

Women's interest in surgery as a career in the early postgraduate period: a national longitudinal study

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Abstract

Background: Women remain underrepresented in Surgery in Aotearoa New Zealand (AoNZ). This study described interest in surgical careers by gender in the early postgraduate period and associated influencing factors.

Methods: AoNZ medical graduates between 2012 and 2016 responding to an Exit Questionnaire (EQ) at graduation and 3 years later (PGY3) as part of the Medical Schools Outcomes Database and Longitudinal Tracking Project (MSOD) were included. Analyses of specialty preferences and influences by gender were performed.

Results: Of 992 participants, 58% were women. At EQ, 158 participants (16%) had a surgical preference: 21% of men and 14% of women ($P < 0.01$). By PGY3, this was 20% of men and 10% of women ($P < 0.01$). A logistic regression found women were half as likely as men to have a surgical preference at PGY3. Those with a surgical preference at EQ were over 23 times more likely to have a surgical preference at PGY3, irrespective of gender. There were significant differences in self-reported career influencing factors between women and men at EQ and PGY3, as well as between PGY3 women with a surgical and those with a non-surgical preference. These included nature of the specialty, training requirements, lifestyle, family and personal factors.

Conclusions: Increasing the proportion of women in Surgery requires a multifaceted approach starting during medical school and continuing through early postgraduate years. More needs to be done to make surgical experiences as an undergraduate and junior doctor appealing to women.

Introduction

For over 30 years, over half of medical students in Aotearoa New Zealand (AoNZ) have been women.¹ While the proportion of women specialists has steadily increased, it is yet to reach parity with men: in 1975, 5% of AoNZ specialist workforce were women, rising to 19% in 2000 and 35% in 2019.^{2,3} Women remain underrepresented in Surgery, comprising 10.8% of surgical specialists.^{3,4} In the two largest surgical specialties, 19.4% of general and 6.1% of orthopaedic surgeons were women.⁵ As well as being an equity issue, gender diversity is important for increasing productivity, efficiency, quality of care and is a driver for innovation.⁶ Two studies conclude patients cared for by women surgeons have better

outcomes than men surgeons, increasing the argument for encouraging women to follow a surgical career.^{7,8}

In response to longstanding gender disparity, several training bodies have set targets to achieve parity in training programmes, including the Royal Australasian College of Surgeons (RACS).^{9–11} The RACS strategy was for 40% women trainees in each of the nine surgical specialties by 2021 as well as identifying and removing structural barriers to greater participation of women.^{9–11} A comprehensive approach is necessary as multiple factors may give rise to impediments women encounter when applying for and participating in surgical training programs.^{11–13} These include the length of specialty training and lack of provision for part-time work and

parental leave.¹⁴ Other factors include medical school 'culture', availability of mentors, and the specialty's culture.^{15–20} However, while this aspiration has not yet been achieved, overall, women comprised 32% of RACS surgical trainees from AoNZ in 2020, with 90% of inactive trainees (usually for parental leave) being women.⁵

This study aimed to describe interest in surgical careers by gender over the early postgraduate period as well as influencing factors, to identify where focus might be directed to strengthen pathways for women's surgical careers.

Methods

Participants

The population of interest was medical graduates between 2012 and 2016 inclusive. Data came from the nationwide Medical Schools Outcomes Database and Longitudinal Tracking (MSOD) project in which medical students from AoNZ's two medical schools are invited to complete career intention questionnaires at graduation from medical school (EQ) and 3 years later (PGY3) and beyond.^{21,22} Participants who responded to both the EQ and PGY3 questionnaires were included in the study. International students were excluded. Gender options available on the survey were female, male (prior to 2017) with the addition of gender diverse (2017 and onward). Participants provided written informed consent at data collection. The MSOD project was approved by the University of Auckland Human Participants Ethics Committee (#8539) and the University of Otago Ethics Committee (#07-155).

Variables

Participants indicated their career specialty interest in both surveys. Respondents indicated 'Yes' or 'No' to: 'Have you decided what area of medicine you are interested in pursuing once you have completed your basic medical degree (EQ) [or internship (PGY3)]?' Those who answered 'Yes' selected their choice from a list of 28 areas of medicine, while those who responded 'No' ranked their top three from the same list. First choice was used irrespective of level of decidedness. The term 'preference' is used throughout to refer to participants' preferred specialty.

