



Push and pull factors, and the role of residents in nurturing medical students' interest in surgery as a career option in a multicultural Asian context: Results of a prospective national cohort study

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ABSTRACT

Background: Studies in Caucasian populations suggest that interest among medical students in pursuing a surgical career is dwindling. We sought to investigate these trends and to evaluate the impact of resident teaching in a multiethnic Asian population.

Study design: Between 2015 and 2017, 1780 Singaporean third- and fifth-year medical students completed a structured anonymized questionnaire following the completion of an 8-week general surgery rotation. Medical students' impressions of their faculty and resident mentors were analyzed using hierarchical multilevel mixed-effects models.

Results: Respondents' opinions of general surgery improved from 3.31 ± 0.91 points to 4.03 ± 0.83 points on a 5-point Likert scale ($P < 0.0001$). Medical students were more likely to regard their interaction with residents as a "pull" factor compared to their interaction with faculty members (74.7% vs 65.6%; $P < 0.0001$). Our analyses revealed 9 statistically-significant "pull" factors and 5 "push" factors which attract or deter Asian medical students from a career in surgery. Comparing the pedagogical qualities of resident and faculty mentors, we found that residents surpassed faculty mentors in 9 domains, had comparable appraisal scores on 3 domains, and fared worse than faculty on 8 domains. Importantly, residents fared better at promoting interest in a surgical career ($P = 0.0006$) and influencing the career aspirations of medical students ($P < 0.0001$) compared with faculty members.

Conclusions: To our knowledge, this is the largest study from a Southeast Asian country providing representative sample numbers. With this knowledge of pull and push factors, the surgical clerkship can be improved by emphasizing pull factors and preparing students to cope with the push factors. Finally, our findings suggest that roping in residents as mentors to medical students may improve the pipeline of students interested in pursuing surgery after medical school.

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Introduction

Surveys of medical students and residency placement statistics from the United States of America, Canada, Australia, New Zealand, Greece, Switzerland, and the United Kingdom suggest that interest in general surgery and surgical subspecialties as career choices is dwindling.^{1–5} These trends are arguably worrisome as they

forebode a decrease in the pool and quality of applicants for surgical training programs, and may potentially lead to future shortfalls in certain specialties.⁶ Interestingly, preferences for medical specializations appear to vary across races, with medical students of Caucasian descent less likely to indicate interest in surgical careers as compared to their Asian counterparts.^{1–5} These ethnic disparities are certainly peculiar, and detailed investigations may afford unique insights that can help to shape current ideas regarding the drivers of declining surgical interests worldwide, and also inform medical education policies in Asian countries. Hitherto, studies from Southeast Asia involving representative numbers of medical students are lacking.

In many academic medical centers today, surgical residents are

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charged with providing clinical teaching and exposure for medical students. Implicit and frequently overlooked in this capacity is the notion that residents also act as role models to medical students, and therefore may play a part in shaping their perspectives and attitudes towards a surgical career.⁷ Consequently, medical students' impressions of the quality of resident teaching and other attributes such as integrity, leadership, and communication skills, may be paramount in influencing their career choices. However, it is unclear whether medical students perceive a difference in the quality of mentoring rendered by surgical residents and faculty members.

In view of the above considerations, we conducted a national prospective study in Singapore to investigate the impact of a surgical clerkship on medical students' impression of general surgery, identify factors which encourage ("pull") or discourage ("push") medical students away from a career in surgery, and appraise the quality of mentorship provided by residents and faculty from the perspective of medical students.

Methods

The study population comprised 1780 medical students from the Yong Loo Lin School of Medicine, National University of Singapore, who participated at a feedback session following the completion of their third-year or fifth-year general surgery clerkship during the academic years 2015–2017. The surgical clerkships consisted of an 8-week rotation with one of the 6 teaching hospitals. Students were assigned to surgical teams and participated in all clinical, procedural and educational activities alongside residents and faculty members. Pre-posting briefings were centralized and delivered and overseen by the university to ensure that curriculum and assessment was uniform throughout the teaching hospitals.

At the end of the clerkship, students received a structured anonymized questionnaire assessing their pre-clerkship and post-clerkship attitudes towards general surgery (based on a 5-point Likert scale), factors that may have a positive or negative bearing on their decision on whether to pursue a career in surgery (which they rated as "pull" or "push" respectively), and their perception of both surgical residents and faculty members in terms of their teaching attributes and other relevant qualities (based on a 5-point Likert scale). The questionnaire was administered by the same administrators who were briefed and trained by the study team. The briefing explained the aims and objectives of the study and reassured the students that their posting grades were independent of the study. The study protocol and survey questions are provided in the **Supplementary Material**. Institutional Review Board approval was obtained prior to study commencement, and students provided informed written consent for their questionnaire responses to be used for research purposes.

