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The Role of Dedicated Research Training in Promoting Academic Success in Plastic Surgery: Analysis of 949 Faculty Career Outcomes

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Background: This study aimed to analyze the association between completion of research training and career success in American plastic surgery faculty to aid trainees in their decisions to perform research fellowships.
Methods: A cross-sectional analysis of attending academic plastic surgeons in the United States was conducted. Outcomes were compared between faculty who completed research training (research fellowship, PhD, or MPH) and those who did not. Outcomes included promotion to full professor and/or department chair, h-index, and attainment of National Institutes of Health funding. Outcomes were analyzed using chi-squared tests, *t* tests, and multivariable regressions.
Results: A total of 949 plastic surgery faculty members were included, and of those, 185 (19.5%) completed dedicated research training, including 13.7% (n = 130) who completed a research fellowship. Surgeons who completed dedicated research training were significantly more likely to achieve full professorship (31.4% versus 24.1%, $P = 0.01$), obtain National Institutes of Health funding (18.4% versus 6.5%, $P < 0.001$), and have a higher mean h-index (15.6 versus 11.6, $P < 0.001$). Dedicated research fellowships were independently predictive of achieving full professorship (OR = 2.12, $P = 0.002$), increased h-index ($\beta = 4.86$, $P < 0.001$), and attainment of National Institutes of Health funding (OR = 5.06, $P = 0.01$). Completion of dedicated research training did not predict an increased likelihood of becoming department chair.
Conclusion: The performance of dedicated research training was predictive of improved markers of career success in plastic surgery and should be considered beneficial in both the short and long term. *(Plast Reconstr Surg Glob Open 2023; 11:e4996; doi: 10.1097/GOX.0000000000004996; Published online 17 May 2023.)*

INTRODUCTION

In recent years, there has been a widespread increase in competition for integrated plastic surgical residency positions owing to a number of factors, including a growing interest in the field and a reduction in traditional independent plastic surgery residency positions, among other reasons.[1–3] This issue has been compounded by the transition of the United States Medical Licensing Examination Step 1, which was historically used as an objective screening metric for determining residency interview invitations, from a scored examination to a pass/fail examination in 2022.[4–6] This has led many prospective applicants to strengthen their residency applications by completing dedicated research fellowships or other research training (eg, obtaining a PhD or MPH).[7–11]

Prior data suggest that there may be an immediate benefit to completing research training, as applicants completing research fellowships have been more successful in the integrated plastic surgery residency match.[7–9,11,12] As of 2022, among United States Allopathic (MD) graduates, successfully matched applicants to integrated plastic surgery reported the highest number of academic publications and presentations among all medical and surgical specialties.[1] There is also a demonstrated benefit to

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additional research training among plastic surgery residents towards a clinical fellowship match, and many trainees value protected time for research during residency.[13,14] Furthermore, several plastic surgery residency programs require a dedicated research year during training. Despite this, in the setting of unchecked increases in medical school tuition, increasing physician debt, and declining reimbursement, trainees must carefully weigh the opportunity cost of delaying attainment of an attending surgeon-level salary.

Although the benefits of research training for plastic surgery trainees are apparent in terms of residency and fellowship matches, the long-term career implications of one or more years of dedicated research training remain unclear. As many aspects of career success as an academic surgeon rely on research output, it would appear that completion of research training would confer skills necessary for such markers of success, including publication output, attainment of funding from the National Institutes of Health (NIH), and oversight of clinical trials.[15–17] It has been established that there is a clear link between academic career success and completion of research training in other surgical specialties; however, to date, there remains limited evidence regarding the potential long-term benefits of research training in plastic surgery.[18–20] This study aimed to examine the long-term career benefits of completing dedicated research training, with an emphasis on research fellowships in promoting academic career success among academic plastic surgical faculty across the United States.

Takeaways

Question: Are there long-term career benefits to completing dedicated research training in academic plastic surgery?

Findings: Surgeons who completed research training were more likely to achieve full professorship, obtain federal funding, and have a higher h-index. Completion of a research fellowship was independently predictive of improved academic career outcomes. Research training had no influence on promotion to program director or department chair.

Meaning: In academic plastic surgery, there are both short- and long-term benefits to completing dedicated research training in medical school or residency.

METHODS

Study Design

A retrospective, cross-sectional analysis of academic plastic surgery faculty in the United States was performed. Faculty members were included if they were affiliated with the United States Accreditation Council for Graduate Medical Education accredited plastic surgery training program (either independent and/or integrated) during the 2020–2021 academic calendar. Residency programs were identified through the listings of the American Council of Academic Plastic Surgeons program.[21] Faculty members were identified from the publicly available residency program websites for each institution. Faculty members were excluded if they were not full time or if they were not trained in plastic surgery (eg, oral and maxillofacial surgery or podiatry). The present study is exempt from institutional review board approval.