Participants indicated the degree which 22 factors influenced their specialty preference on a five-point Likert scale from 1 = 'did not influence chosen area of medicine at all' to 5 = 'influenced chosen area of medicine a great deal'. For ease of interpretation, factors were grouped into four categories: specialty exposure/nature of specialty, training program, lifestyle, and family (whānau)/personal. These categories have been used in similar research comparing the same set of influencing factors.²³ Demographic information (age at graduation, gender, ethnicity, relationship status, number of dependents) was included in the analysis.

Data processing and statistical analysis

EQ and PGY3 responses were paired to create the dataset used for analysis. Specialty preferences were categorised into 'surgical' and 'non-surgical,' with 'surgical' inclusive of all surgical subspecialties. The broad categories of non-surgical specialties included:

General Practice, Intensive Care Medicine, Medicine, Obstetrics and Gynaecology (O&G), EROAD group (Emergency Medicine, Radiology, Ophthalmology, Anaesthetics, Dermatology),²⁴ Paediatrics, Psychiatry, and Other. Specialties in the EROAD group have been identified in the American context as offering a more controllable lifestyle.²⁴ The prioritisation criterion used to select one ethnicity was consistent with that applied by the NZ Ministry of Health.²⁵

Gender comparisons were made using χ^2 tests for categorical data and Mann–Whitney *U*-tests for continuous and discrete variables. Statistical significance was set at $\alpha = 0.05$. The multiple comparison Type I error rate was controlled using a Bonferroni procedure.²⁶ Alluvial plots were used to illustrate the changes in preferences by gender between EQ and PGY3.

A logistic regression with outcome variable 'specialty preference at PGY3' with outcomes 'surgical' or 'non-surgical' was built in SPSS v25 (IBM; <http://www.spss.com>). The factors included 'gender' (women/men), 'age at graduation' (over 25/under 25), 'specialty preference at EQ' (Surgery/Other), and the interaction term 'gender by specialty preference at EQ'. The factors regarding gender and specialty preference at EQ were entered into the model as we hypothesised that these factors impact a participant's specialty selection at PGY3. Age at graduation was included as previous research shows it influences specialty preferences.²⁷

Results

Sample characteristics

Nine hundred and ninety-two participants (580 women; 58%) completed both EQ and PGY3 surveys. No participants who completed the PGY3 survey 2017 or later identified as gender diverse. No differences were seen between men and women in age at graduation, ethnicity or relationship status at EQ or PGY3 (Table 1). However, there was a significant difference by gender in career preference at EQ and PGY3. At EQ, 14% of women compared with 21% of men had a surgical preference ($P < 0.05$); at PGY3, this was 10% of women compared with 20% of men ($P < 0.05$, Table 1). At both time points, the most common non-surgical preference for women was General Practice (~24%), whereas for men this was evenly split between General Practice and an EROAD group s (~20% each).

For the entire sample, factors rated as 'influential' or 'highly influential' on preference (median score ≥ 4) at EQ were: intellectual content of specialty; opportunity for procedural work; experience of specialty as an undergraduate; influence of mentors; work culture of specialty; perceived amount of working hours; perceived opportunity for flexible hours; self-appraisal of own skills and aptitude; and, interest in helping people (Fig. 1). At PGY3, the factors were similar (Fig. 2).

Mann–Whitney *U*-tests compared distributions of influencing factors between women and men. At EQ a greater proportion of women ranked financial prospects and prestige as less influential than men, while a larger proportion of women ranked opportunity for flexible hours, self-appraisal of domestic circumstances and typical patient in discipline as more influential on their preference (Fig. 1, all $P < 0.002$). At PGY3 a larger proportion of women than men ranked financial prospects and prestige as less influential on

their preference but interest in helping people as more influential (Fig. 2, all $P < 0.002$).

The impact of gender on preference at PGY3

At EQ, a total of 158 participants (16% of total sample) had a surgical preference: 75 women (47%) and 83 men (53%) (Table 1). At PGY3 compared to EQ, there was no change in the proportion of

men with a surgical preference ($P = 0.57$). In contrast, there was a significant reduction in the proportion of women with a surgical preference (55 women, 41% PGY3 surgical group, $P < 0.05$).