Baseline characteristics and demographics of medical students were summarized descriptively. The difference in students' pre- and post-clerkship attitudes towards general surgery was compared using paired t-tests. The percentage "pull" or "push" responses were tabulated, and the importance of a given factor was evaluated using an exact binomial test under the null hypothesis that an equal proportion of "pull" or "push" responses would be recorded if that factor left medical students equally decided or undecided about pursuing surgery as a career. McNemar's test (with a matched-pair variance estimator) and modified Poisson regression were used to compare and compute ratios of paired and unpaired proportions respectively. Confidence intervals for proportions were obtained from exact binomial probability densities. Medical students' impressions of their faculty and resident mentors were visualized using polar plots and compared using hierarchical

multilevel mixed-effects models. The multilevel models took into account clustering of survey responses under medical students' year of study (third-year or fifth-year), hospitals which they were posted to, as well as intra-individual correlation in the evaluation of residents and faculty by the same medical students, which were modelled as random effects. A sensitivity analysis using ordinal outcome models was also done since the 5-point Likert scale can also be construed as an ordinal outcome; these sensitivity analyses corroborated that of the main analysis (data not shown).

As a secondary objective of this study, we also assessed the construct (convergent and discriminant) validity of the survey appraising mentors' pedagogical qualities using principal components analysis as well as unsupervised hierarchical cluster analysis. Briefly, a correlation matrix was computed based on Spearman's rho, which was then subjected to agglomerative hierarchical clustering using the complete linkage method and Euclidean dissimilarity metric. The average silhouette method was used to determine the optimal number of clusters. The mentor appraisal questionnaire demonstrated good construct validity with weak correlation (i.e., discrimination) between traits which are considered to measure somewhat disparate domains or clusters of pedagogical qualities, but conversely, high correlation (i.e., convergence) between traits which are generally considered to be more similar or related to each other (e.g., the observation that clinical and theoretical knowledge coalesces into a single cluster) (Fig. 1). The appraisal questionnaire also demonstrated good stability as demonstrated by the reproducibility of clusters in the subgroups of surgical residents and faculty members (Fig. 1).

Nominal two-sided $P < 0.05$ was taken to denote statistical significance, and analyses were performed in STATA version 16.0 (StataCorp, College Station, Texas).

Results

A total of 1780 medical students responded to the survey and questionnaire responses were largely complete with minimal missing data (response rates ranging from 89.0% to 100% for various questions in the survey). Most respondents identified as Chinese ($n = 1541$, 90.2%), with the remainder of Indian ($n = 109$, 6.4%), Malay ($n = 23$, 1.4%), and other ethnicities. Respondents' ages were fairly homogenous within each batch, with a mean age of 21.4 ± 0.90 and 23.1 ± 0.64 years among third-year and fifth-year medical students respectively. Detailed demographics are provided in Table 1.

Overall, medical students' opinions of general surgery improved from 3.31 ± 0.91 points to 4.03 ± 0.83 points on a Likert scale with a maximum of 5 points (paired difference, 0.73; 95% CI 0.68 to 0.78; $P < 0.0001$). After the general surgery clerkship, 41.8% of participants indicated that they were inspired to pursue a career in general surgery.

We next sought to determine what factors attract or dissuade medical students from a career in surgery (Fig. 2). Intellectual challenges arising from cases was judged to be the most significant "pull" factor ($n = 1446/1692$, 85.5%; $P < 0.0001$), followed by the presence of role models during their general surgery ($n = 1386/1694$, 81.8%; $P < 0.0001$), interaction with residents ($n = 1265/1694$, 74.7%; $P < 0.0001$), patient interaction and relationships ($n = 1154/1690$, 68.3%; $P < 0.0001$), operative exposure ($n = 1135/1692$, 67.1%; $P < 0.0001$), interaction with surgical faculty ($n = 1110/1693$, 65.6%; $P < 0.0001$), their overall experience during surgical rotation ($n = 1065/1690$, 63.0%; $P < 0.0001$), academic opportunities and research ($n = 999/1691$, 59.1%; $P < 0.0001$), and prestige of being a surgeon ($n = 919/1688$, 54.4%; $P < 0.0001$). Of note, there was a significantly higher proportion of students who regarded interaction with surgical residents as a "pull" factor compared to their

