university

University ID no.	Percentage of staff who were female	Percentage of residents who were female	Percentage of staff from a visible minority	Percentage of residents from a visible minority
1	32.1	61.0	32.1	56.1
2	33.3	56.8	25.0	27.0
3	17.2	52.2	17.2	43.4
4	24.1	63.0	31.0	44.4
5	12.0	68.4	20.0	31.6
6	21.0	75.0	42.1	25.0
7	22.2	45.8	18.5	41.7
8	40.0	61.0	48.0	48.8
9	40.7	40.6	25.9	46.9
10	7.6	52.6	30.8	47.4
11	23.9	45.7	17.4	67.4
12	32.8	47.0	29.5	51.8
13	20.0	81.8	6.7	0.0
14	30.8	80.0	7.7	5.0

ID = identification.

There was a significant difference between the percentages of recently hired male and female general surgeons who had completed a master's degree (55.8% v. 76.7%, $p = 0.02$). Only 10 of the general surgeons hired between 2013 and 2020 had completed a PhD, of whom 1 was female (2.3%) and 9 were male (11.7%) ($p = 0.08$) (Table 3).

Of the recently hired general surgeons, 40 (33.3%) were considered VM. Among all of the general surgeons hired between 2013 and 2020, 10 (8.3%) were VM women. There was no significant difference between the number of recently hired general surgeons who had completed a graduate degree ($n = 76$) and who were considered VM ($n = 28$, 70%) and those who were not ($n = 58$, 72.5%) ($p = 0.77$).

Recently hired general surgeons without a graduate degree

Nearly three-quarters (73.5%) of the recently hired general surgeons without a graduate degree were hired by 4 institutions. Six institutions hired only 1 or 2 general surgeons without a graduate degree between 2013 and 2020, while 4 (28.6%) institutions did not hire anyone without a graduate degree from 2013 to 2020.

With respect to location of training compared with location of practice, 61 of the 120 recently hired surgeons (50.8%) were hired at the institution at which they completed residency training. Of these, 21 (34.4%) were hired without a graduate degree. Of the 59 surgeons hired at a different institution than the one at which they completed their training, 13 (22.0%) were hired without a graduate degree ($p = 0.13$). The percentage of men hired without a graduate degree was approximately 1.5 times the percentage of women hired without a graduate degree. The percentages of VM and non-VM surgeons hired without a graduate degree were similar (Table 4, Figure 1 and Figure 2).

DISCUSSION

Diversity makes the Canadian surgical workforce stronger, but to our knowledge there have been no studies investigating gender or VM equity in the hiring processes

for Canadian surgical positions. This study showed substantial variability in the diversity of Canadian surgeons at academic hospitals across the country, with the general surgery workforce of one-third of the study hospitals consisting of less than 10% female or VM general surgeons. Interestingly, diversity in gender or VM status did not correlate with city population. Similarly, diversity with respect to VM status in each hospital did not correlate with the VM diversity of the respective city. This study demonstrated moderate correlations between the percentage of VM residents and staff general surgeons as well as VM staff general surgeons and full professors within each institution. Moreover, although every academic institution had female and VM assistant professor surgeons, the number of institutions with no female or VM general surgeons increased with increasing academic rank. Fifty percent of institutions had no female full professors and 50% had no VM full professors. Finally, this study also showed that the percentage of male general surgeons recently hired at academic institutions without a graduate degree is approximately 1.5 times the percentage of female general surgeons without such a degree. Thus, there is concerning variability in diversity among academic general surgeons hired in Canada with respect to factors such as the specific hospital and promotion.