The alluvial plots allow visualization of career choice changes by gender between EQ and PGY3. (Fig. 3). The width of each 'stream' is proportional to the number of participants within each category. In contrast to the pattern seen in men, there is attrition of 33 (44%) women from the EQ surgical group to non-surgical specialties by PGY3. This attrition across time was not offset by the number of women moving to a surgical preference by PGY3. The proportion with a persisting surgical choice was higher in men: 77% from EQ to PGY3 compared with 56% of women.

The logistic regression model to explore gender impact on a participant's propensity for surgical preference at PGY3, holding other explanatory variables constant, found that women were half as likely as men to have a surgical preference at PGY3 ($P < 0.05$, Table 2). Further, if a participant had a surgical preference at EQ, they were 23.4 times more likely to have a surgical preference at PGY3 ($P < 0.05$, Table 2). Overall, the model accounted for 42% of the variance.

Table 1 Characteristics of participants

	Women <i>N</i> = 580 (58%)	Men <i>N</i> = 412 (42%)	<i>P</i> -value
Age at graduation	25 ± 3	25 ± 3	0.50
Ethnicity			0.24
Māori	53 (9%)	33 (8%)	
Pacific	17 (3%)	12 (3%)	
Other	161 (28%)	139 (34%)	
NZ European	349 (60%)	228 (55%)	
Single at EQ	273 (47%)	208 (51%)	0.30
Single at PGY3	168 (28%)	116 (29%)	0.76
Specialty decided at EQ	238 (41%)	186 (45%)	0.20
Specialty decided at PGY3	471 (81%)	336 (82%)	0.89
Specialty interest EQ†			<0.01*
Surgical	75 (14%)	83 (21%)	
Non-surgical	477 (86%)	308 (79%)	
Specialty interest PGY3†			<0.001*
Surgical	55 (10%)	78 (20%)	
Non-surgical	495 (90%)	314 (80%)	

* $P < 0.05$. †49 and 50 respondents did not indicate their specialty interest at EQ and PGY3, respectively.

Influencing factors at PGY3 for women preferring surgical versus non-surgical specialties

A sub-analysis compared self-reported influencing factors at PGY3 for women with surgical and non-surgical preferences (Fig. 4). At PGY3, women with a surgical preference were significantly more influenced than their non-surgical peers by the opportunity for procedural work, experience of the specialty as an undergraduate, training experiences as a doctor, and the perceived prestige of the specialty (all $P < 0.002$). Women with non-surgical preference at PGY3 were more influenced by perceived opportunity for flexible

