OPEN

PRS GLOBAL OPEN

SPECIAL TOPIC

Academic and Clinical Background of Plastic Surgery Residents of the Saudi Training Program

Qutaiba N. M. Shah Mardan, MBBS*
Ahmed B. Alharbi, MBBS†
Salman A. Alzaidi, MBBS‡
Eman S. Aldhafeer, MBBS§
Abdulmohsen M. Allazzam, MD†

Background: Plastic surgery residents are required to contribute to the scientific milieu, apart from honing their surgical skills. Data regarding their academic and clinical background are limited locally in comparison with their counterparts. This is the first study of its kind on the Saudi training program, with suggested potential solutions to shortcomings.

Methods: This is a cross-sectional study based on an electronic, 27-element, self-administered questionnaire sent to a WhatsApp group gathering all 40 plastic surgery residents of the Saudi program, with the exclusion of a single participant.

Results: The mean of overall residents' publications was 2.29 articles. No significant difference ($P = 0.438$) was found in the number of publications among residents of different levels. However, seniors have published significantly ($P = 0.002$) more articles (mean = 1.6; SD = 1.24) during residency compared with juniors (mean = 0.42; SD = 1). The group that had taken rotations in plastic surgery abroad published more articles ($P = 0.02$) than the group that did not. Using η correlation, a positive correlation ($\eta = 0.36$) was found between taking courses in research and publication.

Conclusions: The Saudi plastic surgery residents are ahead of their colleagues in other local specialties but fall behind their counterparts internationally. The relatively poor contribution in terms of research, posters, and oral presentations could be remedied with measures such as providing protected research time and mentorship. They should be emboldened to pursue postgraduate studies, as only 3 residents had a Master of Science degree. *(Plast Reconstr Surg Glob Open 2020;8:e2865; doi: 10.1097/GOX.0000000000002865; Published online 21 May 2020.)*

INTRODUCTION

On top of sharpening their surgical skills, scholarly contribution in terms of publications, presentations at scientific meetings, and attending courses form an imperative part of the plastic surgery training. A project group[1] surveyed 191 residents from different specialties in the Kingdom of Saudi Arabia (KSA). Fewer than one third reported that they had participated in research, whereas 37.9% and 20.7% had presented oral or poster presentations, respectively.[1] In a different study involving 100 family medicine residents in KSA, approximately half of the cohort expressed unwillingness to conduct research, with only 43% of the residents reported publishing before. A poster or oral presentation was done by 39%.[2] Such subpar levels of participation in academic activities were noted in a sample of pediatric residents in KSA. As high as 86.7% never published an article, and 78.3% did not present oral nor poster presentations before.[3] On a regional level, 73.9% of 142 Bahraini residents had an opportunity to participate in research, with considerably lesser trainees reported presenting oral or poster presentations (around 23.2% and 31%, respectively).[4]

Internationally, different studies have been published investigating the background of the plastic surgery trainees.[5–11] However, this is the first study to discuss the academic and clinical background of the plastic surgery trainees of the Saudi program. After pinpointing areas of weakness, potential solutions to these obstacles are provided.

METHODOLOGY AND DESIGN

In this cross-sectional study, the authors structured a nonvalidated, self-administered questionnaire, using a

*From the *College of Medicine, Sulaiman Alrajhi Colleges, Al-Qassim, Al-Bukhariya, Saudi Arabia; †Surgery Department, Plastic Surgery Division, College of Medicine, King Khalid University Hospital, King Saud University Medical City, Riyadh, Saudi Arabia; ‡College of Medicine, Taif University, Taif, Saudi Arabia; and §King Abdulaziz Medical City, Riyadh, Saudi Arabia.*

Received for publication December 21, 2019; accepted March 26, 2020.

DOI: 10.1097/GOX.0000000000002865

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

Google survey. The 27-element–based questionnaire asked about residents' clinical and academic performance. It was stated that no identifier information was asked, nor there were positive or negative consequences should the subject filled the questionnaire or refrained from doing so. Therefore, the project was not submitted to an institutional review board. In May 2019, the survey was sent to a WhatsApp group gathering all plastic surgery trainees in the Saudi program. The single inclusion criterion was being a plastic surgery trainee of the Saudi program, and rotators from other specialties were excluded. No sample size calculation was done because all 40 plastic surgery trainees, including the recently accepted ones, have participated. A single respondent was excluded from the analysis due to contradicting answers, reducing the population to 39 trainees.