Surgery is traditionally a male-dominated profession. Our data show that this is changing, with just over 1 in 3 surgeons (35.8%) hired at academic hospitals in Canada since 2013 being women compared with 23.1% of those hired before 2013. However, Canadian Post-M.D. Education Registry (CAPER) data suggest that 44.3% of residents graduating from general surgery residency programs from 2011 to 2013 were women. Even evaluating CAPER data with 1- to 2-year shifts in the time period to account for variable lengths of training and time to securing jobs showed that no less than 43% of graduating surgeons were women. This estimated comparison of CAPER data with our findings on the percentage of women hired in academic general surgery (44.3% v. 35.8%) suggests that 8.5% fewer female general

Table 3. Gender of general surgeons hired between 2013 and 2020, by graduate degree status, visible minority status and hiring location

Characteristic	No. (%) of general surgeons		p value
	Male n = 77	Female n = 43	
Academic qualification			
Graduate degree	52 (67.5)	34 (79.1)	0.18
Master's degree	43 (55.8)	33 (76.7)	0.02
PhD	9 (11.7)	1 (2.3)	0.08
Visible minority	30 (39.0)	10 (23.3)	0.08
Hired at own institution	39 (50.6)	22 (51.2)	0.96

Table 4. Gender and visible minority status of general surgeons hired between 2013 and 2020, by graduate degree status and hiring location

Characteristic	No. (%) of general surgeons			
	Female n = 43	Male n = 77	Visible minority n = 4	Non-visible minority n = 80
No graduate degree	9 (20.9)	25 (32.5)	12 (30)	22 (27.5)
No graduate degree and hired at own institution	6 (14.0)	15 (19.5)	7 (17.5)	14 (17.5)
No graduate degree and hired at other institution	3 (6.9)	10 (13.0)	5 (12.5)	8 (10.0)

