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Demographics in general surgery programs: Relationship between female faculty and proportion of female residents

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ABSTRACT

Introduction: We hypothesized that general surgery programs with more female faculty and leadership may be associated with more female residents.
Methods: The Fellowship and Residency Electronic Interactive Database Access system (FREIDA) was assessed for chair gender, program director gender, percentage of female faculty, and percentage of female residents at general surgery residency programs. Programs were stratified by type: university-based (UB), community-based/university-affiliated (UA) and community-based (CB).
Results: 304 general surgery programs reported a mean of 38.4% female residents which did not differ by program type. Chairs were more likely female in UB programs (12.8%) versus 5.5% in UA and CB programs ($p = 0.05$). There were more female faculty at UB programs (23.3%) versus UA (21.7%) and CB (17.4%) ($p = 0.04$). Chair ($p = 0.21$), program director ($p = 0.98$) and faculty gender proportion ($p = 0.40$) was not associated with female resident complement.
Conclusions: In general surgery programs, faculty and leadership gender composition was not associated with proportion of female residents.

Introduction

For the first time, in 2019, the majority (50.5%) of U.S. medical students were women.[1] However, near gender parity in U.S. medical schools is not new. In 2017, the majority of first year medical students were women and in 2015, 46.9% of medical students were women. Surgical residencies have historically and persistently had fewer female matriculants. For the 2018-19 year, according to the Accreditation Council for Graduate Medical Education (ACGME), 38.9% of general surgery residents were female (3.3% gender not reported).[2] This proportion has not changed since at least 2006, when 40% of incoming surgery residents were women.[3] There are also fewer women at senior academic levels in surgery: 29.7% of assistant professors, 21.7% of associate professors, and only 12.9% of full professors are female.[4] The proportion of women in faculty positions in academic medical centers has remained relatively stagnant, with modest increases that are statistically below average for both women and minorities.[5]

Numerous studies have reported same-sex mentorship as a factor that promotes matriculation of female U.S. medical students into surgical careers.[6–8] Exposure to female surgical role models during surgical clerkships in medical school has been associated with women electing to pursue general surgery careers.[9] Consequently, the absence of positive female surgical role models has been cited as a deterrent for female medical students pursuing surgical specialties.[10] In a survey of seven medical schools with the highest and lower proportion of female faculty based on Association of American Medical Colleges (AAMC) data, 4th year female medical students at schools with more female faculty were much more likely to choose a surgical residency.[11]

While the current literature suggests that female faculty representation impacts medical student choice, to our knowledge, there are no studies evaluating female faculty and female leadership with general surgery resident gender. Moreover, most of the aforementioned studies used survey methodology to elucidate factors affecting female pursuit of surgical careers. We hypothesized that general surgery residency programs with female chairs, female program directors and/or a larger proportion of female faculty would have more female residents.

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Materials and methods

The Fellowship and Residency Electronic Interactive Database Access system (FREIDA) collects survey data from all Accreditation Council for Graduate Medical Education (ACGME) approved programs.[12] FREIDA surveys, conducted jointly with the American Medical Association (AMA) and AAMC, are sent out annually to all accredited programs and posted online in a searchable format in August for the programs that submit data by July. New programs are added as they become accredited. The FREIDA website was assessed for program director gender, percentage of female faculty, and percentage of female residents at general surgery residency programs. Percent of female residents was reported as an aggregate of the last 3 years of data by FREIDA. Department chair gender was found on program websites. When gender was not explicitly stated, names, photographs and gendered pronouns used on institutional websites were used to assign chair and program director gender. Program director and chair gender as well as percent of female faculty were based on the August 2019 data.

University-based (UB), community-based/university affiliated (UA), and community-based (CB) programs were evaluated. Military-based programs were excluded. FREIDA defines UB as programs where the "majority of experience takes place in a hospital that serves as a primary affiliate of the medical school"; UA as programs where the "majority of experience is in a community-based hospital that is affiliated with an academic medical center, but is not a primary affiliate of the academic medical center" and CB as programs where the "majority of experience is in a community setting that is not in an academic medical center, or a hospital with a medical school affiliation."[13] Many community-based programs did not have identified department chairs. Programs without department chairs were excluded from analyses utilizing this variable. Proportion of female faculty was split into quartiles for tables. Descriptive statistics, Pearson's Chi square, Kruskal-Wallis and linear regression were used for analysis. A p-value of less than or equal to 0.05 was deemed statistically significant.