Data Collection

All publicly available faculty data were identified from residency program websites, and missing data were obtained from publicly available records, including faculty LinkedIn and Doximity profiles. The following covariates were assessed for each faculty member. Demographic data included sex, race/ethnicity, and underrepresented medicine status (African American, Latino, American Indian/Alaskan Native, Native Hawaiian, and other Pacific Islanders). Gender identity and race were determined from publicly available faculty images and profiles. Clinical and training data included medical school, advanced degrees (PhD, MBA, DMD/DDS, MS, MA, MHS, MPH), plastic surgery residency program type (independent or integrated), clinical fellowship training (microsurgery, aesthetic surgery, hand surgery, craniofacial surgery), completion of at least one dedicated year of research training in medical school or residency, final year of training, and years in practice (as of 2021; relative to final year of training). Completion of dedicated research training was defined as the completion of any of the following prior to the completion of residency: research fellowship (either clinical or basic science), PhD, or MPH. The following career outcome data were collected: faculty position (assistant, associate, or full professor), endowed professorship, and chair/chief status. Research output was defined as the number of publications, citations, h-index, and NIH funding data over the course of a career.

Publication and funding data were collected using the Scopus Author Identifier (scopus.com), author search, and NIH Reporter (projectreporter.nih.gov). Editorial board membership was determined using online mastheads for the following journals: *Plastic and Reconstructive Surgery, Plastic and Reconstructive Surgery – Global Open, Annals of Plastic Surgery, Journal of Craniofacial Surgery, Cleft Palate-Craniofacial Journal, Journal Plastic, Reconstructive, & Aesthetic Surgery, Microsurgery, Journal of Reconstructive Microsurgery, Aesthetic Surgery Journal, and Journal of Hand Surgery, and Hand.*

The primary career outcomes analyzed included full professorship, chief/chair status, attainment of NIH funding, and the h-index. Secondary career outcomes included endowed professor status, program director status, the mean number of academic publications, and academic journal board positions.

Statistical Analysis

Descriptive statistical methods were used to report faculty demographic and career characteristics. Categorical variables were summarized as frequencies and percentages, and continuous variables were summarized as means with standard deviations. Bivariate comparisons

were made for primary and secondary career outcomes between faculty who completed dedicated research training during medical school or residency and those who did not. Faculty completing a research fellowship, in addition to a PhD or MPH, were grouped in their respective degree categories for analyses. Categorical variables were compared using chi-square or Fisher exact tests. Continuous variables were compared using *t* tests or Mann-Whitney *U* tests. Multivariable logistic and linear regressions were performed for the primary outcomes, including full professorship, department chair status, NIH funding status, and the h-index. The final regression models were adjusted for the following covariates: years in practice, non-White race, male sex, completion of a research fellowship, PhD, and MPH. Statistical significance was set at an alpha level of 0.05 significance. All statistical analyses were performed utilizing STATA/MP 17.0 (StataCorp LLC; College Station, Tex.).

RESULTS

A total of 99 accredited plastic surgery residency programs were identified, and 949 plastic surgery faculty members across these programs met inclusion criteria. Demographic, educational, and career characteristics of the faculty members are summarized in Table 1. The cohort was 78.3% men (n = 743) with 14.8±11.4 years in practice, on average. Of the cohort, 19.5% (n = 185) completed dedicated research training; 13.7% (n = 130) completed a dedicated research fellowship during medical school or residency, 5.9% (n = 56) had PhD degrees, and 1.5% (n = 14) had MPH degrees. Of the individuals with a PhD, 19.6% (n = 11) completed an additional research fellowship at some point during training, and of the individuals with an MPH, 28.6% (n = 4) also completed a research fellowship. Across the United States, 25.5% (n = 242) had achieved full professorship, 6.6% (n = 63) held an endowed professorship, and 10.1% (n = 96) had become department chief/chair.

Table 1. Demographic, Educational, and Career Characteristics of the Faculty

Characteristic	Value (N = 949)
Years in practice, mean (SD)	14.8 (11.4)
Men	743 (78.3%)
Women	206 (21.7%)
Underrepresented in medicine	51 (5.4%)
Academic rank	
Assistant professor	375 (39.5%)
Associate professor	225 (23.7%)
Full professor	242 (25.5%)
Endowed professorship	63 (6.6%)
Residency program director	96 (10.1%)
Department chair/chief	96 (10.1%)
Additional advanced degrees	
PhD	56 (5.9%)
MBA	32 (3.4%)
DMD/DDS	24 (2.5%)
MS/MSc	32 (3.4%)
MA	9 (0.9%)
MHS	6 (0.6%)
MPH	14 (1.5%)
Other	10 (1.1%)
Research fellowship	130 (13.7%)
Clinical fellowship	652 (68.7%)

Unless otherwise noted, data are represented as frequencies and percentages.