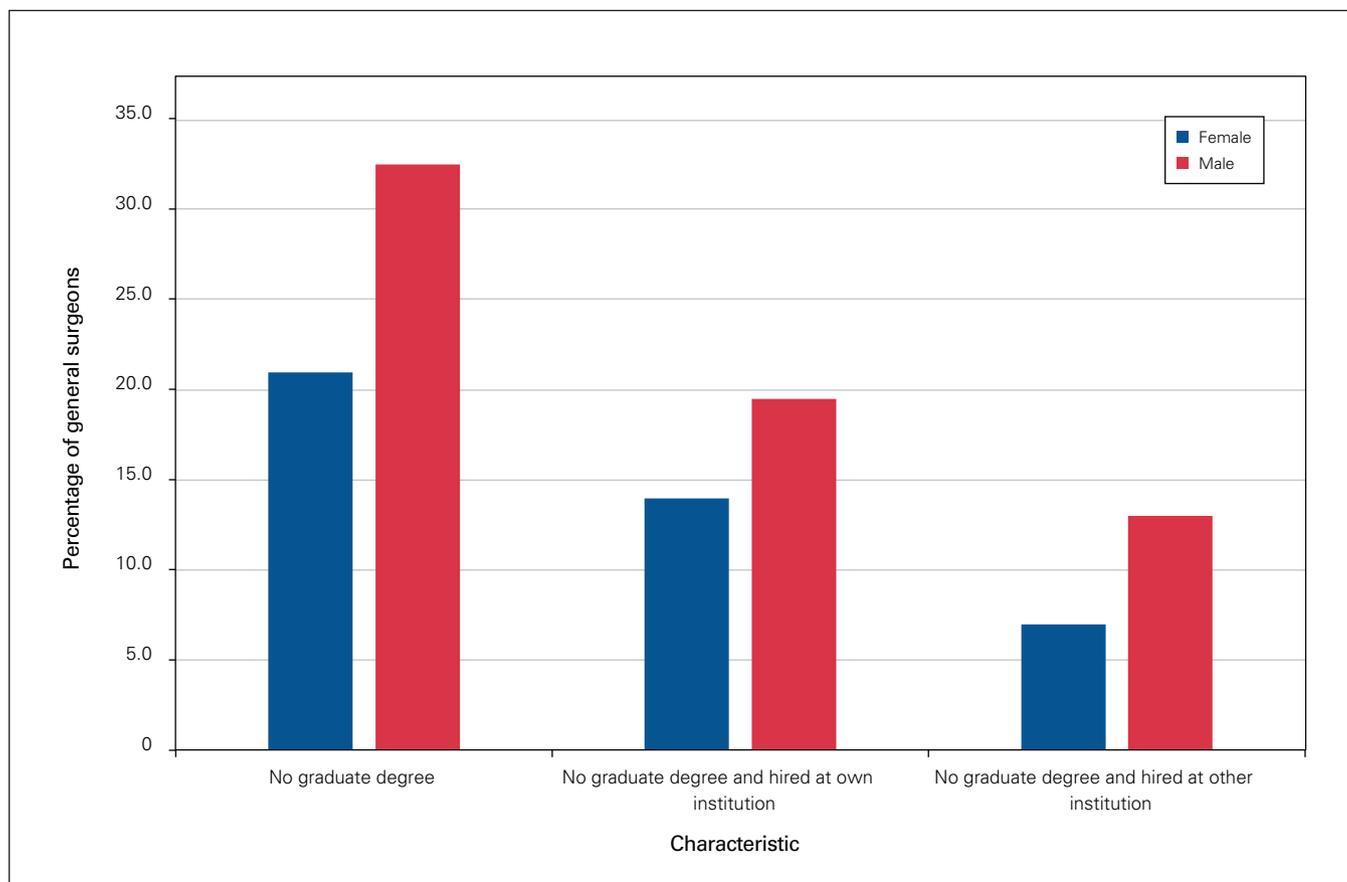


Fig. 1. Canadian academic general surgeons hired between 2013 and 2020 without a graduate degree, stratified by gender.

surgeons are securing positions in academic surgery. This signal suggests that fewer female general surgeons are pursuing academic careers; if this is the case, the barriers contributing to this leaky pipeline warrant future study. Furthermore, the leaky pipeline suggests that the greater percentage of female and VM residents is not enough to ensure an equitable percentage of female and VM academic general surgeons.

Although many factors are taken into consideration in hiring decisions in academic surgery, 1 objective factor frequently listed as required or strongly preferred in job postings for academic surgeons is the completion of a graduate degree. Our results show that 1.5 times more male than female general surgeons were recently hired without a graduate degree. Although the reasons for this are probably multifactorial, this finding is supported in the literature, with a meta-analysis of gender bias in simulated hiring decisions demonstrating reduced bias when information about the applicant clearly indicated high objective competence.²⁸ This suggests that when female surgeons have greater objective qualifications, such as a graduate degree, they may encounter less gender bias when seeking employment. A systems-based strategy to improve equity for female surgeons has been shown by female leaders serving as champions in efforts

to work toward parity. Across 99 American plastic surgery residency programs, the presence of a female plastic surgery chair was associated with a 45% relative increase in the number of female plastic surgery residents.²⁹ The absence of role models further compounds implicit biases against women seeking leadership roles, resulting in exclusion.³⁰

The mean percentage of VM academic surgeons in our study was 25.7%, which is comparable to the mean percentage of the population from VM in the Canadian cities included in this study (28.4%).²⁷ Nevertheless, the percentage of VM surgeons at each institution varied greatly (0% to 66.7%) and did not correlate with the population of the city or the city's VM population. This suggests that the hiring of VM surgeons is not related to the demographic characteristics of the city and may rather be a function of the individual culture at each hospital. The percentage of VM residents versus VM staff general surgeons showed a moderate correlation ($r = 0.46, p = 0.10$). Similarly, the percentage of VM staff general surgeons was moderately correlated with the percentage of VM full professors ($r = 0.40, p = 0.16$). These moderate correlations support the “you can't be what you can't see” notion and suggest that VM general surgeons may be important role models for trainees and graduating

