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Women in Leadership and Their Influence on the Gender Diversity of Academic Plastic Surgery Programs

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Abstract

Background: Women seldom reach the highest leadership positions in academic plastic surgery. Contributing factors include lack of female role models/mentors and lack of gender diversity. Studies show that female role models and mentors are critical for recruiting and retaining female surgeons and that gender diversity within organizations more strongly influences women's career choices. We therefore sought to determine the current gender diversity of academic plastic surgery programs and investigate influences of gender and leadership on program gender composition.

Methods: A cross-sectional study of U.S. plastic surgery residency programs was performed in December 2018. Genders of the leadership were collected, including: Medical School Dean, Department of Surgery Chair, Department/Division of Plastic Surgery (PRS) Chair/Chief, PRS Program Director (PD), PRS faculty, and PRS residents. Gender relationships among these groups were analyzed.

Results: Ninety-nine residency programs were identified (79 integrated \pm independent, 20 independent). Women represented a smaller proportion of academic plastic surgeons in more senior positions (38% residents, 20% faculty, 13% PDs, 8% Chairs). PRS Chair gender was significantly correlated with PD gender and PRS faculty gender was significantly associated with PRS resident gender. Although not statistically significant, female PRS Chair gender was associated with a 45% relative increase in female PRS residents.

Conclusions: Women in leadership and gender diversity influence the composition of academic plastic surgery programs. Gender disparity exists at all levels, worsening up the academic ladder. Recruitment, retention, and promotion of women is critical as such diversity is required for continued progress in innovation and problem-solving within plastic surgery.

Introduction

Women have entered medicine in increasing numbers over the last half-century, but still rarely reach the highest academic ranks and leadership positions. This phenomenon, known as the glass ceiling, was previously attributed to an unfilled pipeline. However, the pipeline is being increasingly filled, but is leaking due to attrition, lack of opportunity, and gender bias.¹⁻⁴ In 1965, merely 9.3% of medical school matriculants were women.⁵ Since 2002, however, women have represented ~50% of medical students, and in 2018-2019, women matriculants outnumbered men for the first time (51.6% vs 48.3%).^{6,7} In plastic surgery, the proportion of female residents has increased from 22% in 2007 to 39% in 2017, while the proportion of active, board-certified female plastic surgeons has only increased from 12% to 16% over the same timeframe.⁸⁻¹⁰ The most recent published data reveal even fewer women in leadership: women represented only 9% of plastic surgery program directors (PD) in 2011 and 5% of Chairs/Chiefs in 2015.^{11,12} Even with a full pipeline, structural and active strategies are needed to achieve diversity and equity in leadership across many domains, including gender.

By these numbers, improvements have clearly been made in recruiting female medical students to plastic surgery, but not in retaining and promoting them. Multiple factors contribute to this leaky pipeline, but the lack of female role models and mentors is commonly cited among female students, residents, and faculty as a major deterrent from entering, remaining, or advancing within academic surgery.¹³⁻²⁸ Multiple studies show that same-sex role models and mentors are beneficial in recruiting and retaining female surgeons.^{13, 23, 29-32} Experimental psychologists have found that after interacting with an exceptional woman, female students view themselves as more successful and believe they are similar and will emulate her in the future.^{33, 34} Furthermore, there are many demonstrated benefits of mentorship: greater academic productivity, career advancement and satisfaction, self-efficacy, collaboration, and lower turnover and burnout rates.³⁵⁻⁴⁰

Gender diversity of surgical faculty and residents positively influences women's choices to pursue surgery, strongly impacting residency program ranking for women applying into surgical versus non-surgical specialties.^{14, 41, 42} A parallel trend is seen in business - an international survey revealed that women value companies' gender diversity more than men when evaluating potential employers.⁴³ It is unsurprising, then, that Neumayer *et. al.*, found 88% of female medical students who matched into surgical residencies came from schools with a greater proportion of female surgeons.²⁹ Furthermore, specialties with higher percentages of female PDs have higher percentages of female residents.⁴⁴ Similarly, corporate companies with women in leadership have more women in midlevel management.⁴⁵

Gender relationships within academic plastic surgery, however, have yet to be fully studied. We hypothesized that programs with more gender diversity in leadership positions would have more women faculty and residents. The objectives of this study were to: 1) determine the current gender composition of U.S. plastic surgery residency programs and 2) investigate the influence of gender and leadership on the composition of academic plastic surgery programs with respect to Chair/Chief, PD, faculty, and residents.

Methods

Study Design and Data Collection

A cross-sectional study of the gender makeup of U.S. plastic surgery residency programs was performed in December 2018. Independent and integrated programs were identified using the American Council of Academic Plastic Surgeons lists. The following data were collected from individual residency program websites: genders of the Medical School Dean, and Plastic Surgery Division/Department Chair, PD, faculty, and residents. If Plastic Surgery was not a department, Department of Surgery Chair gender was also analyzed. Faculty were subcategorized into core and affiliate. If program websites were incomplete, the program coordinator or PD was contacted directly to complete the data set. If data subsequently remained incomplete, they were excluded from analysis. Data were collected from individual program websites as the Accreditation Council for Graduate Medical Education and Association of American Medical Colleges do not publicly release individual program data. This study was deemed exempt by the Washington University in St. Louis Human Resource Protection Office.

Figure 1 shows the relationships investigated. Arrows point from positions of higher to lower academic rank, with gender of the former hypothesized to influence gender of latter. If Plastic Surgery was not a department, the influences of Medical School Dean gender on Surgery Chair gender, and Surgery Chair gender on Plastic Surgery Chair gender and Plastic Surgery Faculty gender makeup were also investigated. The influence of Surgery Chair gender on the Plastic Surgery faculty gender composition was considered given the variability in Plastic Surgery Chair independence in faculty hiring processes. The influence of Plastic Surgery Chair, PD, faculty, and resident genders on the gender makeup of fourth year medical students matching into plastic surgery could not be determined (grey arrows, Figure 1). The National Resident Matching Program (NRMP) does not collect demographic data nor release individual level data to the public. Although the Electronic Residency Application Service (ERAS) collects demographic data, without the ability to correlate these data with individual match results, this information is not helpful for this study.

Statistical Analysis

Fisher's exact test was used to compare categorical data. Using QQ-plots, numerical data were determined to be sufficiently normal. Welch's t-tests were used to compare numerical data in categories. Linear regression with appropriate t-tests for coefficient significance and F-tests for regression significance were used to analyze the relationships between numerical variables. All data analysis was performed using R 3.4.1.

Results

Gender composition of plastic surgery residency programs

Ninety-nine plastic surgery residency programs were identified (79 integrated \pm independent, 20 independent). Owing to incomplete data, exclusions included: 3 programs for Medical School Dean and Department of Surgery Chair (n = 96), 1 program for Plastic Surgery Chair (n = 98), and 8 programs for residents (n = 91).