Analysis of data was conducted using SPSS, 25th edition of Microsoft. The following variables were ordinal: grade point average (GPA), the number of publications, publications where the subject is the first author, presentations, and posters. They were coded as ranged values. For example, the volunteers were asked whether they had no publications, or had 1–2, 3–5, or >5. Therefore, a separate set of variables was created where the midpoint of the ranges was included to extract meaningful means to facilitate the analysis. To elaborate this, 1.5 was the midpoint (where 1–2 was chosen) and 4 (where 3–5 was chosen). Consequently, subjects who chose >5 for a certain variable were excluded from the analysis of that particular variable because no mean is computable. Another variable was created for the overall published articles in which the extracted midpoints of published articles during and before residency were summed because this was not asked in the questionnaire.

Frequencies were calculated for all the variables. Kruskal-Wallis H test was used for the difference in the overall number of published articles among different levels of residents. Independent-samples t test was used for the difference in the number of publications between senior (from the fourth to the sixth year) and junior (from the first to the third year) residents. Mann-Whitney U test was done investigating any significant difference in the overall number of publications between the trainees who took rotations abroad and those who did not. A probability value of 0.05 was chosen for significance. Eta (η) correlation was used to determine the association between taking research courses and increased number of publications.

RESULTS AND ANALYSIS

Forty plastic surgery residents have filled in the questionnaire in this study, excluding a single participant. Demographic data of the study participants are detailed in Table 1. Regarding publications during medical school and internship, a majority, 62% (n = 24), had 1 or 2 publications by that time; 13% (n = 5) had between 3 and 5 publications; and 26% (n = 10) had not published any articles. None of the participants published >5 articles during medical school. During residency training, 49% (n = 19) had not published any articles, whereas only 5.1% (n = 2) had >5 articles published. Around 36% (n = 14) published 1 or 2 articles, and 10% (n = 4) published between 3 and 5 articles. Almost half of the residents, 44% (n = 17), responded that some of their published articles were in the field of plastic surgery. Exactly 33% (n = 13) published articles focused on plastic surgery, whereas none of the articles published by 23% (n = 9) of the trainees were in this field. Rather, they were in other disciplines. When asked about first authorship, 46% (n = 18) have never been a first author in any article and another 46% (n = 18) were identified as the first author in 1 or 2 articles only. 7.7% (n = 3) were the first author in 3–5 articles while none of the study population were the first author in >5 published articles. Taking the midpoint of overall published articles during medical school and residency, by summing their midpoint, 5.1% (n = 2), 7.7% (n = 3), 10% (n = 4), 21% (n = 8), and 51% (n = 19) of the residents have published an average of >5.5, 5.5, 4, 3, and 1.5 research articles, respectively. The remaining 8.1% (n = 3) have not published before. The mean of overall publications of the residents was 2.29 articles, excluding the 2 residents who published >5.5 articles (Table 1).

Half of the participants, 51% (n = 20), presented 1 or 2 posters in regional events. Nearly 10% (n = 4) presented 3–5 posters in regional meetings, whereas only a single person presented >5 times and 36% (n = 14) had never presented a poster before. On the international level, about 28% (n = 11) presented 1 or 2 posters and

Table 1. Participants' Demographic Data

Parameters	No. of Respondents (Percentage)
Sex	
Males	24 (61.5)
Females	15 (38.5)
Age, y	
24–27	15 (38.5)
28–30	13 (33.3)
31–35	11 (28.2)
>35	0 (0)
GPA in medical school	
<3.5–4 out of 5 or 3.25–3.5 out of 4	0 (0)
3.5–4 out of 5 or 3.25–3.5 out of 4	1 (2.6)
4–4.5 out of 5 or 3.5–3.75 out of 4	12 (30.8)
>4.5 out of 5 or 3.75 out of 4	26 (66.7)
Level of residency	
R1	9 (23.1)
R2	5 (12.8)
R3	6 (15.4)
R4	5 (12.8)
R5	5 (12.8)
R6	9 (23.1)
Plastic surgery experience before the program	
Summer courses or electives before internship	12 (30.8)
Rotations while in internship	20 (51.3)
Summer training and internship rotations	3 (7.7)
Nontraining plastic surgery position	4 (10.3)
Months spent rotating in plastic surgery during internship	
1	2 (5.1)
2	20 (51.3)
3	12 (30.8)
>3	5 (12.8)
Honors or prizes won	
None	15 (38.5)
1–2	21 (53.8)
3–5	0 (0)
>5	3 (7.7)