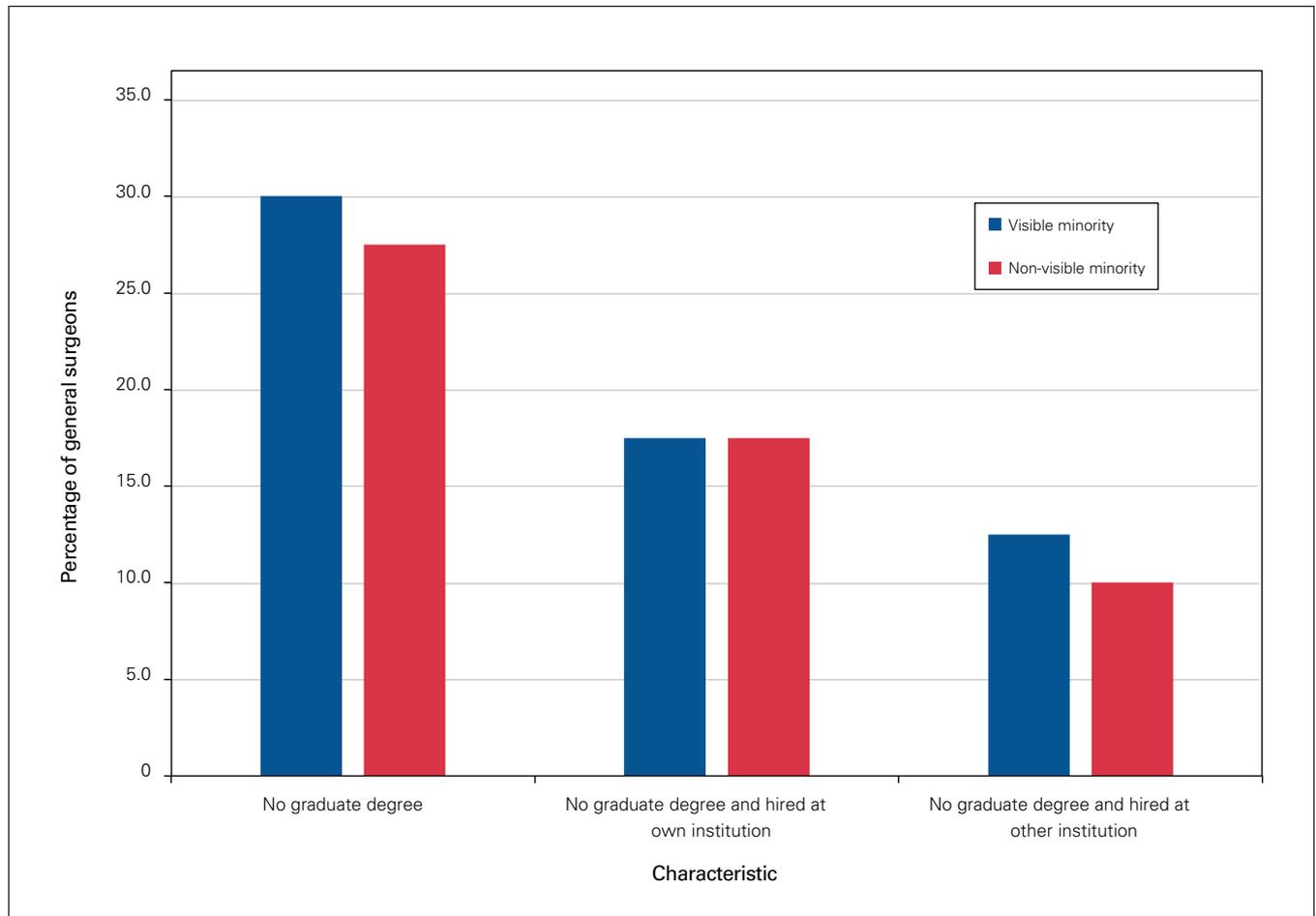


Fig. 2. Canadian academic general surgeons hired between 2013 and 2020 without a graduate degree, stratified by visible minority status.

surgeons seeking employment. There are robust data on gender with respect to medical students as well as residents entering and completing training, but similar Canadian data do not exist with respect to VM status, to our knowledge.³¹ Interestingly, we did not observe the same trend in hiring with respect to graduate degree status as was observed for gender. The reason why our findings may be different for female surgeons than VM surgeons remains unclear.