The gender compositions of plastic surgery residency programs are displayed in Table 1. In more senior positions, women constitute a smaller proportion of academic plastic surgeons: 38% residents, 20% faculty, 13% PDs, and 8% Chairs.

Influence of women in leadership on gender makeup of plastic surgery residency programs

Investigated gender associations are displayed in Figure 1 and Table 2. Medical School Dean gender is not associated with Plastic Surgery or Surgery Chair genders: 6.3% (1 of 16) programs with a female Dean and 8.8% (7 of 80) programs with a male Dean have a female Plastic Surgery Chair (Fisher's exact test, p approx. 1). Similarly, 0% (0 of 12) programs with a female Dean and 18% (11 of 60) programs with a male Dean have a female Surgery Chair (Fisher's exact test, p = 0.19). Surgery Chair gender is not associated with Plastic Surgery Chair gender: 8.3% (1 of 12) programs with a female Surgery Chair and 9.7% (6 of 62) programs with a male Surgery Chair have a female Plastic Surgery Chair (Fisher's Exact test, p = 1). In the other 24 institutions, Plastic Surgery is an independent department. Surgery Chair gender is also not associated with the gender distribution of the core or total

faculty; female Chairs have an average of 21.2% core and 20.9% total female Plastic Surgery faculty, while male Chairs have an average of 21.8% core and 20.9% total female Plastic Surgery faculty. There was a single program where the Plastic Surgery Chair was also the Surgery Chair.

Plastic Surgery Chair gender is associated with PD gender: 75% (6 of 8) of programs with a female Chair vs 7.8% (7 of 90) of programs with a male Chair have a female PD (Fisher's Exact test, $p = 4.0 \times 10^{-5}$). This association continues to be significant when the 32 Chairs who are also PDs are eliminated; 4 of 6 remaining programs with a female Chair and 6 of 60 remaining programs with a male Chair have a female PD (Fisher's Exact test, $p = 3.7 \times 10^{-3}$). However, Plastic Surgery Chair gender is not associated with the gender distribution of the core or total faculty. In programs with male Chairs, on average 21.0% of core faculty and 20.0% of total faculty are female. In programs with female Chairs, on average 24.7% of core faculty and 23.4% of total faculty are female. There are no significant differences in these proportions for core or total faculty (t-test, $p = 0.50$ and $p = 0.56$, respectively).

Plastic Surgery Chair gender is not significantly associated with resident gender composition; however, the effect size is noteworthy. On average, programs with a male or female Chair have 34.8% and 50.3% female residents, respectively (t-test, $p = 0.11$). Although not statistically significant due to the limited statistical power derived from the small number of female chairs, it is important to highlight that the effect size is large - a female Chair is associated with a 45% relative increase in female residents.

PD gender is also not associated with resident gender distribution. Programs with a male or female PD have on average 36.0% and 37.0% female residents, respectively (t-test, $p = 0.84$).

There is, however, a significant positive correlation between the core or total faculty gender distribution and resident gender distribution. A linear regression model using percentage female faculty as a factor determining percentage of female residents shows that each 10% increase in female faculty is associated with a 4.1% increase in the percentage of female residents (Figure 2). The slope of this regression line is significantly greater than zero (t-test, $p=0.01$, 95% CI for slope of regression [0.10, 0.73]). Due to the presence of other factors contributing to resident program choice, which were unmeasured in our analysis, the correlation of this linear single factor regression is low, but significant ($R^2 = 0.07$, $p = 0.01$). Similarly, a generalized monotonic non-linear relationship between these variables was also significant (Spearman's $Rho = 0.23$, $p = 0.03$).

Discussion

Given the abundant literature highlighting the importance of female role models and mentors and gender diversity on the recruitment and retention of women surgeons, we hypothesized that women in leadership roles within plastic surgery residency programs would positively influence the programs' gender diversity. We found significant positive associations between Plastic Surgery Chair gender and PD gender, and between the gender makeup of the faculty and the gender diversity of the residents. The correlation between Plastic Surgery Chair and

PD gender is logical. The Chair is responsible for appointment and retention of the PD. Business survey studies have shown that high-potential women pay it forward (73% of successful women mentor other women); companies with women leaders have more women in midlevel management.⁴⁵ With respect to the faculty and resident gender correlation, although the low R^2 value indicates that faculty gender composition is an insufficient stand-alone predictor of resident gender composition, it does not diminish the significance of the positive association between the variables; this coefficient is significantly different from zero. The low R^2 simply means that additional predictive factors will be needed to fully model the data. Our finding aligns with aforementioned studies showing that, compared to men, gender diversity is more important for female medical students seeking residency positions and for business women considering job opportunities.

We detected no association between Surgery Chair gender and Plastic Surgery faculty gender composition. Faculty will be retained through Chair appointments, confounding the effect of Chair gender on faculty appointments. Further, depending on individual institutional practices, the Plastic Surgery Chair may have sole faculty hiring responsibilities, independent of Surgery Chair influence.

We found no significant correlation between genders of the Medical School Dean and Plastic Surgery Chair, Surgery Chair and Plastic Surgery Chair, or Plastic Surgery Chair and faculty or residents. The lack of significance can be attributed to the low number of female Chairs, which results in a low-powered t-test. Additionally, lack of association between Dean and Plastic Surgery Chair genders is unsurprising as Chairs are maintained through Dean appointments, and Chair recruitment depends on multiple factors including clinical and research practices, faculty priorities, and broader institutional goals. The lack of association between Plastic Surgery Chair and faculty genders can also be explained by faculty longevity and retention through Chair appointments, and that the Chair might not be the sole influencing factor in division/department gender considerations. The lack of association between PD gender and resident gender diversity is not unexpected given that medical students may have little interaction with the PD during the residency interview process, generally only at the interview day. The Plastic Surgery Chair, however, is the face of the program, which helps explain the 45% increase in female residents with the presence of a female Plastic Surgery Chair. Analyses regarding resident data are limited by the match process- residents may not match into their preferred program and residencies may not match their highest-ranked candidates. Taken together, our findings suggest that women in leadership have the power to influence the gender diversity of academic plastic surgery programs. Unfortunately, we cannot draw strong conclusions owing to a scarcity of women reaching the highest leadership positions within plastic surgery. Therefore, future follow-up studies are necessary to closely monitor these trends and, hopefully, will reveal progress within our field.