Bivariate analyses of career outcomes between faculty members completing dedicated research training and those who did not are summarized in Table 2. In terms of academic promotion, completion of dedicated research training was associated with an increased likelihood of achieving full professorship (31.4% versus 24.1%, $P = 0.01$). Research training was also associated with improved academic productivity markers, including a greater mean number of publications (65.5±90.1 versus 43.2±70.0, $P < 0.001$) and a greater h-index (15.6±12.3 versus 11.6±11.4, $P < 0.001$). Furthermore, the cohort was more likely to have obtained any NIH funding during their academic careers (18.4% versus 6.5%, $P < 0.001$) than those who did not complete research training. Faculty members who completed dedicated research training were not significantly more likely to be program directors or department chairs/chiefs.

The results of a multivariable regression models for selected academic career outcomes with subgroup analyses of the type of research training received are summarized in Table 3. Completion of a dedicated research fellowship prior to becoming an attending surgeon was independently predictive of achieving full professorship (OR, 2.12; $P = 0.002$), attainment of NIH funding (OR, 5.06; $P = 0.01$), and higher mean h-index ($\beta = 4.86$; $P < 0.001$). Attainment of a PhD was also significantly predictive of being NIH-funded (OR, 3.93; $P = 0.001$). Having a PhD or MPH degree was not predictive of promotion to full professorship or a higher mean h-index. Finally, the completion of dedicated research training was not predictive of promotion to department chair/chief.

DISCUSSION

With the increased emphasis placed on research experience in prospective applicants to plastic surgical residency, the purpose of the present study was to evaluate the long-term career effects of dedicated research training so that trainees may weigh both short- and long-term benefits. Analysis of all academic plastic surgical faculty across the United States revealed that nearly 20% of attending surgeons have completed dedicated research training prior to becoming faculty, including a large number of those completing research fellowships, a proportion that is likely to continue to increase in the future. The long-term benefits associated with training are sizeable, as demonstrated in this study with the most currently available faculty data reported. It was found that numerous markers of academic success improved with the prior completion of research fellowships. These markers included promotion to full professorship, attainment of NIH funding, and research output.

Table 2. Bivariate Analyses of Academic Outcomes Based on the Performance of Dedicated Research Training

	Dedicated Research Training, N = 185	No Dedicated Research Training, N = 764	*P*
Years in practice, mean (SD)	14.2 (11.4)	15.0 (11.5)	0.37
Academic outcome			
Achieved rank of full professor	58 (31.4%)	184 (24.1%)	**0.01***
Endowed professorship	13 (7.0%)	50 (6.5%)	0.81
Program director	17 (9.2%)	79 (10.3%)	0.64
Department chair/chief	16 (8.6%)	80 (10.5%)	0.54
Number of publications, mean (SD)	65.5 (90.1)	43.2 (70.0)	**<0.001***
H-index, mean (SD)	15.6 (12.3)	11.6 (11.4)	**<0.001***
Has held board position on an academic journal	50 (27.0%)	132 (17.3%)	**0.002***
Obtained any NIH funding	34 (18.4%)	50 (6.5%)	**<0.001***

Unless otherwise noted, data are represented as frequencies and percentages.
*Indicates a significant association.

Table 3. Multivariable Regressions Modeling Academic Outcomes Based on Completion of a Research Training

Covariate	Full Professor			Department Chair/Chief			NIH Funded			H-index		
N = 949	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	β	95% CI	*P*
Research fellowship	2.12	1.31–3.44	**0.002***	0.97	0.51–1.84	0.92	5.06	1.46–17.57	**0.01***	4.86	2.91–6.82	**<0.001***
PhD	1.79	0.85–3.79	0.13	0.63	0.19–2.09	0.45	3.93	1.80–8.58	**0.001***	2.33	−0.55 to 5.22	0.11
MPH	0.33	0.05–2.10	0.24	0.65	0.08–5.34	0.69	1.73	0.97–3.09	0.06	2.84	−2.83 to 8.50	0.33

Multivariable logistic regressions were used to model full professorship, department chair/chief status, and NIH funding status. A multivariable linear regression was used to model h-index. The final models for full professorship, department chair/chief status, NIH funding status, and h-index included the following covariates: completion of research fellowship, PhD, MPH, non-White race, male sex, residency program tier, and years in practice.
*Indicates significance.
OR, odds ratio; CI, confidence interval.