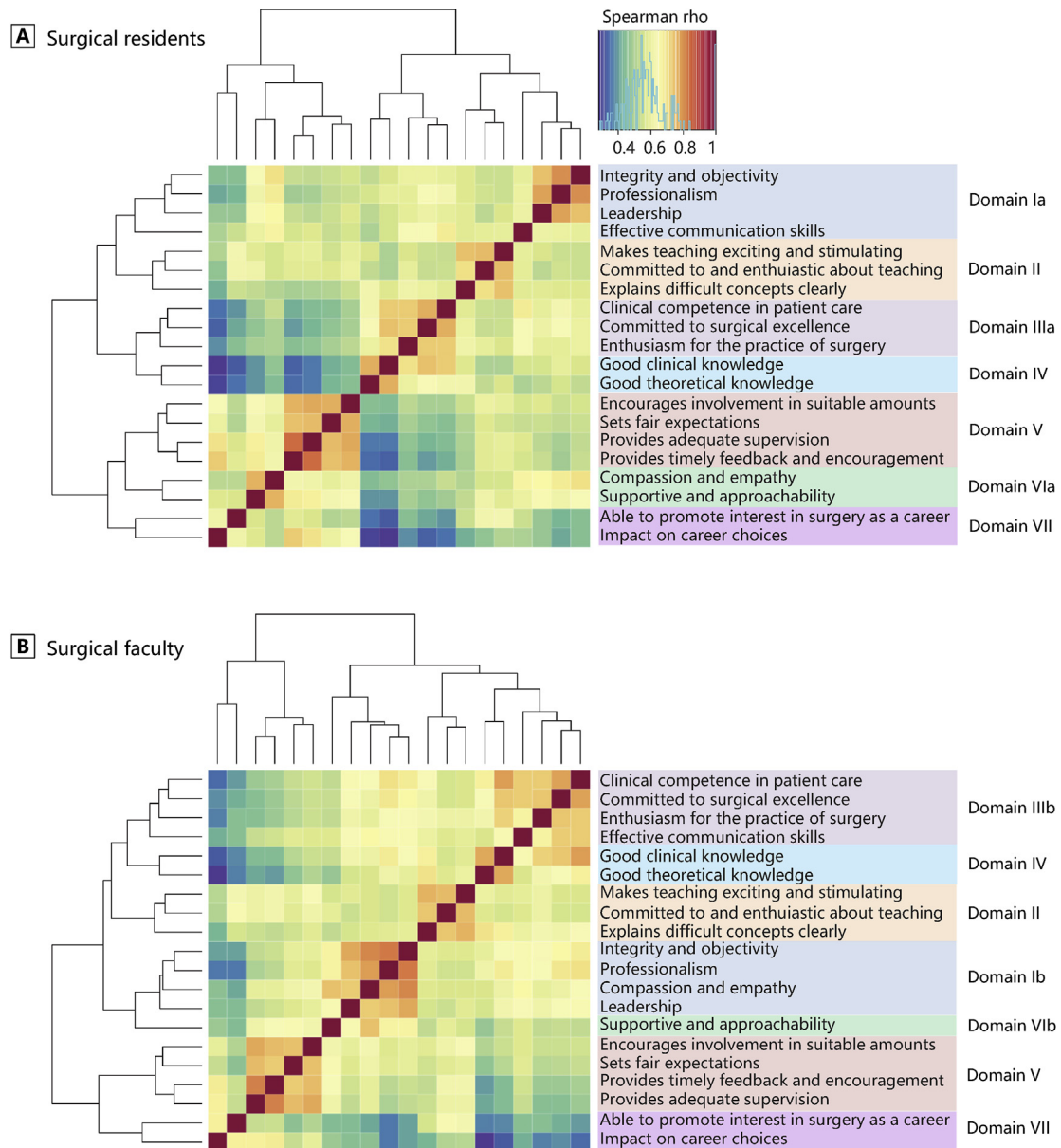


Fig. 1. Construct (discriminant and convergent) validity and stability of mentor appraisal questionnaire was assessed using cluster analysis. Depicted here are hierarchically-clustered heatmaps identifying closely-related pedagogical attributes, and good stability as shown by the reproducibility of clusters when (A) surgical residents and (B) surgical faculty are analyzed separately.

interaction with faculty members (74.7% vs 65.6%; paired ratio, 1.36; 95% CI 1.26–1.46; $P < 0.0001$).

The most significant “push” factor was medical students’ perception of lifestyle *during* residency ($n = 1470/1692$, 86.9%; $P < 0.0001$), followed by amount of time spent in hospital ($n = 1391/1695$, 82.1%; $P < 0.0001$), perception of lifestyle *after* residency ($n = 1253/1693$, 74.0%; $P < 0.0001$), the length of surgical residency ($n = 1193/1691$, 70.6%; $P < 0.0001$), and gender-related concerns such as gender disparity ($n = 1127/1687$, 66.8%; $P < 0.0001$). Lifestyle *during* residency was more frequently regarded a “push” factor than *after* residency (86.9% vs 74.0%; paired ratio, 1.17; 95% CI 1.15–1.20; $P < 0.0001$). Male students were less likely than female students to consider gender-related concerns as “push” factors (37.0% vs 81.0%; ratio, 0.44; 95% CI 0.38–0.51; $P < 0.0001$). Finally, a similar proportion ($P < 0.0001$) of students considered career opportunities after residency to be a “pull”

($n = 864/1690$, 51.1%) or “push” factor ($n = 826/1690$, 48.9%) (Fig. 2).