Table 2. Data about the Scholarly Output of the Residents

Parameters	No. of Respondents (Percentage)	Mean
Publications during college or internship		1.4
0	10 (25.6)	
1–2 (1.5)	24 (61.5)	
3–5 (4)	5 (12.8)	
>5 (no midpoint)	0 (0)	
Publications during residency		1
0	19 (48.7)	
1–2 (1.5)	14 (35.9)	
3–5 (4)	4 (10.3)	
>5 (no midpoint)	2 (5.1)	
First-author articles		1
0	18 (46.2)	
1–2 (1.5)	18 (46.2)	
3–5 (4)	3 (7.7)	
>5 (no midpoint)	0 (0)	
Regional posters		1.2
0	14 (35.9)	
1–2 (1.5)	20 (51.3)	
3–5 (4)	4 (10.3)	
>5 (no midpoint)	1 (2.6)	
International posters		0.5
0	26 (66.7)	
1–2 (1.5)	11 (28.2)	
3–5 (4)	2 (5.1)	
>5 (no midpoint)	0 (0)	
Regional presentations		1
0	15 (38.5)	
1–2 (1.5)	20 (51.3)	
3–5 (4)	2 (5.1)	
>5 (no midpoint)	2 (5.1)	
International presentations		0.4
0	28 (71.8)	
1–2 (1.5)	10 (25.6)	
3–5 (4)	1 (2.6)	
>5 (no midpoint)	0 (0)	

Values presented in the first column show ranges, with the calculated midpoint enclosed in parentheses. The values indicated by >5 are not included in the calculation of the mean because no midpoint could be extrapolated.

Table 3. Courses Attended by Residents

Parameters	No. of Respondents (Percentage)
Advanced trauma life support	
Yes	33 (84.6)
No	6 (15.4)
Basic surgical skills	
Yes	38 (97.4)
No	1 (2.6)
Microscopic and/or flap dissection	
Yes	22 (56.4)
No	17 (43.6)
Cosmetics related	
Yes	7 (17.9)
No	32 (82.1)
Research	
Yes	21 (53.8)
No	18 (46.2)
Other courses	
Yes	10 (25.6)
No	29 (74.4)

Other courses include wound care and management, peripheral nerve dissection, craniofacial anomalies, and surgical anatomy.

only 2 (5.1%) had between 3 and 5 poster presentations. A greater number, 67% (n = 26), had not presented any posters internationally, and none of the respondents presented >5 posters at the international level. As far as oral presentations are concerned, only 2 people, 5.1%, presented between 3 and 5 or >5 times at the regional level in comparison to 39% (n = 15) participants who did not give an oral presentation. The majority, 51% (n = 20), however, gave 1 or 2 regional oral presentations. At the international level, most of the study sample, 72% (n = 28), had not given oral presentations before. Almost 26% (n = 10) presented 1 or 2 oral presentations at an international meeting, whereas only a single person presented between 3 and 5 times and none of the participants presented >5 times. The midpoints of the aforementioned data are detailed in Table 2. Of the respondents, only 7.7% (n = 3) attained a higher degree in the form of a Master of Science. Approximately 21% (n = 8) of the study population took rotations abroad, outside KSA, in plastic surgery. Courses attended by the residents, different English qualification and medical licensing examinations taken by the trainees, and desired subspecialties are listed in Tables 3, 4, and 5, respectively.

Kruskal-Wallis H test showed an insignificant difference ($P = 0.438$; degrees of freedom = 5) among residents of different levels in the overall number of publications with a mean rank of 17.3 for R1, 24.2 for R2, 13.4 for R3, 18.1 for R4, 18.4 for R5, and 23.2 for R6 residents. Juniors differed significantly from seniors in terms of publications during residency [$t(35) = -3.38$; $P = 0.002$; 95% CI, −2 to −0.49 on independent samples t test]. The mean of seniors' publications (mean = 1.6; SD = 1.24) surpassed that of the juniors (mean = 0.42; SD = 1). Mann-Whitney U test indicated that the overall published articles, before and during residency, are significantly more in the group that took rotations in plastic surgery abroad (n = 7) in comparison with those who did not (n = 30) ($U = 52$; $P = 0.02$). Using η correlation, a positive correlation ($\eta = 0.36$) was found between taking courses in research and publishing more articles. No significant difference has been found in the overall published articles based on sex [$t(35) = 1.2$; $P = 0.2$; 95% CI, −35 to −1.57], using independent-samples t test.

DISCUSSION

A 27-element–based questionnaire was sent to all the plastic surgery trainees in Saudi Arabia. The purpose of this questionnaire was to examine different aspects of the residents' achievements, including academic and clinical domains and contrast it with their counterparts.