Although this was beyond the scope of this study, the way equity, diversity and inclusion are experienced in terms of gender and VM status seem to have some differences that warrant further exploration, particularly given that most of the literature on inequity among Canadian surgeons focuses on gender rather than VM status. Moreover, the existing literature shows even greater perceived disparity for women who also identify as belonging to a VM; there are only 22 such academic general surgeons (5.6%) in Canada.¹⁹

Reducing barriers to academic careers for female surgeons and improving the wide variability in diversity across hospitals are ways we can improve hiring equity in Canada. Unfortunately, a systematic review showed no clear

decrease in gender bias in hiring over 30 years of publications,³² suggesting that purposeful and systemic efforts are needed to create meaningful change. Attempted fixes, such as adding a chief diversity officer to the hiring process at academic institutions, have not resulted in any growth in diversity for underrepresented ethnic groups.³³

Fortunately, evidence exists with respect to how we can improve. Evidence-based recommendations to mitigate the subconscious activation and application of gender bias in hiring include the following: ensuring that women comprise at least 25% of the applicant pool, insisting that evaluators commit to the value of specific credentials before reviewing applications or before making summary judgments about applicants or both, encouraging those making hiring decisions to spend adequate time reviewing applications and minimize cognitive distractions, using structured interviews with standardized questions, implementing training workshops for decision-makers that include examples of common biases and problem-solving to overcome these biases, and using an inclusion rather than exclusion selection strategy when constructing a final list of applicants.³² In addition, the American Surgical Association recommends annually

reviewing the composition of the search committee for recruitment and producing annual recruitment reports for faculty and the institution's leadership that include data on the specific percentages of women and people from underrepresented minority groups in terms of interviews, offers and promotion.¹⁰

Limitations

There are several important limitations to this study. The data were limited to English-speaking academic hospitals, and thus the findings may not be generalizable to community hospitals or French-speaking academic hospitals in Quebec.

As the level of precision of the demographic characteristics increased (e.g., female, from a VM, recently hired at another institution) the sample size decreased, which limited our ability to determine statistical significance. As such, the results reported in this study largely show frequencies that should be interpreted accordingly in the absence of a larger data set.

Visible minority status was author reported as opposed to self reported. While this method could have misclassified surgeons, it probably more accurately depicted how each individual surgeon was perceived by others, which probably influences their hiring experience more than their self-perception does. Collection of resident data was limited in that our data set included foreign medical graduates, of whom a higher percentage belong to VM groups than among Canadian medical graduates, and foreign medical graduates typically plan to seek employment in their home country upon completion of training.

With respect to academic promotion, practices vary greatly between universities, from no incentivization to mandatory application for promotion after a given number of years. This probably contributed to the wide range in the number of full professors across the institutions.

Given that all of the data in this study were from publicly available websites, there was the potential for misclassification. Independent reviews by multiple authors to ensure consensus and member-checking were used to mitigate any errors. Furthermore, any errors would be expected to occur at the same frequency across all demographic categories (e.g., men and women) and therefore would probably not bias the results in any direction.

The methodology also limited our ability to capture data on surgeons with education, clinical or administrative focuses who may contribute academically but may or may not have a graduate degree. Graduate degree status is an important metric of credentials in hiring, but it is only 1. Moreover, individuals may have completed graduate degrees after they were hired, the timing of which is not always appreciated.

With respect to hiring, surgeons were classified as having been hired at their own institution if they completed residency there, but we were unable to accurately confirm fellowship training for many surgeons. If a surgeon is more

likely to be hired at the institution in which they trained, this would probably apply to fellowship training as well as residency training.

We were also unable to capture information on the resources associated with each job (e.g., elective time, endoscopy time), which may be a missed source of inequity beyond simply being employed. Finally, it should be noted that although the variables we studied to determine equity were limited to gender and VM status, we recognize that there are several other potential variables worth investigating. This study was limited to gender and VM status because of the availability of this information on public websites, not because they are more important than other sources of inequity.

CONCLUSION

Factors that may affect a surgeon's success in securing a job in Canada are important both for graduating surgeons seeking employment and for hiring committees and institutions to understand. This understanding is imperative to improving transparency, equity, diversity and inclusion in the hiring process. General surgery in Canada has a greater percentage of recently hired female and visible minority surgeons than in the past, but the percentage varies widely from hospital to hospital across the country and does not necessarily translate to equity in hiring. We must be willing to examine our systems and processes for inequity, confront and mitigate the effects of our biases, develop a climate for change and organizational accountability and ultimately build a surgical workforce that is equitable for all surgeons in Canada.

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