Surgical residents today are increasingly involved in medical student teaching, and students’ impressions of the quality of resident teaching, their demeanor and other personal attributes (eg. integrity, professionalism, leadership, and communication skills) may play a role in molding their career decisions. As such, it is important to appraise the quality of resident and faculty mentorship from the perspective of medical students (Fig. 3 and Table 2). We found that medical students perceived residents to be less effective than faculty members on domains such as (i) theoretical knowledge (4.26 vs 4.46, difference = -0.194 , $P < 0.0001$); (ii) making teaching exciting and stimulating (4.06 vs 4.11, difference = -0.051 , $P = 0.0070$); (iii) explaining difficult concepts clearly (4.13 vs 4.26, difference = -0.130 , $P < 0.0001$); (iv) possessing good clinical knowledge (4.27 vs 4.48, difference = -0.214 ,

Table 1
Characteristics of medical students in the study.

	Overall (n = 1780)	Third-year (n = 908)	Fifth-year (n = 872)
Male, No./Total no. ^b (%)	823 (47.3)	422/872 (48.4)	401/869 (46.1)
Age, mean (SD), y	22.3 (1.16)	21.4 (0.90)	23.1 (0.64)
Race, No./Total no. ^b (%)			
Chinese	1541/1708 (90.2)	770/854 (90.2)	771/854 (90.3)
Indian	109/1708 (6.4)	56/854 (6.6)	53/854 (6.2)
Malay	23/1708 (1.4)	14/854 (1.6)	9/854 (1.1)
Others	35/1708 (2.0)	14/854 (1.6)	21/854 (2.5)
Religion, No./Total no. ^b (%)			
Christian	384/846 (45.4)	431/831 (51.9)	815/1677 (48.6)
No religion	232/846 (27.4)	235/831 (28.3)	467/1677 (27.8)
Buddhist	111/846 (13.1)	83/831 (10.0)	194/1677 (11.6)
Hindu	43/846 (5.1)	42/831 (5.1)	85/1677 (5.1)
Islam	20/846 (2.4)	13/831 (1.6)	33/1677 (2.0)
Others	56/846 (6.6)	27/831 (3.2)	83/1677 (4.9)
Citizenship, No./Total no. ^b (%)			
Singaporean	1665/1709 (97.4)	840/862 (97.4)	825/847 (97.4)
Singaporean permanent resident	33/1709 (1.9)	18/862 (2.1)	15/847 (1.8)
Others	11/1709 (0.6)	4/862 (0.5)	7/847 (0.8)
Tertiary education, No./Total no. ^b (%)			
GCSE Advanced Level	1400/1709 (81.9)	700/861 (81.3)	700/848 (82.5)
International Baccalaureate	217/1709 (12.7)	112/861 (13.0)	105/848 (12.4)
High School Diploma	66/1709 (3.9)	29/861 (3.4)	37/848 (4.4)
Polytechnic Diploma	26/1709 (1.5)	20/861 (2.3)	6/848 (0.7)
Opinion of general surgery before clerkship, mean (SD) ^a	3.31 (0.91)	3.13 (0.88)	3.48 (0.91)
Opinion of general surgery after clerkship, mean (SD) ^a	4.03 (0.83)	4.11 (0.83)	3.95 (0.81)
Change in perception of general surgery after clerkship, mean (SD) ^a	0.73 (1.06)	0.98 (1.14)	0.47 (0.89)
Inspired to pursue a surgical career after clerkship, No./Total No. ^b (%)			
Yes	662/1584 (41.8)	450/801 (56.2)	212/783 (27.1)
No	918/1584 (58.0)	347/801 (43.3)	571/783 (72.9)
Unsure	4/1584 (0.3)	4/801 (0.5)	0/783 (0.0)

*Based on questionnaire administered after phase III surgical rotation.

^a Based on a Likert scale from 1 (poor) to 5 (excellent).

^b Denominators may differ from the total numbers of students due to missing responses.

