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SPECIAL TOPIC

Gender Bias in the Integrated Plastic Surgery Residency: A Snapshot of Current Trends

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Introduction: According to the American Society of Plastic Surgeons, the male to female ratio of plastic surgeons is approximately 5:1. As more surgical specialties are recruiting female residents, there has been an increase in the amount of females. We set out to examine the current trends in residency recruitment and whether a quantifiable gender bias exists.

Methods: A review of all the integrated plastic surgery programs within the United States was conducted. Data were collected regarding department or division status, the gender of the chairman and the program directors, the number of residents per year and gender of residents per year. The ratio of male to female residents was calculated.

Results: A total of 62 residency programs were identified. The vast majority had a male program director with only 8 female program directors identified. The mean ratio of female/male (F/M) residents overall was 1/1.2. Female program directors selected residents in the same ratio as their male counterparts [F/M ratio: 1/1.26 versus 1/1.18, p:0.813]. A linear logistic regression failed to identify the geographic location, department status, gender of the department chairman or the number of residents selected per year as predictors of higher F/M ratio.

Conclusions: There are still fewer female program directors and residents in plastic surgery overall. However, neither was more likely to select a resident of their own gender. This analysis does not rule out the possible self-selection factor.
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INTRODUCTION

Since 1965, there has been a dramatic increase in the number of graduating female physicians, from 7% to 46% in recent years.[1] Plastic surgery has seen a parallel increase in women selecting plastic surgery as a specialty from 13% in 1998 to 35% in 2015.[1] However, shortly after this initial increase, graduating female physicians entering plastic surgery has since plateaued, and between 2014 and 2018 only 27%–34% of the applicants who entered plastic surgery were women.[2]

According to the American Society of Plastic Surgeons, currently the male to female ratio of practicing plastic surgeons is approximately 5:1.[3] The underrepresentation of women in surgery has been explored and is influenced by many factors such as mentorship and role models, work–life balance, professional satisfaction, retirement and financial planning, and patient/public preference.[4] Such factors influence a person's choice in the type of specialty chosen, however, does not address whether a gender bias exists within the residency selection/ranking process itself. Therefore, we set out to examine the current trends in residency recruitment and whether a quantifiable gender bias exists within the residency match.

METHODS

A web search was conducted (May 2019) for all the websites of the integrated plastic surgery programs in the United States of America. A list provided by the American Council for Graduate Medical Education was utilized to identify all the programs. Programs without sufficient information in their websites were excluded from further analysis. Data extracted from each website were the following: department status, gender of the chairman, gender of the program director, and geographic location of the residency program. The total number of residents per year and their gender was collected from the publicly available websites. The primary aim of the study was determining

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whether a gender bias existed during the residency application and selection process, namely, if male program directors tended to hire more male residents as compared to their female counterparts. The secondary purpose of the present study was to identify whether there are any independent factors that predict a higher female/male (F/M) ratio in the integrated plastic surgery residency programs.

Statistical Analysis

The study population was divided in 2 groups based on whether a man or a woman was the program director identified at the website. The 2 groups were then compared for differences in their characteristics. A χ^2 or Fisher's exact test was used to compare categorical variables. For continuous variables, a Mann-Whitney U test was used. *P* values were derived from the aforementioned tests. To assess whether a gender bias was present, the residents were examined in 2 ways: a ratio of F/M residents overall and for each postgraduate year was calculated and a percentage of female residents overall and for each year was used.

To identify independent predictors of higher F/M ratio, a linear regression was deployed, inserting as independent variables all the factors that were previously examined. B with 95% mean differences, adjusted *P* values, beta coefficients and degree of correlation were extracted from the regression.

RESULTS

A total of 62 residency program with publicly available websites were identified. Only 20 (32%) had a department status. Out of the 62 programs, 20 were in the northeast of the United States, 19 in the Midwest, 12 in the South, and 8 in the west coast. The vast majority of the program directors were men (87% of male program directors versus 13%). Each program selected an average of 2 residents per year (range: 1–4). A total of 15 programs had 1 resident per year, 27 selected 2 residents per year, 14 selected 3, whereas 6 programs had 4 residents per year (Table 1).

The mode of male residents overall was 3 and that did not differ between programs with male and female program directors. On the contrary, female residents had a mode of 1 resident (Table 2). The mean F/M ratio overall was 0.9 (9 female residents for every 10 male residents). There was no difference in the ratios between female and male program directors in hiring residents with regard to gender (0.8 versus 0.9, $P = 0.529$). When each postgraduate year (PGY) year was separately examined, no differences in the ratios between male and female program directors were identified (Table 3). Similarly, the overall percentage of female residents was 39% and that did not differ between the 2 groups (42% versus 37%, $P = 0.712$). Each (PGY) year did not show any differences with regard to the percentage of female residents between the 2 groups (Table 3).

A linear regression failed to identify department status, program location, gender of the program director [B (95% mean difference): 0.02 (–0.53, 0.57), adjusted $P = 0.952$] or the chairman, or the number of residents per year as factors associated with a higher F/M ratio (Table 4).