Results

There were 304 programs, of 330 listed, with sufficient data available in FREIDA to be included in the initial analysis. There were an equivalent number of university-based (n = 119, 39.1%) and community-based/university-affiliated (n = 120, 39.5%), with the remaining (n = 65, 21.4%) comprised of community-based programs. Chairs were more likely to be female in UB programs (n = 15 of 117, 12.8%) compared to 5.5% (n = 7 of 127) in UA and CB programs ($p = 0.05$). Similarly, there were more female program directors (n = 27 of 119, 22.7%) at UB programs compared to UA and CB programs (n = 28 of 185, 15.1%) but this was not significant ($p = 0.10$). There was a larger proportion of female faculty at UB programs (23.3%) compared to UA (21.7%) and CB programs (17.4%) ($p = 0.04$).

Only half of programs (n = 152) supplied their 3-year average of percentage of female residents. In all programs, there was a mean of 38.4% female residents (SD 10.3) with a range of 2.5%–68.4%. Of those programs that reported, there was a larger proportion of female residents in UB (39.9%) versus UA (37.6%) and CB (35.7%) programs but this did not reach significance ($p = 0.21$) (Fig. 1).

Chair gender ($p = 0.21$), program director gender ($p = 0.98$) and percentage of female faculty ($p = 0.40$) were not associated with female resident complement overall (Table 1). Proportion of female residents was also not associated with the chair gender, program director gender or percent of female faculty on subgroup analysis of programs by type (all $p > 0.05$, Table 2). There was an interaction between female faculty percentage and chair gender. In all program types, under female chairs, as female faculty percent increased, female resident proportion decreased ($p = 0.01$) whereas under male chairs, female resident proportion did not change as a factor of proportion of female faculty ($p = 0.96$)(Fig. 2)However, much of the variance in resident gender by program is likely due to other factors ($R^2 = 0.05$).

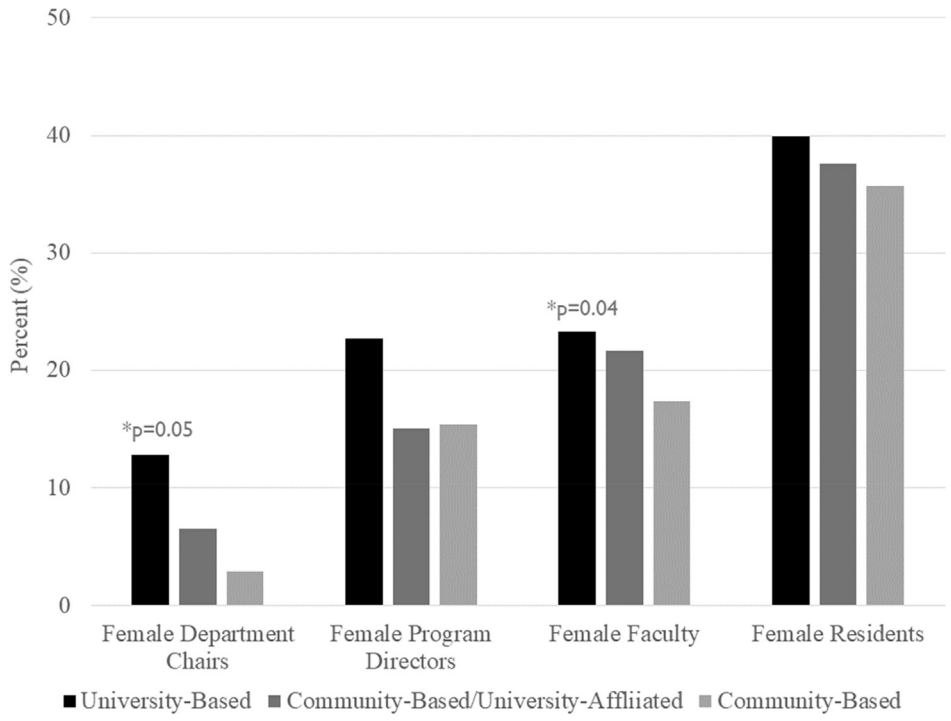

Fig. 1. Percentage of females by type of residency program and position. *Significantly different by program type.

Table 1
Proportion of female residents by chair gender, program director gender and high and low quartiles of proportion of female faculty in all programs.