In this study, academic promotion and research output in plastic surgery was strongly linked to having completed prior research training. Academic promotion to full professorship is a multifactorial process that considers clinical productivity, medical education, leadership roles, and research output. In many instances, academic promotion to full professorship may rely on high research output. It is unsurprising, then, that completion of dedicated research fellowships, in which future faculty received dedicated research training, mentorship, and additional time to publish, was independently predictive of promotion to full professorship. Markers associated with increased research output, including h-index and procurement of NIH funding, were significantly greater in the cohort that completed research fellowships, and all of these markers have been demonstrated to significantly influence career promotion in plastic surgery and other surgical specialties.[15,22–25] A prior study by Jinka et al demonstrated that the timing of research fellowships may play a role in early career academic productivity, as completion of a research fellowship during residency (and not during medical school) was predictive of increased research output.[17] It remains unclear, though, whether timing of research fellowships influence long-term outcomes beyond productivity as a junior faculty, and the presented study demonstrated that completion of a research fellowship, regardless of timing, was predictive of increased long-term productivity.

The results of the present study corroborate those of Lopez et al., who examined the influence of PhD degrees and research fellowships on academic productivity and plastic surgical career outcomes in a cohort of 607 faculty members, as of 2014.[20] Coinciding with the results of Lopez et al, our study found an independently predictive association between research training (specifically, research fellowships) and the procurement of NIH funding and a higher h-index. The present study also found, however, that completion of a dedicated research fellowship was predictive of improved academic rank (ie, promotion to full professor). This difference may be due to the constantly evolving landscape of plastic surgery faculty in the United States, as well as evolving factors for academic promotion, potentially placing more emphasis on academic productivity.

Completion of research training did not seem to influence long-term promotion into leadership roles beyond full professorship, including residency program director, department chief/chair, and endowed professorships. Although research output and quality are likely vital components of promotion to these positions, other qualities demonstrated or attained through the course of a career are also likely to be necessary. In the case of promotion to residency or fellowship program director, these factors are likely to include demonstrated passion for and excellence in medical education, mentorship, and dedicated training in medical education. On the other hand, promotion to department chair is likely to hold surgical excellence, demonstrated leadership ability, impact on the field of plastic surgery, management skills, and years in practice as equal, if not more, importance than research output. In considering the long-term benefits of completing research training in plastic surgery, however, it is certainly possible that the development of many of these external skills, such as leadership, medical education, and innovation, can only be fostered by spending a year of mentored research during the course of their training.

There are several limitations to the present study, which primarily issue from its design as a retrospective,

cross-sectional study utilizing publicly available data. The resources utilized to obtain faculty data, including publicly available residency program websites and public profiles, are limited in their utility, as these resources are often out of date or may have inaccuracies. The landscape of academic plastic surgical faculty is constantly evolving landscape, and this study is limited to the period from which career outcomes were obtained. It is likely that, as trends in completing research fellowships increase, a greater proportion of faculty in the future will have performed a research fellowship. Further, the timing of completion of research fellowship was not standardized; faculty may have completed these fellowships either during the course of medical school or during residency training, research fellowships may have been either one or two years, and, additionally, fellowships may have been either clinical or basic science. As data were obtained from publicly available data without a survey component, faculty gender identity was not self-identified and verified in a two-step manner, which has now become the gold standard.[26] Reported faculty race in this study suffers from the same limitation. This study was also limited by the measured outcomes. Although career success is often ambiguous and defined on a per-surgeon basis, the markers chosen (ie, research output, academic promotion, and NIH funding) are those that have traditionally represented career milestones in academic surgery. The utility of NIH funding as a metric of academic success in plastic surgery, in particular, may be limited by the fact that the majority of high-impact research in the specialty is unfunded.[27] Furthermore, academic promotion and career success are complex, multifactorial processes that rely on many factors, including clinical acumen, surgical excellence, leadership, and personality, among other attributes, in addition to research productivity. Finally, many applicants who elect to complete additional research training during medical school or residency may self-select into career positions that can inherently involve more research time (in lieu of private practice or purely clinical academic positions) and potentially have contributed to skewed outcome measures. Despite these limitations, this study utilized a large cohort comprising all academic plastic surgery faculty members in the United States and encompassed physicians from various backgrounds and clinical settings.

Although choosing to dedicate additional time to completing dedicated research training has impactful financial and personal implications for applicants, prospective applicants should know that the benefits extend beyond improving the likelihood of a successful match in the short team. Plastic surgery faculty in the United States who completed dedicated research training were found to have a higher likelihood of achieving milestones in academic career success, such as full professorship and procurement of NIH funding.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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