Experience in Plastic Surgery before Residency

Undergraduate electives and clerkships institute an important educational tool. Summer electives drive the students toward better preparation for clinical rotations, nurture their desire for a specific field, improve the chances of attachment to a mentor in that specialty, assist in acquisition of skills such as suturing and more thorough exposure to specialties shallowly covered in the undergraduate curricula.[12]

Plastic surgery trainees of the Saudi program enjoy some or all thereof advantages because all participants in this study had some form of experience in plastic surgery, before joining the training program, either through summer electives (31%), internship rotations (51%), nontraining positions (10%), or a combination of the abovementioned

Table 4. English Language Qualifications Tests and Licensing Examinations Taken by Residents

Parameters	No. of Respondents (Percentage)
English language qualification tests	
TOEFL	Taken: 3 (7.7) Not taken: 36 (92.3)
IELTS	Taken: 16 (41) Not taken: 23 (59)
Medical licensing examinations	
USMLE step 1	Taken: 6 (15) Not taken: 33 (85)
USMLE step 2	Taken: 4 (10) Not taken: 35 (90)
MCCQE	Taken: 9 (23) Not taken: 30 (77)
MRCS (part A or B)	Taken: 0 (0) Not taken: 39 (100)

IELTS, International English Language Testing System; MCCQE, Medical Council of Canada Qualifying Examination; MRCS, Medical Royal College of Surgeons; TOEFL, Test of English as a Foreign Language; USMLE, United States Medical Licensing Examination.

Table 5. Desired Subspecialties Arranged from "the Most Favorite" to "the Least"

Parameters	No. of Respondents (Percentage)
Hand and wrist	
Yes	18 (46.2)
Not chosen	21 (53.8)
Breast reconstruction	
Yes	14 (35.9)
Not chosen	25 (64.1)
Aesthetics	
Yes	12 (30.8)
Not chosen	27 (69.2)
Microsurgery	
Yes	12 (30.8)
Not chosen	27 (69.2)
Pediatrics	
Yes	11 (28.2)
Not chosen	28 (71.8)
Craniofacial surgery	
Yes	8 (20.5)
Not chosen	31 (79.5)
Burns	
Yes	6 (15.4)
Not chosen	33 (84.6)

Each resident could choose >1 single choice.

(7.7%). On the other hand, 55% of the plastic surgery trainees participating in the study by Opel et al[8] did not have any previous experience. Another survey encompassing 100 plastic surgery senior house officers, a nontraining position, showed that 37% of the group had previous experience in plastic surgery with an average of 2.9 years.[9]

Higher Degrees

Residents with higher postgraduate degrees are considered to be more research-productive.[13] Among the residents in the Saudi plastic surgery training program, only 3 (7.7%) had a higher degree, in the form of a master degree. Other studies[8] reported that 53% of their sample had attained postgraduate qualifications. Whitaker et al[9] reported that 25% of senior house officers in their study held a Bachelor of Science or a Bachelor of Medical Sciences degree. Another 5% had a Master of Arts degree, 3% had an Master of Science degree, and 1% had a Doctor of Philosophy degree. A survey was sent to trainees of the Canadian plastic surgery program, responded by 95 out of all 149 Canadian plastic surgery residents, showed that 15% and 3.2% of the residents had a master and a Doctor of Philosophy degree, respectively.[5] It is concluded that our trainees are falling short when compared with their counterparts in terms of academic degrees pursuit.

Background in Research

The value of conducting research goes beyond springboarding in competition for fellowship or academic positions.[1] It ensures continuous life-long learning, fosters critical thinking, and ultimately results in better patient care.[2] Means of publications were 2.29, 1.43, and 1, for articles published during medical school, for publications during residency, and for first-author articles, respectively. There was no significant difference between residents of dissimilar levels in the number of publications ($P = 0.438$). Sex, as well, had no influence ($P = 0.2$). However, seniors significantly published more articles than juniors during residency (1.6 versus 0.42 articles; $P = 0.002$). The higher the level, the more likely a resident was to publish. Residents who attended rotations in plastic surgery abroad published more articles ($P = 0.02$) in comparison to those who did not.