	Percent Female Residents, mean ± SD	p-value
Female Department Chair (n = 12)	42.4 ± 10.9	0.21
Male Department Chair (n = 118)	38.6 ± 9.9	
Female Program Director (n = 26)	38.4 ± 9.3	0.98
Male Program Director (n = 126)	38.5 ± 10.5	
Highest Quartile Proportion of Female Faculty, >27% (n = 51)	39.0 ± 11.3	0.27
Lowest Quartile Proportion of Female Faculty, <17% (n = 52)	36.3 ± 10.5	

Table 2
Percent of female residents by program type.

	Percent Female Residents		p-value
	University-Based, mean ± SD	University-Affiliated or Community Based, mean ± SD	
All (n = 152)	39.9 ± 9.8	37.2 ± 10.5	0.10
Female Department Chair (n = 12)	42.8 ± 10.9	41.3 ± 12.3	0.85
Male Department Chair (n = 118)	39.5 ± 9.8	37.6 ± 10.1	0.31
Female Program Director (n = 26)	38.2 ± 11.0	38.9 ± 6.2	0.85
Male Program Director (n = 126)	40.4 ± 9.5	36.9 ± 11.0	0.63
Highest Quartile Proportion of Female Faculty (n = 44)	38.5 ± 12.5	39.5 ± 10.5	0.78
Lowest Quartile Proportion of Female Faculty (n = 38)	37.9 ± 10.1	35.8 ± 10.8	0.60

Discussion

While there was more female representation in university-based programs, a larger female presence in leadership positions and faculty was not associated with a larger proportion of female residents. Under male chairs, with a higher proportion of female faculty, there was a greater number of female residents. Due to the small number of female chairs, this interaction between chair gender and female faculty may be deceptive. Factors other than same-sex representation in faculty and leadership positions may be more important to recruiting and retaining female general surgery residents.

This study evaluated one of the many theorized reasons that gender in general surgery residencies is not proportionate to the gender makeup of currently graduating medical students. Same-sex role models and positive mentorship experiences have been shown to be associated with greater female interest in surgery.[14,15] Lifestyle is reported as the number one factor related to attrition and a strong factor in specialty choice.[15–17] However, perception of surgical lifestyle as resident or attending does not appear to be different between male and female general surgery applicants.[18] Attrition, which was significantly higher among female residents (25% vs. 15% male) in a meta-analysis, has been suggested as a reason for fewer total female residents.[16] There are likely structural or institutional barriers that impact females pursuing general surgery and contribute to the higher attrition rate. A qualitative study of women in academic surgery found that negative culture and/or institutional policies were a gendered impediment to advancement.[19] The inflexibility and time demands of a surgery residency may also disproportionately impact female residents. An encouraging 32% of programs reported on-site child care or subsidized day care though this was not associated with proportion of female residents. Discrimination, sexual harassment as well as overt and implicit bias have been perceived or actual deterrents to women wishing to pursuing surgery as a career.[9,20] However, general surgery is not exclusive to this disparity: general surgery has more female residents than otorhinolaryngology (35.7%), vascular surgery (25.0%), urology (25.0%), thoracic surgery (21.1%), neurosurgery (17.3%), orthopedic surgery (14.7%).[2]

Much research focuses on barriers to women in surgery but there is evidence of specific interventions and policies at the medical student, resident and faculty level to increase female participation in general surgery. At the medical student level, timing of exposure to surgery (earlier than 3rd year clerkship) has been associated with the decision to pursue surgery.[23,24] Positive clerkship experience has a strong relationship to choice of a surgical career.[21,22] Expectations of work-life balance also impact medical students' specialty decisions. In a study by Snyder et al., female medical students reported that they would be more interested in surgery if 6-week maternity/paternity leave was more accepted during residency, if child care were available, if part-time residency training were an option, if part-time practice was common place, if clinical practice could be split with colleagues and if there were more facility and residents of the same gender.[25] Our study looked at faculty gender and its association with resident composition though, resident composition is a result of medical student applications and matriculation. A 2011 study from Stanford University surveyed all medical student interviewees at that institution and found that gender and racial diversity of current residents had a positive impact on medical students' perceptions of general surgery programs.[26] Similarly, a 2001 study by Mayer et al. of University of California Davis general surgery residency graduates found that respondents considered many of the same attributes important in a residency program. However, female surgery residency graduates were more concerned about gender mix and geographic location than male graduates.[6] "Fit" or a sense of belonging has been described in numerous studies as important to medical student program preference.[11,18,27] Seeing oneself as a peer to current residents may play a greater role in program choice than identifying with more senior members of the surgical community.