$P < 0.0001$); (v) showing enthusiasm for surgical practice (4.21 vs 4.37, difference = -0.164 , $P < 0.0001$); (vi) showing competence in patient care (4.24 vs 4.40, difference = -0.158 , $P < 0.0001$) (vii) commitment to surgical excellence (4.23 vs 4.43, difference = -0.201 , $P < 0.0001$); and exhibiting (viii) leadership (4.15 vs 4.22, difference = -0.068 , $P < 0.0001$) (Fig. 3 and Table 2).

Interestingly, medical students deemed surgical residents to be (i) more effective in promoting interest in a surgical career (3.80 vs 3.73, difference = 0.071 , $P = 0.0006$); (ii) demonstrating effective communication skills (4.15 vs 4.10, difference = 0.049 , $P = 0.0052$); (iii) encouraging involvement in suitable amounts (4.07 vs 4.02, difference = 0.048 , $P = 0.0113$); (iv) setting fair expectations (4.10 vs 4.01, difference = 0.089 , $P < 0.0001$); (v) offering adequate supervision (3.97 vs 3.85, difference = 0.119 , $P < 0.0001$); (vi) providing timely feedback and encouragement (3.96 vs 3.80, difference = 0.159 , $P < 0.0001$); (vii) impacting the career choices of medical students (3.79 vs 3.67, difference = 0.121 , $P < 0.0001$); (viii) exhibiting compassion and empathy (4.18 vs 4.02, difference = 0.152 , $P < 0.0001$); and (ix) being more approachable and supportive as compared with faculty members (4.19 vs 3.98, difference = 0.208 , $P < 0.0001$) (Fig. 3 and Table 2). There were no differences between residents and faculty mentors in terms of their (i) commitment to teaching (4.11 vs 4.18, difference = -0.061 , $P = 0.0947$); (ii) integrity and objectivity (4.23 vs 4.25, difference = -0.020 , $P = 0.1741$); and (iii) professionalism (4.27 vs 4.30, difference = -0.029 , $P = 0.0572$) (Fig. 3 and Table 2).

Discussion

To our knowledge, we present the largest prospective study of Asian medical students to date assessing the impact of a surgical clerkship on students' opinion of general surgery, identifying the factors that compel or discourage students from pursuing a career

in surgery, and addressing whether the quality of resident and faculty teaching differs from the perspective of medical students. The findings from our study are likely to have important policy, clinical, and research implications in light of the diminishing popularity of general surgery and its subspecialties among medical students^{1–5} and the paucity of representative studies from the Southeast Asia.

Impact of a surgical clerkship

In the present study, we found that medical students who underwent a 8-week surgical clerkship had significantly improved sentiments towards general surgery, consistent with previous reports,^{8–13} with 63.0% of students rating their overall experience during the clerkship as a “pull” factor that may draw them towards a surgical career. Nevertheless, interpretation of these results should take into account the fact that it was administered shortly after the completion of the surgical rotation, which could be associated with short-term acquiescence bias. At least one previous study has suggested that any positive impact of a surgical rotation on students' outlook may be transient, with perceptions returning to negative baseline values within 1-year of the clerkship.¹⁰

“Push” and “pull” factors

Intellectual challenges arising from cases was deemed by medical students to be the most appealing aspect of surgery (85.5%) – a finding also obtained by Glynn and colleagues among Irish medical students.¹⁴ Interestingly, although intellectual stimulation arising from cases was the most significant “pull” factor according to medical students (85.5%), academic and research opportunities proved to be far less attractive to students (59.1%). In contrast to Glynn et al., job prestige was ranked the least important (albeit