Table 1. Demographics

	N (%)
Department status	20/62 (32.3)
Geographic location	
Northeast	20/62 (32.3)
Midwest	19/62 (30.6)
South	12/62 (19.4)
West	8/62 (12.9)
Other	3/62 (4.8)
Male program director	54/62 (87.1)
Female program director	8/62 (12.9)
Male chairman	55/62 (88.7)
Male division chief	54/62 (87.1)
Female faculty [mean (mode)]	4 (3)
No. residents/year	
Mode (range)	2 (1, 4)
1	15/62 (24.2%)
2	27/62 (43.5%)
3	14/62 (22.6%)
4	6/62 (9.7%)

DISCUSSION

In this study, we evaluated whether there was an inherent gender bias within program directors in the selection of residents into plastic surgery as a potential reason for the unchanging percentage of women entering plastic surgery, which has been stagnant at 27%–34% since 2014.

Because previous studies have shown that women are less likely to hold leadership positions,[5–8] we evaluated if having less female program directors could influence the selection process, as only 8 out of 62 program directors were women. The ratio of current female-to-male applicants was 1:1.2 within the past 3 years, and this corresponded to the ratio of selected resident genders by female and male program directors alike. No other factors were found to affect gender selection.

Although the present paper failed to show any gender bias in the selection process of residency, the reasons for the implicit bias could be numerous, but surveys from past studies have shown that even with the same curriculum vitae, women were still perceived as less competent.[9] This is otherwise known as role congruity and is defined as our ideas of gender roles as learned through societal norms.[10] A recent survey by Silva showed that women felt less likely to be able to negotiate, and men, and felt less respected by their coworkers and the people they managed.[11] This confidence gap has been seen to hinder women's ability to achieve a higher level of success.[10,12] With fewer women as program directors, it is concerning that women hold a negative bias toward themselves, and it is this negative self-perception that could be driving the selection process from both program directors and applicants.

Patients of female surgeons tend to have an overall more positive experience. Studies have shown that patients of female physicians have lower mortality rates.[13] Female patients also prefer female plastic surgeons which is likely related to their comfort levels during intimate examinations.[14] Additionally, patients of female plastic surgeons

Table 2. Resident Distribution for the First 3 Years

	Overall (N = 62)	Male Program Director (N = 54)	Female Program Director (N = 8)	*P*
Male residents overall	3 (0–8)	3 (0–8)	3 (2–6)	0.509
Female residents overall	1 (0–7)	1 (0–7)	1 (1–6)	0.831
Male residents, first year	1 (0–3)	1 (0–3)	1 (0–2)	0.842
Female residents, first year	1 (0–2)	1 (0–2)	0 (0–2)	0.487
Male residents, second year	1 (0–3)	1 (0–3)	1 (0–2)	0.78
Female residents, second year	0 (0–3)	0 (0–3)	0 (0–2)	0.796
Male residents, third year	1 (0–4)	1 (0-4)	1 (0–2)	0.52
Female residents, third year	1 (0–3)	1 (0–3)	0 (0–2)	0.329

Table 3. Residents Percentages

	Overall (N = 62)	Male Program Director (N = 54)	Female Program Director (N = 8)	*P*
F/M ratio overall	0.86 ± 0.11	0.87 ± 0.12	0.79 ± 0.12	0.529
F/M ratio, first year	0.56 ± 0.10	0.57 ± 0.1	0.50 ± 0.22	0.891
F/M ratio, second year	0.65 ± 0.10	0.66 ± 0.12	0.57 ± 0.20	0.942
F/M ratio, third year	0.65 ± 0.11	0.63 ± 0.12	0.83 ± 0.31	0.474
Percentage of women overall	39% ± 3%	37% ± 3%	42% ± 12%	0.712
Percentage of women, first year	42% ± 5%	44% ± 6%	31% ± 13%	0.448
Percentage of women, second year	34% ± 5%	33% ± 5%	44% ± 15%	0.486
Percentage of women, third year	42% ± 5%	40% ± 5%	57% ± 15%	0.266

Table 4. Linear Regression of Predictors of F/M Ratio

	B (95% Mean Difference)	Adjusted *P*	Beta Coefficient	Correlation
Department status	–0.29 (–0.71, 0.13)	0.175	–0.201	–0.19
Program location	0.02 (–0.14, 0.18)	0.782	0.039	0.04
Male program director	0.02 (–0.53, 0.57)	0.952	0.009	0.01
Male chairman	0.08 (–0.47, 0.63)	0.766	0.043	0.043
Male division chief	0.12 (–0.23, 0.72)	0.734	0.082	0.032
No. female faculty	0.05 (0.03, 0.32)	0.031	0.341	0.310
No. residents per year	0.11 (–0.10, 0.32)	0.288	0.154	0.152

show a higher satisfaction rating 4.93 for women plastic surgeon versus 4.65 for their male counterpart.[15]

It needs to be noted that a limitation of the present study is that the selection process is a match. The applicants also choose the residency and as such the selection process is not solely dependent on the program director but it also involves the faculty or the family of the applicant, etc. Although the program director has a more powerful vote in the process, faculty also is intimately involved and the present study does not take into account a male-dominated program with a female program director. It is possible that female applicants may preferably rank higher programs with a more female-dominated faculty than a male-dominated faculty. As a matter of fact, the present study did show that a more female-dominated program was more likely to have recruited female residents. The faculty also has differences in how they chose residents. Some programs have roundtables about resident selection, and others have the program directors who make all the decisions. All the above need to be taken into account when interpreting the present study.

Understanding these gender trends will help close the gender gap. The best way to achieve this goal is at the beginning, the start of one's career, which we believe is at the resident selection process. We must aim to correct this gender bias from both medical students and leaders in the field, possibly by boosting the public image of female surgeons in the eyes of the media and the public to encourage more female applicants to the residency program. With time, and progression within the field, such bias will likely lead to wider gender gaps.

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