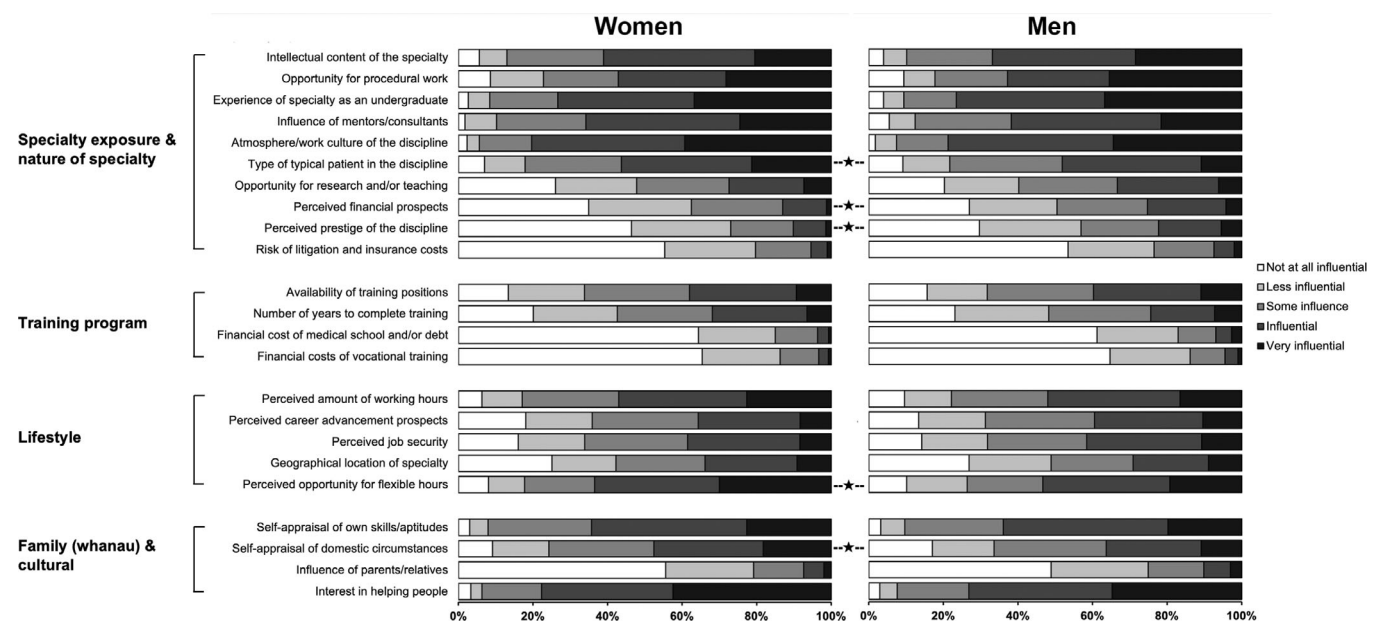


Fig. 1. Differences in influencing factors between women ($n = 580$) and men ($n = 412$) at EQ. The influence of each factor was measured on a five-point Likert scale (1 – Not at all influential; 5 – Very influential). Stars (★) represent statistically significant differences between groups. Significance values are Bonferroni corrected ($P < 0.002$).

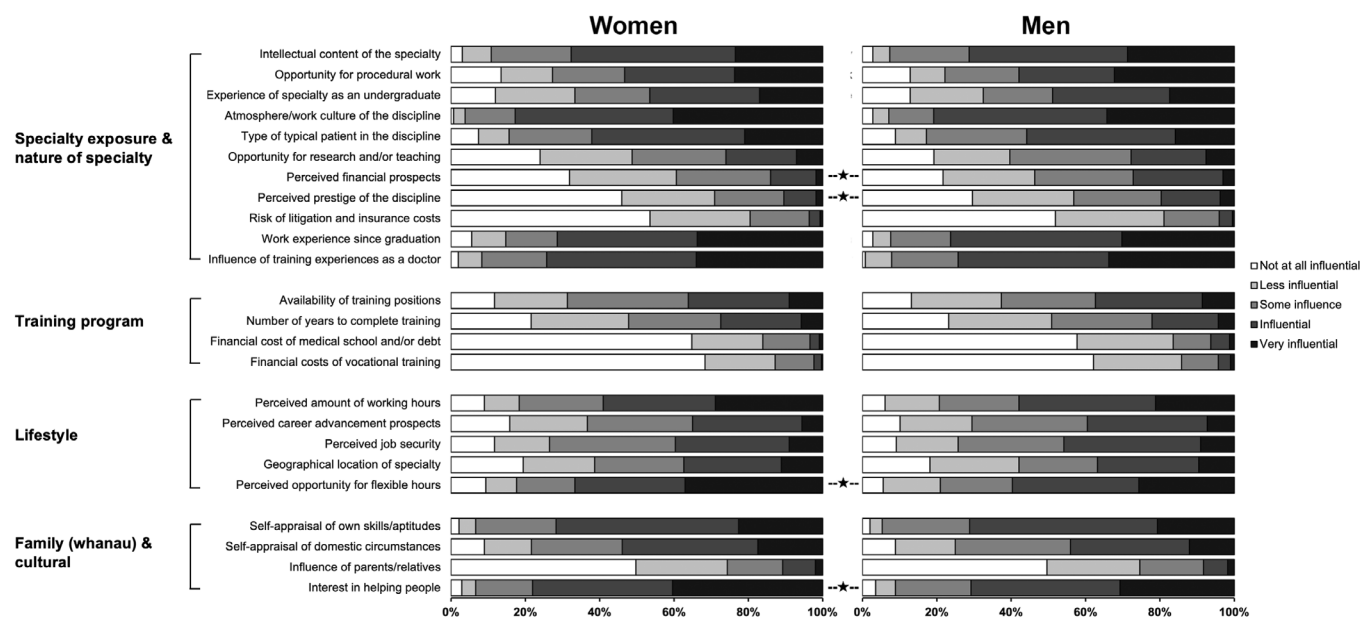


Fig. 2. Differences in influencing factors between women ($n = 580$) and men ($n = 412$) at PGY3. The influence of each factor was measured on a five-point Likert scale (1 – Not at all influential; 5 – Very influential). Stars (★) represent statistically significant differences between groups. Significance values are Bonferroni corrected ($P < 0.002$).