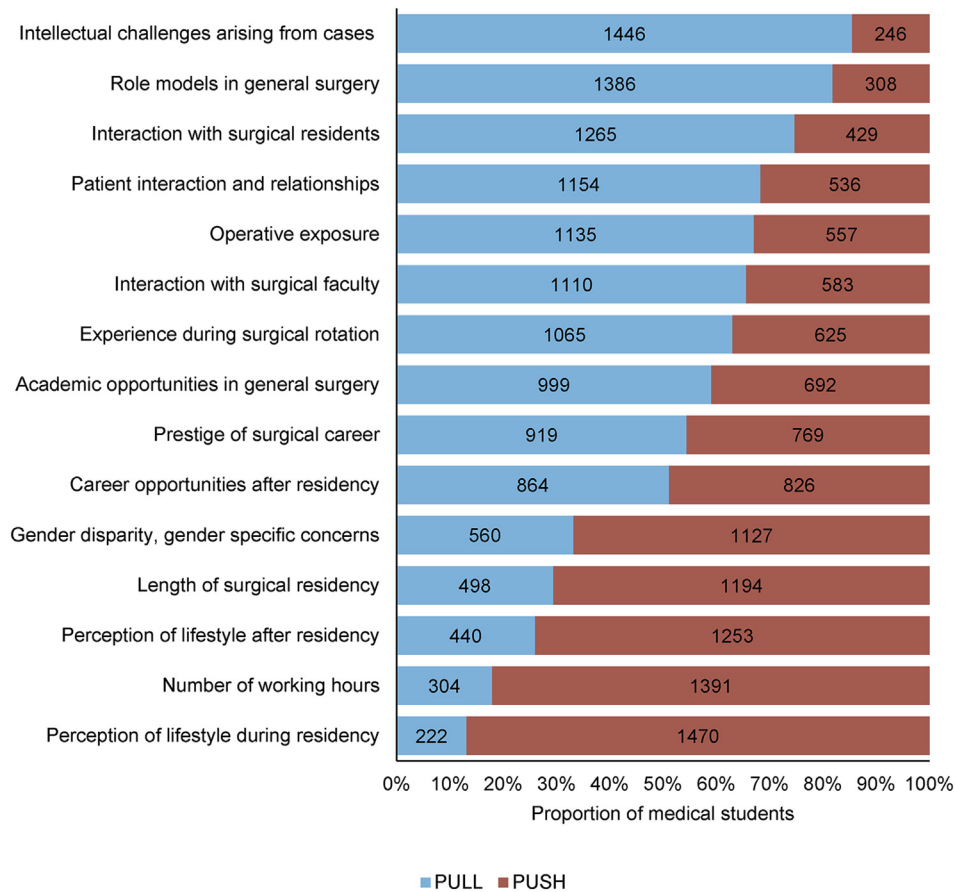


Fig. 2. “Pull” and “push” factors that encourage or discourage medical students from pursuing a surgical career.

statistically-significant) “pull” factor by Asian medical students in our study (54.4%). Nevertheless, we cannot exclude the possibility that social desirability bias could have skewed the proportion of Asian students who rated career prestige as a “pull” factor, although this type of response bias should have been partially mitigated by the anonymized nature of the questionnaire.

Medical students’ involvement in patient care and operating theatre experiences during surgery clerkships have previously been associated with inclination towards careers in surgery,^{9,15} and students’ expectations to be meaningfully engaged in patient care have even been reported to exceed those of residents and faculty members.^{16,17} Our study lends support to the notion that medical students highly value their involvement in clinical procedures and management, with 67.1% and 68.3% of participants indicating that operative exposure and patient interaction respectively are factors which have a positive bearing on their decision whether to pursue surgical careers.

An extensive body of literature exists with regards to general surgeons’ satisfaction with work-life balance and burnout. It is intriguing that the “push” factors – such as the number of working hours and length of surgical training – as identified by medical students in our study appear to resonate with surgeons themselves.¹⁸ Several other observations warrant discussion: Firstly, our results indicate that students more frequently regarded lifestyle *during* residency as a “push” factor than *after* residency (86.9% vs 74.0%; $P < 0.0001$). Stated differently, students are deterred from pursuing surgery to a greater extent because of their perception of *residents’* lifestyles rather than those of *faculty members*. Secondly, we found that female students were two times more likely than

male students to be affected by gender-related concerns (81.0% vs 37.0%; $P < 0.0001$). Indeed, gender discrimination (both real and perceived) repeatedly features as a significant reason why female medical students are discouraged from entering the surgical workforce,^{19,20} and continues to require our emphatic commitment to tackle. Further studies are also needed to investigate whether perceptions of gender discrimination are more pervasive in Asian countries with more patriarchal societies.

Comparison of pedagogical attributes of surgical residents and faculty

There is increasing advocacy for surgical residents to play an active role in imparting knowledge, skills, attitudes and responsibilities to medical students during their clerkships. One of the most intriguing findings from our analysis is that medical students were more attracted to a surgical career because of their interaction with residents as compared to faculty members (74.7% vs 65.6%; $P < 0.0001$), and residents also promoted interest in a surgical career and influenced their career aspirations to a greater extent than faculty mentors. Another surprising finding was that surgical residents were deemed to exhibit more effective communication skills compared to faculty mentors. In total, residents surpassed faculty mentors in 9 domains, had comparable appraisal scores on 3 domains, and fared worse than faculty on 8 domains. Furthermore, our finding that residents received comparable or better appraisal scores than faculty members is in consonance with some single-institution studies in the West.²¹ However, another single-institution study found that student impressions of