Within plastic surgery, we found that 38% of residents, 20% of faculty, 13% of PDs, and 8% of Chairs/Chiefs are women. Furthermore, previous studies have shown that female plastic surgeons are more likely to be assistant professors than their male counterparts.⁴⁶ The lack of women leaders also extends to our professional societies (Table 3). In the majority of our

societies, women have represented less than 5% of all presidents. These data align with recently published data.⁴⁷

Organizational diversity is critical. The nationwide surgeon deficit is projected to be 23,100-31,600 by 2025.⁴⁸ The estimated physician replacement cost is 2 to 3 times the physician's annual salary (and even higher in surgical subspecialties) and will only worsen as the projected surgeon shortage intensifies.⁴⁹ Retention of women surgeons provides prospective patients with more diverse provider choice and, thus, could enhance an institution's bottom line. Additionally, women leaders can reduce gender stereotypes and perpetuate change.⁵⁰ Business surveys conducted in 2012 reveal that companies with women leaders have more balanced work-life policies, smaller gender wage gaps, and more women in midlevel management.⁴⁵ It is also well established that companies with strong women leaders are more profitable and innovative, generating a return on equity of 10% versus 7.4% of those with male leaders and producing 20% more patents than companies with male leaders.⁵¹⁻⁵⁴ Furthermore, in a study of university students performing team projects, researchers found that women performed better under female leadership, and social psychologists have found women's leadership styles to be more effective with men and women than male leadership styles.^{55, 56} Beyond the benefits of women in leadership, more gender diverse business teams demonstrate increased sales, enhanced problem-solving, better decision-making and product development, greater innovation and creativity, and higher employee retention and satisfaction.^{54, 57-61} Within academia, an analysis of 2.5 million scientific papers written between 1985 and 2008 revealed that those authored by more diverse groups were cited more and had higher impact factors compared to more homogeneous groups.⁶² Within healthcare, increasing team diversity to reflect diverse patient populations may enhance the quality of care provided. Finally, amongst female plastic surgery patients, those who have a gender preference prefer women surgeons, who are rated 6% higher than male surgeons.^{63, 64}

Despite the demonstrated benefits of women in leadership and gender diversity, there are multiple barriers to recruitment, retention, and promotion of female academic surgeons, ultimately leading to attrition. Barriers include: gender role congruity (i.e. perceived incongruity between female gender roles and leadership roles that results in prejudice towards women leaders)⁶⁵ and the resulting confidence gap, overt discrimination and implicit bias, slower promotion, lower academic productivity, lack of mentors/role models/sponsors, personal and family demands, pregnancy, and the gender pay gap. Given these barriers, women leave academia at higher rates than men. Female surgical residents have approximately twice the attrition rates of men, and 28% of female surgeons (vs 19% of male surgeons) seriously consider leaving academia.^{26, 66-68} This compounds a concern in academic plastic surgery: only 27% of plastic surgery graduates enter academia, and 40% depart in 5 years.³⁸ Therefore, it is imperative to recruit, retain, and promote women in academic plastic surgery. Suggestions for improvement are highlighted in Table 4, 2, 3, 11, 23, 32, 37, 39, 41, 45, 50, 54, 69-89 Implementation of these strategies has been effective in business and medicine. Between 1996 and 2005, Ernst & Young implemented programs to help women gain traction in their company, including yearly women's leadership conferences, mentoring programs that closely monitored high-potential women, and individualized leadership skills assessments. Over this 10-year period, the percentage of

women in top executive management and as partners rose from 0% to 15% and from 5% to 15%, respectively. Additionally, by retaining women and avoiding the costs associated with unnecessary recruitment, Ernst & Young saved \$10 million.⁵⁴ At Johns Hopkins School of Medicine, similar results were found with development of the Hopkins Task Force on Women's Academic Careers in Medicine in 1990. By implementing interventions targeting leadership training, faculty development and mentoring, faculty education regarding gender-based and structural obstacles, and by regularly monitoring and re-evaluating interventions, Hopkins witnessed an increase in female associate professors from 4 to 26 over a 5-year time period. Additionally, they noted more timely promotions, decreased gender biases, increased mentoring, less isolation, and increased access to information necessary for ensuring career development and salary equity.⁷⁶

Despite the strengths of our study, there are unavoidable limitations. We were unable to obtain medical student data owing to limitations in the ERAS and NRMP databases. These data would have strengthened our analysis. Additionally, data were obtained from program websites, with potential to be inaccurate or outdated. However, with increasing use of program websites by prospective applicants and patients, we expect most program websites display accurate information.

Conclusions

Gender parity is unrealized in academic plastic surgery. The contributing factors are multi-fold and difficult to analyze owing to the persistent leaky pipeline. Awareness of disparities and implementation of targeted interventions to improve recruitment, retention, and promotion of women are critical to narrow the gender gap. Academic diversity will ultimately result in a more vibrant, equitable, and innovative field.

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References

1. Carnes M, Morrissey C, Geller SE. Women's health and women's leadership in academic medicine: hitting the same glass ceiling? *Journal of women's health* (2002). 11 2008;17(9):1453–62. doi:10.1089/jwh.2007.0688
2. Surawicz CM. Women in Leadership: Why So Few and What to Do About It. *Journal of the American College of Radiology : JACR*. 12 2016;13(12 Pt A):1433–1437. doi:10.1016/j.jacr.2016.08.026 [PubMed: 28341310]
3. Zhuge Y, Kaufman J, Simeone DM, Chen H, Velazquez OC. Is there still a glass ceiling for women in academic surgery? *Ann Surg*. 4 2011;253(4):637–43. doi:10.1097/SLA.0b013e3182111120 [PubMed: 21475000]