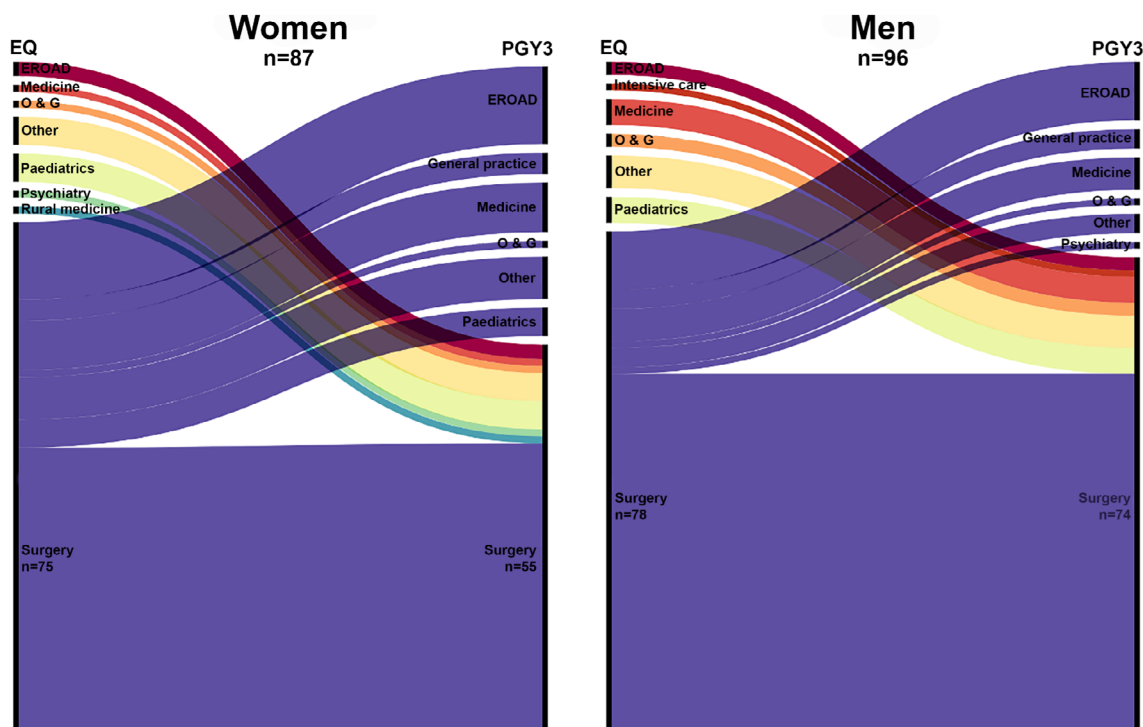


Fig. 3. Alluvial plots of specialty preference at EQ and PGY3 by gender for those who expressed a preference for surgery at either time point.

hours, domestic circumstances, number of years to complete training, and perceived amount of working hours (all $P < 0.002$). However, for both groups, culture in the workforce was highly rated. Intellectual content of the specialty and an altruistic desire to help people was well represented across both groups.

Discussion

Approximately 10% of AoNZ's current senior doctors are surgeons.³ The proportion of both graduates and PGY3's indicating a preference for a surgical career in this study is slightly higher but suggests little room for attrition before, during and after training for

AoNZ to be self-sufficient in replacing surgeons. Our results show significant differences in the proportions of women and men with surgical career preferences, consistent with RACS data reporting 33% of 2020 applicants being women,^{5,11} making it unlikely the RACS target of 40% women trainees in all specialties is achievable in the short term.