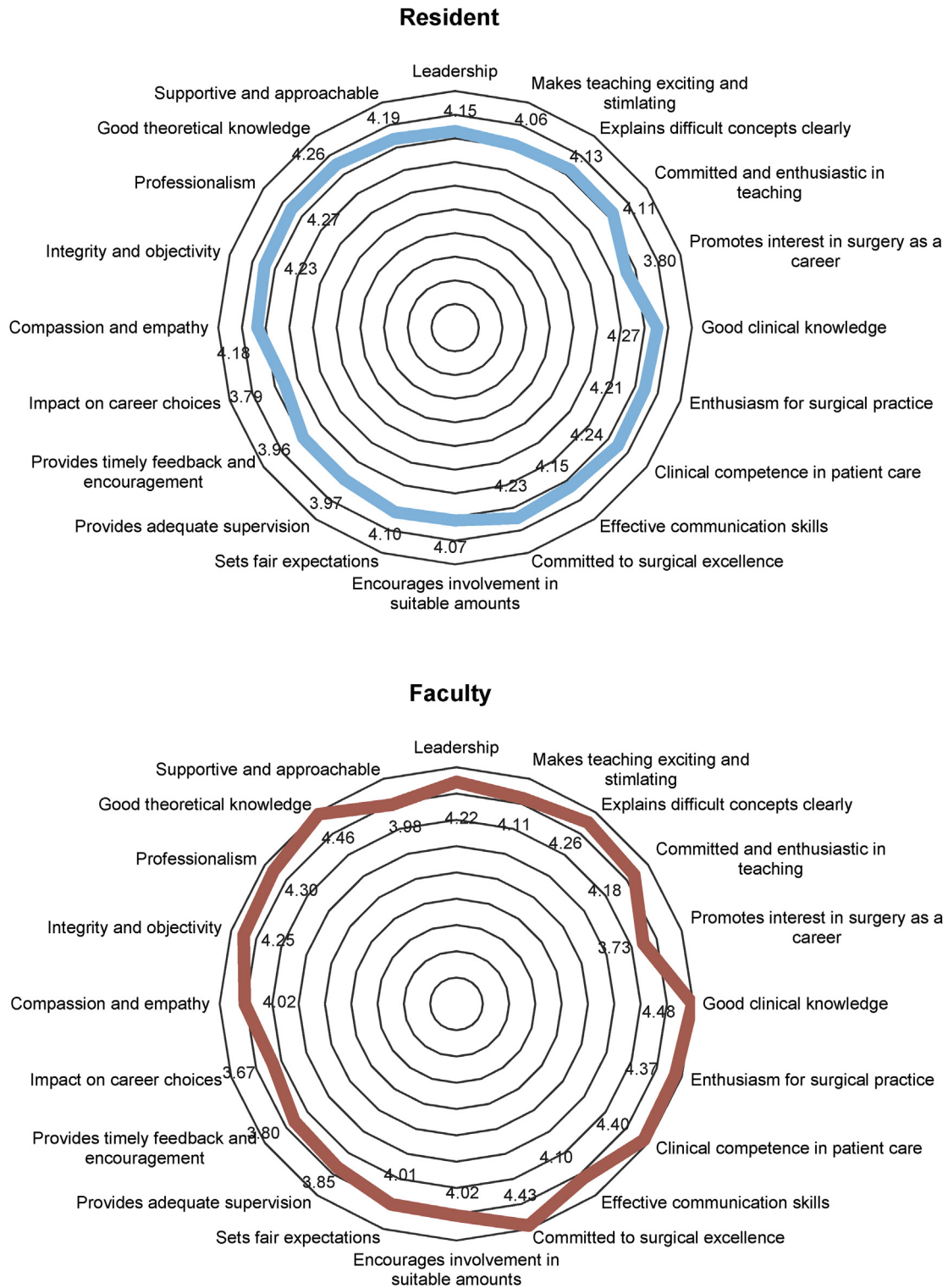


Fig. 3. Polar plots representing the pedagogical qualities, and personal and professional attributes of surgical resident and faculty mentors. Shown are the average postestimation margins of resident and faculty mentors after fitting hierarchical mixed models to account for hospital-level variation and clustering of responses under medical students' year of study. Adjusted mean differences i.e., the difference in adjusted mean scores of surgical residents compared to those of faculty members are shown in Table 2. For example, residents scored 4.26 while faculty received 4.46 points on average in the domain of theoretical knowledge, which corresponds to a mean difference of -0.194 (95% CI: 0.223 to -0.166) points.

surgeons' collegiality and commitment to teaching actually deteriorated significantly during the surgical rotations,⁸ but this was not examined in our current study.

Limitations and strengths

Our study has several limitations. Firstly, as mentioned previously, our survey may be affected by acquiescence bias and social desirability bias, although these could be mitigated by the

Table 2
Differences in medical students' evaluations of surgical residents versus faculty members.