4. Moak TN, Cress PE, Tenenbaum M, Casas LA. The Leaky Pipeline of Women in Plastic Surgery: Embracing Diversity to Close the Gender Disparity Gap. *Aesthet Surg J.* 10 30 2019;doi:10.1093/asj/sjz299
5. AAMC. TABLE 1: MEDICAL STUDENTS, SELECTED YEARS, 1965–2010. Association of American Medical Colleges; 2010.
6. AAMC. Table A-7.1: Applicants, First-Time Applicants, Acceptees, and Matriculants to U.S. Medical Schools by Sex, 1999-2000 through 2008-2009. Association of American Medical Colleges; 2018.
7. AAMC. Table A-1: U.S. Medical School Applications and Matriculants by School, State of Legal Residence, and Sex, 2018-2019. Association of American Medical Colleges; 2018.
8. AAMC. 2008 Physician Specialty Data. 2008 11 2008. Accessed June 5, 2019 <https://www.aamc.org/download/47352/data/specialtydata.pdf>
9. AAMC. ACGME Residents and Fellows by Sex and Specialty, 2017. Association of American Medical Colleges; 2018.
10. AAMC. Active Physicians by Sex and Specialty, 2017. Association of American Medical Colleges; 2017.
11. Weiss A, Lee KC, Tapia V, et al. Equity in surgical leadership for women: more work to do. *Am J Surg.* 9 2014;208(3):494–8. doi:10.1016/j.amjsurg.2013.11.005 [PubMed: 24933664]
12. Wenzinger E, Weinstein B, Singh R, Reid C, Suliman A, Herrera F. Deconstructing a Leader: An in-Depth Analysis of the Commonalities Between Plastic Surgery Chiefs and Chairmen. *Plastic and Reconstructive Surgery.* 9000;PRS Online Firstdoi:10.1097/prs.0000000000005783
13. Snyder RA, Bills JL, Phillips SE, Tarpley MJ, Tarpley JL. Specific interventions to increase women's interest in surgery. *Journal of the American College of Surgeons.* 12 2008;207(6):942–7, 947.e1-8. doi:10.1016/j.jamcollsurg.2008.08.017 [PubMed: 19183543]
14. Mayer KL, Perez RV, Ho HS. Factors affecting choice of surgical residency training program. *J Surg Res.* 6 15 2001;98(2):71–5. doi:10.1006/jsre.2001.6143 [PubMed: 11397120]
15. Baxter N, Cohen R, McLeod R. The impact of gender on the choice of surgery as a career. *Am J Surg.* 10 1996;172(4):373–6. doi:10.1016/s0002-9610(96)00185-7 [PubMed: 8873533]
16. Fitzgerald JE, Tang SW, Ravindra P, Maxwell-Armstrong CA. Gender-related perceptions of careers in surgery among new medical graduates: results of a cross-sectional study. *Am J Surg.* 7 2013;206(1):112–9. doi:10.1016/j.amjsurg.2012.04.009 [PubMed: 22902099]
17. Richardson HC, Redfern N. Why do women reject surgical careers? *Ann R Coll Surg Engl.* 10 2000;82(9 Suppl):290–3.
18. Ek EW, Ek ET, Mackay SD. Undergraduate experience of surgical teaching and its influence and its influence on career choice. *ANZ journal of surgery.* 8 2005;75(8):713–8. doi:10.1111/j.1445-2197.2005.03500.x [PubMed: 16076339]
19. Park J, Minor S, Taylor RA, Vikis E, Poenaru D. Why are women deterred from general surgery training? *Am J Surg.* 7 2005;190(1):141–6. doi:10.1016/j.amjsurg.2005.04.008 [PubMed: 15972188]
20. Sanfey HA, Saalwachter-Schulman AR, Nyhof-Young JM, Eidelson B, Mann BD. Influences on medical student career choice: gender or generation? *Arch Surg.* 11 2006;141(11):1086–94; discussion 1094. doi:10.1001/archsurg.141.11.1086 [PubMed: 17116801]
21. Dahlke AR, Johnson JK, Greenberg CC, et al. Gender Differences in Utilization of Duty-hour Regulations, Aspects of Burnout, and Psychological Well-being Among General Surgery Residents in the United States. *Ann Surg.* 8 2018;268(2):204–211. doi:10.1097/sla.0000000000002700 [PubMed: 29462009]
22. Myers SP, Hill KA, Nicholson KJ, et al. A qualitative study of gender differences in the experiences of general surgery trainees. *J Surg Res.* 8 2018;228:127–134. doi:10.1016/j.jss.2018.02.043 [PubMed: 29907201]
23. Luc JGY, Stamp NL, Antonoff MB. Social media in the mentorship and networking of physicians: Important role for women in surgical specialties. *Am J Surg.* 4 2018;215(4):752–760. doi:10.1016/j.amjsurg.2018.02.011 [PubMed: 29478827]

24. Cochran A, Elder WB, Crandall M, Brasel K, Hauschild T, Neumayer L. Barriers to advancement in academic surgery: views of senior residents and early career faculty. *Am J Surg.* 11 2013;206(5):661–6. doi:10.1016/j.amjsurg.2013.07.003 [PubMed: 24011566]
25. Patton EW, Griffith KA, Jones RD, Stewart A, Ubel PA, Jagsi R. Differences in Mentor-Mentee Sponsorship in Male vs Female Recipients of National Institutes of Health Grants. *JAMA internal medicine.* 4 1 2017;177(4):580–582. doi:10.1001/jamainternmed.2016.9391 [PubMed: 28241219]
26. Sonnad SS, Colletti LM. Issues in the recruitment and success of women in academic surgery. *Surgery.* 8 2002;132(2):415–9. [PubMed: 12219043]
27. Capek L, Edwards DE, Mackinnon SE. Plastic Surgeons: A Gender Comparison. *Plastic and Reconstructive Surgery.* 1997;99(2):289–299. [PubMed: 9030134]
28. Kasten SJ, Levi B, Eng D, Schenarts KA. Toward outcomes-based plastic surgery training: a needs assessment of recent graduates. *Plast Reconstr Surg.* 11 2009;124(5):1703–10. doi:10.1097/PRS.0b013e3181b98c49 [PubMed: 20009859]
29. Neumayer L, Kaiser S, Anderson K, et al. Perceptions of women medical students and their influence on career choice. *Am J Surg.* 2 2002;183(2):146–50. [PubMed: 11918878]
30. Faucett EA, McCrary HC, Milinic T, Hassanzadeh T, Roward SG, Neumayer LA. The role of same-sex mentorship and organizational support in encouraging women to pursue surgery. *Am J Surg.* 10 2017;214(4):640–644. doi:10.1016/j.amjsurg.2017.07.005 [PubMed: 28716310]
31. Ahmadiyah N, Cho NL, Kellogg KC, et al. Career satisfaction of women in surgery: perceptions, factors, and strategies. *Journal of the American College of Surgeons.* 1 2010;210(1):23–8. doi:10.1016/j.jamcollsurg.2009.08.011 [PubMed: 20123327]
32. Cochran A, Freischlag JA, Numann P. Women, surgery, and leadership: where we have been, where we are, where we are going. *JAMA surgery.* 4 2013;148(4):312–3. doi:10.1001/jamasurg.2013.1706 [PubMed: 23716118]
33. Lockwood P “Someone Like Me can be Successful”: Do College Students Need Same-Gender Role Models? *Psychology of Women Quarterly.* 2006;30(1):36–46. doi:10.1111/j.1471-6402.2006.00260.x
34. Jagsi R, Griffith KA, DeCastro RA, Ubel P. Sex, role models, and specialty choices among graduates of US medical schools in 2006-2008. *Journal of the American College of Surgeons.* 3 2014;218(3):345–52. doi:10.1016/j.jamcollsurg.2013.11.012 [PubMed: 24468225]
35. Riska E. Gender and medical careers. *Maturitas.* 3 2011;68(3):264–7. doi:10.1016/j.maturitas.2010.09.010 [PubMed: 21030166]
36. Barker JC, Rendon J, Janis JE. Medical Student Mentorship in Plastic Surgery: The Mentee's Perspective. *Plast Reconstr Surg.* 6 2016;137(6):1934–42. doi:10.1097/prs.0000000000002186 [PubMed: 27219246]
37. Franzblau LE, Kotsis SV, Chung KC. Mentorship: Concepts and Application to Plastic Surgery Training Programs. *Plastic and Reconstructive Surgery.* 2013;131(5):837e–843e. doi:10.1097/PRS.0b013e318287a0c9
38. Ramanadham SR, Rohrich RJ. Mentorship: A Pathway to Succeed in Plastic Surgery. *Plastic and Reconstructive Surgery.* 2019;143(1):353–355. doi:10.1097/prs.0000000000005134 [PubMed: 30589817]
39. DiBrito SR, Lopez CM, Jones C, Mathur A. Reducing Implicit Bias: Association of Women Surgeons #HeForShe Task Force Best Practice Recommendations. *Journal of the American College of Surgeons.* 3 2019;228(3):303–309. doi:10.1016/j.jamcollsurg.2018.12.011 [PubMed: 30611895]
40. Janis JE, Barker JC. Medical Student Mentorship in Plastic Surgery: The Mentor's Perspective. *Plast Reconstr Surg.* 11 2016;138(5):925e–935e. doi:10.1097/prs.0000000000002670
41. Furnas HJ, Garza RM, Li AY, et al. Gender Differences in the Professional and Personal Lives of Plastic Surgeons. *Plastic and Reconstructive Surgery.* 2018;142(1):252–264. doi:10.1097/prs.0000000000004478 [PubMed: 29952905]
42. Ku MC, Li YE, Prober C, Valentine H, Girod SC. Decisions, decisions: how program diversity influences residency program choice. *Journal of the American College of Surgeons.* 8 2011;213(2):294–305. doi:10.1016/j.jamcollsurg.2011.04.026 [PubMed: 21641834]