We found significantly lower initial preference for Surgery and greater attrition from a surgical preference in women than men. This is consistent with a systematic review and meta-analysis of causes of attrition among surgical residents, which identified an overall attrition rate of 18%, but statistically greater for women than men (25% vs. 15%).²⁸ The most common reason was

uncontrollable lifestyle. However, several other risk factors were identified to be significant. The lack of female role models is a recognised barrier in women choosing a surgical career pathway. Visible successful female surgeons serve to inspire as well as to encourage women that such a path is achievable.^{28,29} Other factors that have also been identified include discrimination and perception of inflexible training schemes.^{28–35}

In the RACS Breaking Barriers survey of 1670 women medical students and junior doctors, most barriers to preferencing a surgical career related to personal/lifestyle factors, but some related to flexibility of training and nature of the work.¹¹ Other studies have shown several influencing career factors act synergistically to have a disproportionate impact on women.^{28–34} These deterrent factors include domestic circumstances, absence of flexibility in career structures, experience in medical school, perception of the nature of specialty, and obstacles combining work and family obligations.^{31–34} Interestingly, in the present study, age at graduation did not appear to alter surgical career preference. This has particular relevance with the trend of medical schools moving to a post-graduate model.

Our study builds on what is reported by others by introducing a longitudinal lens, comparing preferences and influences at graduation linked through the early postgraduate years. Most influencing factors remained relatively stable, however, there was significant gender effect on career influences at both time points, consistent with other studies.^{28–33}

The stability in preference for Surgery over time for both genders shows the importance of undergraduate and early postgraduate periods in consolidating surgical career preference. For both women and men, the most common destination for those switching away from Surgery was an EROAD specialty, as seen previously.²⁴ This

Table 2 Logistic regression: Surgical versus non-surgical specialty preference at PGY3

Variables	Selected surgery at PGY3 Odds ratio (95% CI)	P-value
Gender		
Men	-	-
Women	0.5 (0.2–0.8)	0.012 *
Age at graduation		
Under 25	-	-
Over 25	0.8 (0.5–1.3)	0.475
EQ specialty preference		
Other		
Surgery	23.4 (12.7–43.1)	<0.001 *
Gender x EQ specialty preference	1.3 (0.5–3.2)	0.532
Constant	0.1	<0.001 *
Model chi-square	261.846	
Adjusted R-square	0.417	

* $P < 0.05$. $N = 977$; missing data = 5.