Teaching attribute	Adjusted mean difference (95% CI) ^{a, *†}	P [‡]
Theoretical knowledge	-0.194 (-0.223 to -0.166)	<0.0001
Makes teaching exciting and stimulating	-0.051 (-0.088 to -0.014)	0.0070
Explains difficult concepts clearly	-0.130 (-0.165 to -0.096)	<0.0001
Committed in teaching	-0.061 (-0.132 to 0.010)	0.0947
Promotes interest in surgery as a career	0.071 (0.030 to 0.111)	0.0006
Good clinical knowledge	-0.214 (-0.242 to -0.186)	<0.0001
Enthusiasm for surgical practice	-0.164 (-0.195 to -0.132)	<0.0001
Clinical competence in patient care	-0.158 (-0.188 to -0.128)	<0.0001
Effective communication skills	0.049 (0.015 to 0.083)	0.0052
Committed to surgical excellence	-0.201 (-0.232 to -0.171)	<0.0001
Encourages involvement in suitable amounts	0.048 (0.011 to 0.085)	0.0113
Sets fair expectations	0.089 (0.053 to 0.126)	<0.0001
Provides adequate supervision	0.119 (0.080 to 0.158)	<0.0001
Provides timely feedback and encouragement	0.159 (0.120 to 0.199)	<0.0001
Impact on career choices	0.121 (0.080 to 0.161)	<0.0001
Compassion and empathy	0.152 (0.118 to 0.186)	<0.0001
Integrity and objectivity	-0.020 (-0.049 to 0.009)	0.1741
Professionalism	-0.029 (-0.057 to 0.001)	0.0572
Leadership	-0.068 (-0.098 to -0.037)	<0.0001
Supportive and approachable	0.208 (0.168 to 0.248)	<0.0001

^aThree-level hierarchical mixed-effects models were used to adjust for the nested structure of responses by (i) year of study of medical students (third- or fifth-year), (ii) hospitals where students did their clerkship, as well as the (iii) paired appraisal scores of residents and faculty members provided by the same set of medical students, which were modelled as random-effects.

^bBased on a Likert scale from 1 (poor) to 5 (excellent).

^cAdjusted mean differences are calculated as the difference in adjusted mean scores of surgical residents compared to those of faculty members (refer to Fig. 3). For example, residents scored 4.26 while faculty received 4.46 points on average in the domain of theoretical knowledge, which corresponds to a mean difference of -0.194 (95% CI: 0.223 to -0.166) points.

anonymized nature of the survey. Secondly, the survey instrument in our study was not formally assessed for content validity, as we did not submit the questionnaire to other subject matter experts for their input prior to administering it to students. However, we had sought to ensure that the scope of our questions were sufficiently broad and addressed important endpoints by reviewing past surveys employed in similar publications by Western surgical educators. Furthermore, we found that the mentor appraisal questionnaire demonstrated good construct validity with weak correlation (discrimination) between traits which are considered to measure somewhat disparate domains or clusters of pedagogical qualities, but conversely, high correlation (convergence) between traits which are generally considered to be more similar or related to each other (e.g., the observation that clinical and theoretical knowledge coalesces into a single cluster). Thirdly, it is quite conceivable that results from studies of this nature are highly context-, country- or institution-specific, thus potentially limiting reproducibility and generalizability of findings. However, this could be mitigated by the fact that our study features a multicenter design involving 6 restructured hospitals in Singapore, which will hopefully enhance the external validity of our findings. One strength of this study is its large and representative sample size, and the fact that it was a nationwide study conducted in the cosmopolitan city-state of Singapore, which has a multiethnic demographic composition and multicultural exchanges with many neighboring countries in Southeast Asia. This may potentially permit findings to be generalized to other countries in the Asia

Pacific and beyond, since it could be argued that the results are not necessarily unique to an Asian medical community. A second strength of the study methodology is that it is among few to analyze the pedagogical profiles of resident and faculty mentors from the viewpoint of medical students, who are arguably an important stakeholder in the medical education establishment.

Conclusions

In conclusion, this nationwide survey of 1780 Asian medical students who underwent an 8-week surgical clerkship found that surgical residents have different teaching attributes compared to faculty members, and received higher appraisal scores than faculty members on 9 pedagogical domains but lower scores in 8 other domains. Furthermore, surgical residents had greater impact than faculty members on influencing medical students' career aspirations. These suggest that roping in residents as mentors to medical students may improve the pipeline of students interested in pursuing surgery after medical school. Finally, we identified 9 significant "pull" factors and 5 "push" factors which attract or deter Asian medical students from a surgical career. With this knowledge of pull and push factors, the clerkship can be improved by emphasizing pull factors and preparing students to cope with the push factors.

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Declaration of competing interest

No conflicts of interest declared.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amjsurg.2020.04.036>.

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