43. Flood A. Winning the fight for female talent: How to gain the diversity edge through inclusive recruitment. pwc; 2017 3 2017. Accessed June 5, 2019 <https://www.pwc.com/gx/en/about/diversity/iwd/iwd-female-talent-report-web.pdf>
44. Long TR, Elliott BA, Warner ME, Brown MJ, Rose SH. Resident and program director gender distribution by specialty. *Journal of women's health* (2002). 12 2011;20(12):1867–70. doi:10.1089/jwh.2011.2906
45. Sandberg S. *Lean In: Women, Work, and the Will to Lead*. Ebury Publishing; 2015:232.
46. Sasor SE, Cook JA, Duquette SP, et al. Scholarly activity in academic plastic surgery: the gender difference. *J Surg Res*. 9 2018;229:332–336. doi:10.1016/j.jss.2018.04.031 [PubMed: 29937010]
47. Chen W, Baron M, Bourne DA, Kim JS, Washington KM, De La Cruz C. A Report on the Representation of Women in Academic Plastic Surgery Leadership. *Plast Reconstr Surg*. 3 2020;145(3):844–852. doi:10.1097/prs.0000000000006562 [PubMed: 32097336]
48. Inc. I. *The Complexities of Physician Supply and Demand: Projections from 2013 to 2025 Final Report*. 2015 3 2015. Accessed June 5, 2019 <https://www.aamc.org/download/426248/data/thecomplexitiesofphysiciansupplyanddemandprojectionsfrom2013to2.pdf>
49. Shanafelt T, Goh J, Sinsky C. The Business Case for Investing in Physician Well-being. *JAMA internal medicine*. 12 1 2017;177(12):1826–1832. doi:10.1001/jamainternmed.2017.4340 [PubMed: 28973070]
50. Silva AK, Preminger A, Slezak S, Phillips LG, Johnson DJ. Melting the Plastic Ceiling: Overcoming Obstacles to Foster Leadership in Women Plastic Surgeons. *Plastic and Reconstructive Surgery*. 2016;138(3):721–729. doi:10.1097/prs.0000000000002483 [PubMed: 27556609]
51. Lee L-E, Marshall R, Rallis D, Moscardi M. Women on Boards: Global Trends in Gender Diversity on Corporate Boards. *Morgan Stanley Capital International*; 2015 11 2015. Accessed June 5, 2019 <https://www.msoci.com/documents/10199/04b6f646-d638-4878-9c61-4eb91748a82b>
52. Blumberg Y. Companies with more female executives make more money- here's why. *CNBC Make It*; 2018 3 2, 2018. Accessed June 5, 2019 <https://www.cnb.com/2018/03/02/why-companies-with-female-managers-make-more-money.html>
53. Noland M, Moran T, Barbara Kotschwar. Is Gender Diversity Profitable? Evidence from a Global Survey. *Peterson Institute for International Economics*; 2016:35 2 2016. Accessed June 5, 2019 <https://piie.com/publications/wp/wp16-3.pdf>
54. Hewlett SA. *Off-Ramps and On-Ramps: Keeping Talented Women on the Road to Success*. Harvard Business School Press; 2007:298.
55. De Paola M, Gioia F, Scoppa V *Teamwork, Leadership, and Gender*. IZA Institute of Labor Economics, Discussion Paper Series; 2018 September 2018. Accessed June 5, 2019 <http://ftp.iza.org/dp11861.pdf>
56. Eagly AH, Johannesen-Schmidt MC, van Engen ML. Transformational, transactional, and laissez-faire leadership styles: a meta-analysis comparing women and men. *Psychological bulletin*. 7 2003;129(4):569–91. [PubMed: 12848221]
57. Hoogendoorn S, Oosterbeek H, van Praag M. The Impact of Gender Diversity on the Performance of Business Teams: Evidence from a Field Experiment. *Management Science*. 7 2013 2013;59(7):1514–1528.
58. Hunt V, Layon D, Prince S. *Diversity Matters*. 2015:19 2 2, 2015. Accessed June 5, 2019 <https://www.mckinsey.com/~/media/mckinsey/businessfunctions/organization/ourinsights/whydiversitymatters/diversitymatters.ashx>
59. Hong L, Page SE. Groups of diverse problem solvers can outperform groups of high-ability problem solvers. *Proceedings of the National Academy of Sciences of the United States of America*. 11 16 2004;101(46):16385–9. doi:10.1073/pnas.0403723101 [PubMed: 15534225]
60. *An Investor's Guide to Gender Diversity*. 2017 1 17, 2017. <https://www.morganstanley.com/ideas/gender-diversity-investor-guide>
61. Ellison SF, Mullin WP. Diversity, Social Goods Provision, and Performance in the Firm. *Journal of Economics & Management Strategy*. Summer 2014 2014;23(2):465–481.
62. Freeman RB, Huang W. Collaboration: Strength in diversity. *Nature*. 9 18 2014;513(7518):305. doi:10.1038/513305a [PubMed: 25230634]