Gender parity is often seen as a goal in and of itself and there is a paucity of research in medicine and surgery about the advantages of gender parity. Multiple benefits of diversity of ethnicity, gender and socioeconomic status have been described in the business literature including a greater return on investment in a diverse workforce with more satisfied employees and less turnover.[28] Diversity has also been linked to increased economic power, more innovation, improved scientific collaboration as well as greater social cohesion and tolerance.[29] In surgery residencies, gender parity may promote wellness and a sense of belonging, intangible aspects of training that warrant further investigation.

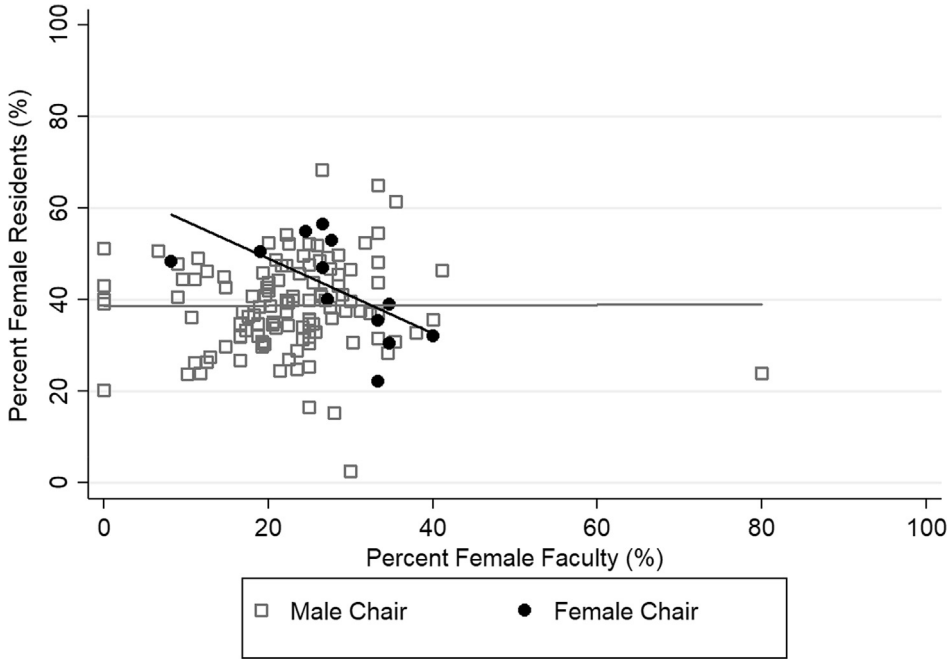

Fig. 2. Percent Female residents by percent female faculty, by chair gender.

This study is limited by several factors. Of the 330 listed general surgery programs, 24 did not respond at all and many responded to only parts of the survey which constrained our analyses. Only half of programs provided data on proportion of female residents. One hypothesis for the poor response to the FREIDA survey question on proportion of female residents is that, unlike the majority of other survey fields, it is required to be calculated. Surgical chairs and program directors were assessed on current data but there is turnover in these positions such that residents currently in programs would have matriculated under the chairpersons and program directors from up to eight years ago depending on program length. Of 323 programs, 50 (15.5%) had a change in PDs in 2018–2019.[2] The mean tenure of a department chair is approximately 8 years.[30]

The National Resident Matching Program, also known as "The Match®," is the system by which graduating medical students and residency programs are connected, based on mutual rank order lists. The Match® uses a proprietary algorithm to connect students to programs and could potentially confound an association between female residents and female faculty. For example, a female general surgery candidate may rank a program with a female chair and female program director first but match at a program with male chair and male program director. However, this bias should be random. If female applicants prefer programs with a higher proportion of female representation, this should be demonstrated despite The Match® algorithm. To further evaluate the association between faculty and leadership gender and resident gender, current as well as past faculty and resident rosters would help assess the relationship between applicants and faculty/resident composition at the time of application.

Conclusions

In all program types, more female representation in faculty or leadership (program directors and chairs), was not significantly associated with more female residents. This data suggests there are other factors associated with female resident preference of general surgery programs.

Declaration of competing interest

We have no conflict of interests to report for all authors (K. Tinsley Anderson, Simone Hyman, Marion C.W. Henry).

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