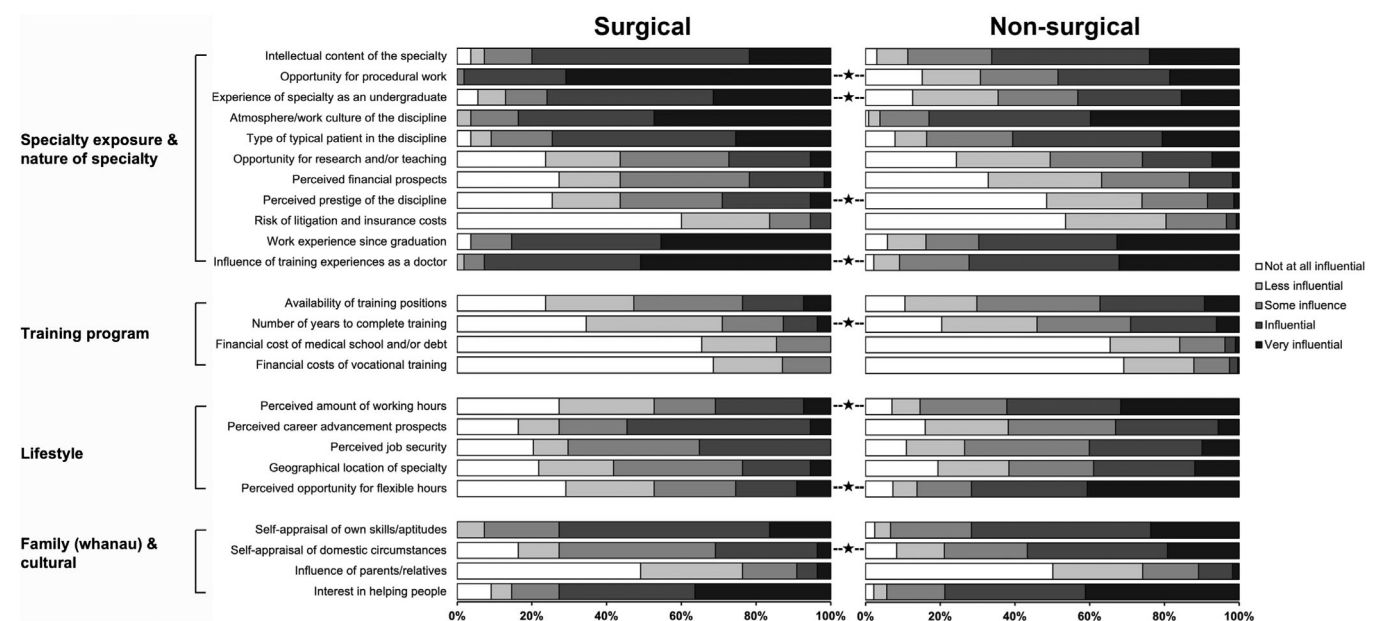


Fig. 4. Differences in influencing factors between women at PGY3 with a surgical preference and those with a non-surgical preference. The influence of each factor was measured on a five-point Likert scale (1 – Not at all influential; 5 – Very influential). Stars (★) represent statistically significant differences between groups. Significance values are Bonferroni corrected ($P < 0.002$).

may be due to the attraction of procedural elements and career opportunities, but with more predictable hours. The second most common was another acute care group of specialties, Medicine, followed by General Practice. These latter specialties have earlier selection than Surgery which might be a factor.

This study has limitations. Selection into surgical training in AoNZ is rare before PGY3. Our findings are based on a preference to train in Surgery rather than enrolment into, or completion of, a surgical training programme. However, it provides insights into career trajectories at a time when application may be considered. Second, the survey combined all surgical subspecialties. It is appreciated that some have greater proportions of women trainees than others.^{10,11,36} Third, some influencing factors do not explain whether they attracted doctors towards one specialty or away from another. The desire to be a surgeon may come with the understanding that having a preference for flexibility or shorter training is not compatible, thus the influence may be rated lower by those choosing surgery. Qualitative research exploring choices in depth may be informative. For example, students' experiences in surgery were found to be strongly gendered with women perceived as 'other'.³⁴ This may influence women's participation, including in procedures, making it harder for women to imagine themselves as successful surgeons, and resulting in self-selection away from Surgery.³⁷

Strengths of the study include the large dataset from surveys completed prospectively by participants at two time points 3 years apart. A novel feature was the longitudinal prospective nature of the study, allowing a description of changes in specialty preference between graduation and PGY3. As it did not focus specifically on Surgery, this may reduce social-desirability response bias.³⁸ We used conservative statistical tests. The strong concordance with findings from other work such as the RACS Breaking Barriers study suggests results may be generalisable to Australia and beyond.¹¹

In conclusion, under-representation of women graduates in AoNZ with a surgical preference at PGY3 occurs because of less initial interest at graduation and nearly half switching to another preference in the early postgraduate period. Career decision-making influences are different for both women and men at graduation and beyond. This study highlights some of the specific challenges for women in considering a surgical pathway. While some relate to lifestyle and family, others relate to the nature of the specialty, which suggests there is more to be done to make undergraduate experiences and surgical training appealing to women. Positive workplace experiences, including the opportunity to perform procedures, as well as greater flexibility in how work and training are organised are important. A systematic focus on the early postgraduate pathway for women with a surgical preference at graduation may be an effective strategy to retain interest.

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Conflict of interest

The authors have no competing financial interests to declare. Professor Phillippa J. Poole is a general physician and was a member of the AMC accreditation panels that reviewed RACS in 2017 and 2021.

Author contributions

Juliette A. Meyer: Conceptualization; formal analysis; investigation; methodology; validation; writing – original draft; writing – review and editing. **Charlotte J. W. Connell:** Conceptualization; data curation; formal analysis; investigation; methodology; software; validation; visualization; writing – original draft; writing – review and editing. **Sarah Rennie:** Conceptualization; supervision; writing – review and editing. **Antonia C. Verstappen:** Conceptualization; data curation; writing – review and editing. **Phillippa J. Poole:** Conceptualization; funding acquisition; methodology; project administration; resources; supervision; writing – original draft; writing – review and editing.

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