63. Huis In 't Veld EA, Canales FL, Furnas HJ. The Impact of a Plastic Surgeon's Gender on Patient Choice. *Aesthet Surg J.* 4 1 2017;37(4):466–471. doi:10.1093/asj/sjw180 [PubMed: 27913412]
64. Wall S Jr., Wall H. Commentary on: The Impact of a Plastic Surgeon's Gender on Patient Choice. *Aesthet Surg J.* 4 1 2017;37(4):472–473. doi:10.1093/asj/sjw277 [PubMed: 28364538]
65. Eagly AH, Karau SJ. Role congruity theory of prejudice toward female leaders. *Psychological review.* 7 2002;109(3):573–98. [PubMed: 12088246]
66. Dodson TF, Webb AL. Why do residents leave general surgery? The hidden problem in today's programs. *Current surgery.* Jan-Feb 2005;62(1):128–31. doi:10.1016/j.cursur.2004.07.009 [PubMed: 15708164]
67. Yeo HL, Abelson JS, Mao J, et al. Who Makes It to the End?: A Novel Predictive Model for Identifying Surgical Residents at Risk for Attrition. *Ann Surg.* 9 2017;266(3):499–507. doi:10.1097/sla.0000000000002384 [PubMed: 28678064]
68. Khoushhal Z, Hussain MA, Greco E, et al. Prevalence and Causes of Attrition Among Surgical Residents: A Systematic Review and Meta-analysis. *JAMA surgery.* 3 1 2017;152(3):265–272. doi:10.1001/jamasurg.2016.4086 [PubMed: 27973673]
69. Babcock L, Laschever S. *Women Don't Ask, Negotiation and the Gender Divide.* Princeton university Press; 2003:223.
70. Blumenthal DM, Bergmark RW, Raol N, Bohnen JD, Eloy JA, Gray ST. Sex Differences in Faculty Rank Among Academic Surgeons in the United States in 2014. *Ann Surg.* 8 2018;268(2):193–200. doi:10.1097/sla.0000000000002662 [PubMed: 29334559]
71. Bucknor A, Kamali P, Phillips N, et al. Gender Inequality for Women in Plastic Surgery: A Systematic Scoping Review. *Plastic and Reconstructive Surgery.* 2018;141(6):1561–1577. doi:10.1097/prs.0000000000004375 [PubMed: 29794715]
72. Butkus R, Serchen J, Moyer DV, Bornstein SS, Hingle ST. Achieving Gender Equity in Physician Compensation and Career Advancement: A Position Paper of the American College of Physicians. *Annals of internal medicine.* 5 15 2018;168(10):721–723. doi:10.7326/m17-3438 [PubMed: 29710100]
73. Cheesborough JE, Gray SS, Bajaj AK. Striking a Better Integration of Work and Life: Challenges and Solutions. *Plast Reconstr Surg.* 2 2017;139(2):495–500. doi:10.1097/prs.0000000000002955 [PubMed: 28125538]
74. Cochran A, Hauschild T, Elder WB, Neumayer LA, Brasel KJ, Crandall ML. Perceived gender-based barriers to careers in academic surgery. *Am J Surg.* 8 2013;206(2):263–8. doi:10.1016/j.amjsurg.2012.07.044 [PubMed: 23414631]
75. Devine PG, Forscher PS, Austin AJ, Cox WT. Long-term reduction in implicit race bias: A prejudice habit-breaking intervention. *Journal of experimental social psychology.* 11 2012;48(6):1267–1278. doi:10.1016/j.jesp.2012.06.003 [PubMed: 23524616]
76. Fried LP, Francomano CA, MacDonald SM, et al. Career development for women in academic medicine: Multiple interventions in a department of medicine. *Jama.* 9 18 1996;276(11):898–905. [PubMed: 8782639]
77. Furnas HJ, Li AY, Garza RM, et al. An Analysis of Differences in the Number of Children for Female and Male Plastic Surgeons. *Plastic and Reconstructive Surgery.* 2019;143(1):315–326. doi:10.1097/prs.0000000000005097 [PubMed: 30589810]
78. Girod S, Fassiotto M, Grewal D, et al. Reducing Implicit Gender Leadership Bias in Academic Medicine With an Educational Intervention. *Academic medicine : journal of the Association of American Medical Colleges.* 8 2016;91(8):1143–50. doi:10.1097/acm.0000000000001099 [PubMed: 26826068]
79. Jagsi R, Griffith KA, Stewart A, Sambuco D, DeCastro R, Ubel PA. Gender differences in salary in a recent cohort of early-career physician-researchers. *Academic medicine : journal of the Association of American Medical Colleges.* 11 2013;88(11):1689–99. doi:10.1097/ACM.0b013e3182a71519 [PubMed: 24072109]
80. Jolly S, Griffith KA, DeCastro R, Stewart A, Ubel P, Jagsi R. Gender differences in time spent on parenting and domestic responsibilities by high-achieving young physician-researchers. *Annals of internal medicine.* 3 4 2014;160(5):344–53. doi:10.7326/m13-0974 [PubMed: 24737273]

81. Longo P, Straehley CJ. Whack! I've hit the glass ceiling! Women's efforts to gain status in surgery. *Gender medicine*. 3 2008;5(1):88–100. [PubMed: 18420169]
82. Phillips NA, Tannan SC, Kalliainen LK. Understanding and Overcoming Implicit Gender Bias in Plastic Surgery. *Plastic and Reconstructive Surgery*. 2016;138(5):1111–1116. doi:10.1097/prs.0000000000002668 [PubMed: 27391836]
83. Pories SE, Turner PL, Greenberg CC, Babu MA, Parangi S. Leadership in American Surgery: Women are Rising to the Top. *Ann Surg*. 2 2019;269(2):199–205. doi:10.1097/sla.0000000000002978 [PubMed: 30048312]
84. Rudman LA, Ashmore RD, Gary ML. "Unlearning" automatic biases: the malleability of implicit prejudice and stereotypes. *Journal of personality and social psychology*. 11 2001;81(5):856–68. [PubMed: 11708562]
85. Shah AR, Haws MJ, Kalliainen LK. Factors Affecting Women's Success in Academic and Private Practice Plastic Surgery. *Plastic and Reconstructive Surgery*. 2018;141(4):1063–1070. doi:10.1097/prs.0000000000004247 [PubMed: 29595742]
86. Sheridan JT, Fine E, Pribbenow CM, Handelsman J, Carnes M. Searching for excellence & diversity: increasing the hiring of women faculty at one academic medical center. *Academic medicine : journal of the Association of American Medical Colleges*. 6 2010;85(6):999–1007. doi:10.1097/ACM.0b013e3181dbf75a [PubMed: 20505400]
87. Siotos C, Payne RM, Stone JP, et al. Evolution of Workforce Diversity in Surgery(). *Journal of surgical education*. 1 9 2019;doi:10.1016/j.jsurg.2018.12.009
88. Waljee JF, Chang KW-C, Kim HM, et al. Gender Disparities in Academic Practice. *Plastic and Reconstructive Surgery*. 2015;136(3):380e–387e. doi:10.1097/prs.0000000000001530
89. Yedidia MJ, Bickel J. Why aren't there more women leaders in academic medicine? the views of clinical department chairs. *Academic medicine : journal of the Association of American Medical Colleges*. 5 2001;76(5):453–65. [PubMed: 11346523]

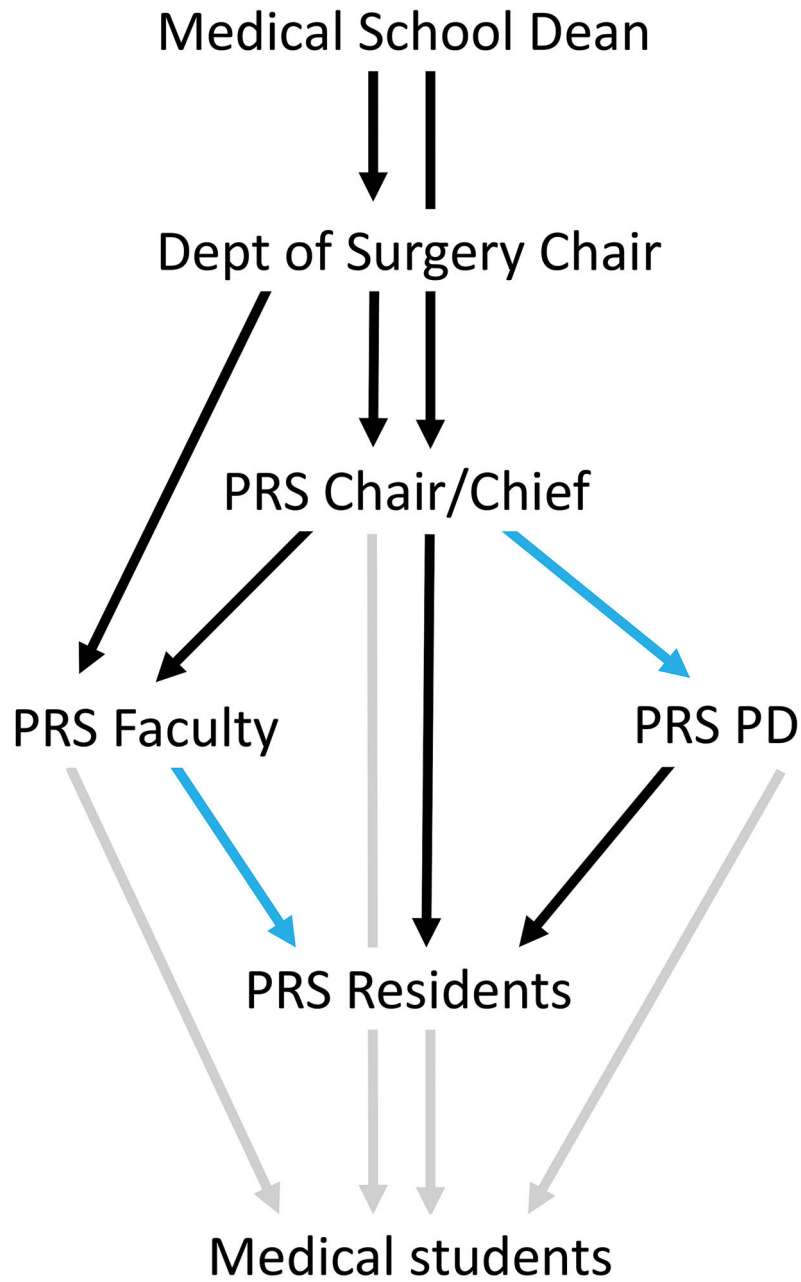


Figure 1.

Relationships hypothesized to be influenced by gender. Arrows point from positions of higher to lower rank within academic surgery, with the gender of the former hypothesized to influence the gender of latter. Significant associations are represented with blue arrows. No association is represented with black arrows, however the effect size of PRS Chair on PRS residents is 45%. The grey arrows represent hypothetical gender associations that were unable to be addressed in our study. The relationship between Dept of Surgery Chair and PRS Chair/Chief or PRS faculty were only investigated if Plastic Surgery was not a separate department. Dept = Department, PD = Program Director, PRS = Plastic and Reconstructive Surgery.

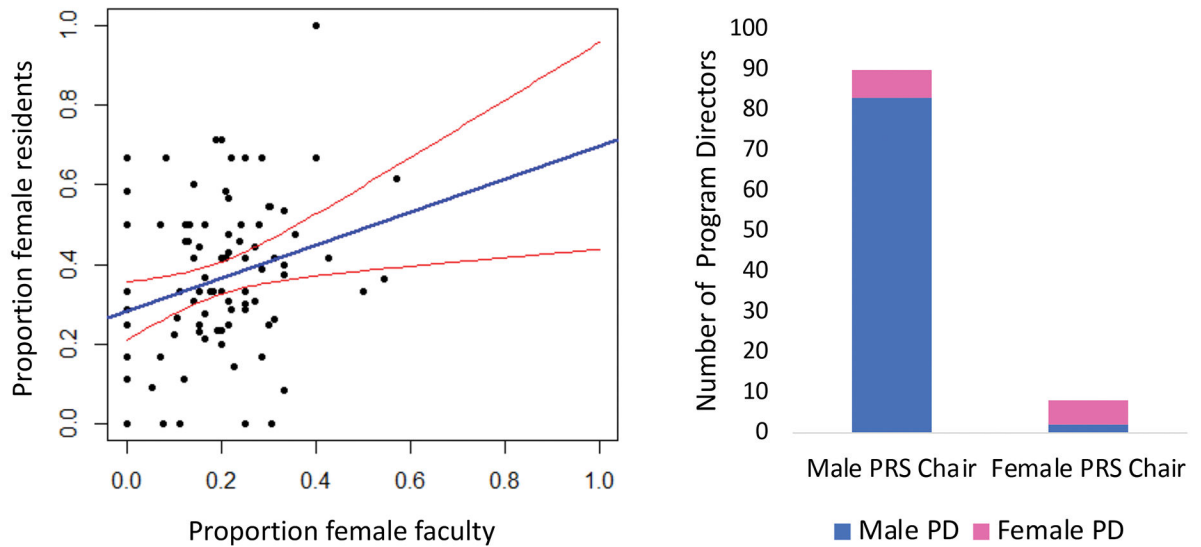


Figure 2.

A. The gender makeup of Plastic Surgery faculty is positively correlated with the gender makeup of the residents. The linear regression model $y = 0.28 + 0.41x$ is shown in blue. This model demonstrates the significantly positive impact that proportion of total female faculty (x) has on the proportion of female residents (y). The upper and lower bounds of the 95% CI for the regression are shown in red. **B.** The gender of the PRS chair is associated with the gender of the program director (PD); a female PRS chair is associated with significantly higher appointments of female PDs. PD = Program Director, PRS = Plastic and Reconstructive Surgery.

Table 1.

Academic position, by title and gender.

	Female	Male	% Female
Medical School Dean	16	80	16.7%
Department of Surgery Chair *	12	62	16.2%
PRS Chair	8 [#]	90 [#]	8.2%
PRS PD	13	86	13.1%
Total PRS Faculty (including Chair)	268	1104	19.5%
Core PRS Faculty (including Chair)	243	963	20.1%
PRS Residents	416	687	37.8%

PRS= Plastic and Reconstructive Surgery, PD= Program Director

* In programs where Plastic Surgery is not a separate department

1 female and 3 males are interim PRS Chairs

Table 2.

Investigating the associations between gender of chairs, program directors, faculty and residents.

2 variables being tested for association		Test statistic	P-value
Medical School Dean	Gender of Surgery Chair	Fisher's exact, $p = 1.0$	1.00
	Gender of PRS Chair	Fisher's exact, $p = 0.19$	0.19
Gender of Surgery Chair	Gender of PRS Chair	Fisher's exact, $p = 1.0$	1.00
	% of Female Faculty (total)	T-test, $t = 3.2 \times 10^{-3}$	1.00
	% of Female Faculty (core)	T-test, $t = 0.10$	0.92
Gender of PRS Chair	Gender of PD	Fisher's exact, $p = 4 \times 10^{-5}$	4.0×10^{-5} [#]
	% of Female Faculty (total)	T-test, $t = 0.61$	0.56
	% of Female Faculty (core)	T-test, $t = 0.72$	0.50
	% of Female Residents	T-test, $t = 1.81$	0.11 [^]
Gender of PD	% of Female Residents	T-test, $t = 0.20$	0.84
% of Female Faculty (total)	% of Female Residents	Linear correlation, $R^2 = 0.07$	0.01

PRS=Plastic and Reconstructive Surgery, PD=Program Director

[#]This association remains significant ($p = 3.7 \times 10^{-3}$) when Chairs who also serve as PD are eliminated from analysis.

[^] Although not statistically significant, it is worth noting that the effect size is 45% (i.e. the presence of a female Chair is associated with a 45% relative increase in female residents).

Table 3.

Representation of women in leadership in plastic surgery professional societies.

Professional Society	Year of Inception	# Women Presidents
American Association of Plastic Surgeons (AAPS)	1921	2
American Society of Plastic Surgeons (ASPS) *	1932	2
Plastic Surgery Foundation (PSF)	1932	4
American Society for Surgery of the Hand (ASSH)	1947	1
Plastic Surgery Research Council (PSRC)	1955	5
American Society for Aesthetic Plastic Surgery (ASAPS) *	1967	0
American Association for Hand Surgery (AAHS)	1970	1
American Society for Peripheral Nerve (ASPN)	1990	5

* Lynn Jeffers is the current President of ASPS (2020), and Jennifer Walden and Melinda Haws have been elected as future presidents of ASAPS. These elections occurred after the data collection period of this study.

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Table 4.

Strategies to overcome barriers to recruitment, retention, and promotion of women in academic plastic surgery.

Barrier	Intervention
Common to all barriers	Incentivize departments to enhance gender diversity and women in leadership
	Acknowledge disparities
	Evaluate and publish disparity data
	Investigate root-causes, using task forces with women leaders
	Encourage initiatives championed by men
	Implement strategies for improvement
	Monitor outcomes Publish results of interventions
Slower promotion	Clearly define tenure criteria and promotion eligibility
	Actively promote women to leadership roles and provide them with leadership and career-development training
	Conduct annual performance evaluations, monitoring the progress of high-potential women closely
	Develop part-time or clinical tenure track positions that don't emphasize time (allow for clock-stopping, value quality over quantity of work)
Traditional gender roles/role congruity	Ignore false humility
	Own one's accomplishments and appreciate one's talent
	Maintain a noticeable profile despite the desire to be reserved
	Lean in and advocate for one's self
Confidence gap	Include residency curricula that address leadership, communication skills, and self-advocacy
	Incorporate values affirmations and social-belonging interventions
	Highlight women's accomplishments to boost confidence and empower
Personal and family demands	Negotiate family responsibilities with partner
	Provide 24-hour on-site childcare, sick-child daycare, and nanny-share networks
	Discourage meetings after traditional work hours
	Limit nighttime call for parents with young children
	Provide childcare at professional meetings (organized by professional societies)
Discrimination and bias	Acknowledge one's own blind spots to promote openness
	Speak up and advocate for others who may be in positions of less power
	Counsel those who discriminate and demonstrate bias
	Research skills women use to overcome discrimination and share these with other women
	Train whole department and members of search/selection committees on implicit biases and provide strategies to combat them
	Develop transparent, fair, and thorough recruitment and hiring processes with sex-blind screening
	Use counter-stereotypic exposures (i.e. invite a successful young black female surgeon-scientist to grand rounds vs older white male)
Lower academic productivity	Analyze and publish data of differences in grant applications, success rates, and award sizes
	Establish diversity on funding panels, with target proportions for women and under-represented minorities
	Train funding panels on implicit bias
	Improve the mentorship and sponsorship of young female faculty

Barrier	Intervention
Lack of role models	<p><i>Actively search for female and male mentors</i></p> <p><i>Attend national meetings and join professional societies to grow network</i></p> <p>Promote more women to leadership positions across institutions/professional societies/plastic surgery governing boards</p> <p>Invite female visiting professors and speakers, moderators, and panelists to our national societies</p> <p>Provide mentorship and leadership training for entire department</p> <p>Institute formalized mentorship and leadership programs within department and regionally/nationally (e.g. AWS Early Career Women Faculty Mentorship Program, ASRM Women's Microsurgery Group, University of Michigan Women's Surgical Collaborative)</p> <p>Offer travel scholarships for female residents and medical students to attending regional/national meetings (e.g. ASRM WMG ViOptix Travel Scholarship)</p> <p>Engage social media</p>
Pregnancy	<p><i>Communicate with Chief/PD early in pregnancy</i></p> <p><i>Educate oneself on parental leave policies</i></p> <p>Develop a universal, comprehensive parental support/leave policy that aligns with ACS recommendations (no less than 6 weeks for parental leave)</p> <p>Provide coverage for oocyte preservation</p> <p>Create lactation rooms and support breastfeeding</p> <p>Cover resident hours with physician extenders</p> <p>Compensate covering residents</p>
Gender wage gap	<p><i>Negotiate for salary, bonus, and benefits</i></p> <p><i>Attend salary negotiation training</i></p> <p><i>Research the market value of one's skillset</i></p> <p><i>When negotiating, be friendly, emphasize common goals, highlight unique skillset, and reframe the discussion from a contest/competition to an opportunity for problem-solving</i></p> <p>Provide salary negotiation training for whole department</p> <p>Externally set transparent and objective guidelines for salary and bonus structure based on market information (do not use prior salaries)</p> <p>Provide equitable compensation, without penalizing for part-time work</p> <p>Conduct annual departmental wage analysis</p>
Medical student recruitment	<p>Integrate plastic surgery early in the preclinical years (i.e. faculty/residents participate in anatomy dissections, lectures, small group sessions)</p> <p>Involve residents/faculty in medical student interest groups</p> <p>Provide an immersive surgical experience to pre-clinical students</p>

Purple text indicates interventions women can individually take, black text indicates interventions institutions/societies/boards can take