In a different study, up to 50% had at least 5 publications with around a quarter more reaching beyond 8.[8] The median number of publications as a first author in the United Kingdom for a plastic surgery trainee was 4.[6] A plenty of factors were identified that hindered the involvement of trainees in research in the Canadian plastic surgery programs. Even though 74% and 70% of the training centers integrated research as a requirement and the trainees were interested in research, respectively, 83% of the respondents considered time to be a major obstacle, 42% were unable to reach mentors, 38% complained of the ethical approval process, and around half of the trainees expressed that their program environment was not research-supportive.[5]

A combination of barriers to scholarly output was identified as pertinent to Saudi Arabia. These included insufficient training in research, lack of time allocated to research, overwhelming work-related stress, absence of proper supervision,[1,3,4] deficient understanding of statistics, and receiving no funding or rewards.[2] Although the findings in these local studies shared common ground with international consensus,[14–16] they surveyed a minority of residents who were not necessarily in plastic surgery. Almarghoub and Al-Qattan[17] reviewed the articles published from KSA, on plastic surgery within 2014 to 2018. Half of the publications were limited to case reports and retrospective studies, with no presence for clinical trials or surgical basic science studies, apart from 3 experimental projects.[17] In alignment with those findings, the publications of residents in other specialties in KSA were limited to case reports and cross-sectional studies,[1,2] with clear disengagement from basic sciences, clinical trials, and transitional projects.

To sum up this point, plastic surgery residents in the Saudi program are ahead of their colleagues in the other local programs[1–4] but are falling behind their counterparts in plastic surgery globally.[5,6,8,10]

Posters and Oral Presentations

While a single person (2.6%) in our population presented >5 posters regionally and 2 (5.1%) presented between 3 and 5 international posters, the majority (51% and 67%) either presented 1 or 2 regional or had no international posters, respectively. Similarly, 51% had 1 or 2 oral presentations in regional conferences and 72% had not presented in international conferences. Two trainees presented >5 times in regional conferences, whereas a single person presented between 3 and 5 times internationally. In comparison with international figures, two thirds of the population in the study by Opel et al[8] presented at least 5 oral presentations at national or international conferences, with 30% crossing the border of 8 presentations.[8] The median number of posters presented by a UK trainee in plastic surgery was 2.[6]

Courses, Future Plans, and Others

Taking the data in Table 3 into consideration, residents of other international programs participate in more various courses.[8] For example, none of the respondents in our sample reported taking courses in burn management, teaching, hand fracture management, and leadership.

For future career preferences, hand and wrist surgery (46%) followed by breast reconstruction (36%) were the top choices. Conversely, fewer trainees were willing to pursue further training in burns (15%). Research projects were likely to be influenced by such inclination because 43% of the publications reported in a article were focused on hand and wrist surgery.[17]

Potential Solutions to These Shortcomings

Half of the plastic surgery trainees in a study attained an intercalated degree,[6] a qualification that is not accessible to medical students in KSA. It can be gained through an additional year of in-depth studying and research in a particular subject. Benefits of such a program include improving or learning new skills, such as critical appraisal, publishing good-quality articles, and wider future career opportunities.[18] Research fellowships could be an alternative. On average per year, research fellows in plastic surgery published 5.25 articles, gave 5.4 oral presentations and 3 poster presentations during their fellowship.[19] More undergraduate students should be encouraged to pursue postgraduate degrees.

Time constraint is a global barrier to scholarly output. Integrating protected research time during training, albeit challenging, could help the residents reorient their effort toward good-quality projects and eventually publishing or presenting them in scientific committees.[20] Also, capable mentors play an invaluable role in the upbringing of the thriving resident.[20–22] Currently, the Saudi plastic surgery training program does not incorporate a mentorship system during residency nor a mandatory research curriculum, the employment of which could uplift the residents' overall performance. The positive impact of incorporating mandatory health research methodology training could be reflected by increased publications and presentations, as suggested by AlSayyad et al[4] and Alhaider et al.[3,4]

From the authors' point of view, a de facto reason behind poor scholar output could be traced back to medical school. Out of 172 medical students of a Saudi university, only 55.3% reported involvement in a research project.[23] A significant contribution to research during medical school predicts a better future as a researcher and a scientist.[24] Many universities integrate a mandatory research course, the quality of which should be improved.

Further, continuously rewarding the trainees, financial or social, will encourage more contribution,[20] especially that plastic surgery research field in KSA is shaded with lack of grants and prestigious awards.[17]

Limitations and Strength Points

This study was limited by using a self-administered questionnaire that subjects to recall bias. It would have been enlightening to have insight over the performance of the residents in the Saudi Medical Licensing Examination as it constitutes 50% of the final score when applying to the training programs, besides GPA and the curriculum vitae. It was excluded in this study, however, due to multiple modifications involving the test over the past years. The main strength of this study is the inclusion of all residents of the Saudi plastic surgery training program.

CONCLUSIONS

Plastic surgery residents undergo rigorous training beyond cutting and stitching. This study shows the background of plastic surgery residents in KSA. Promising measures were taken in the past, but a considerable distance exists toward the goal of outshining other programs. This gap can be closed with collaboration between program directors and trainees. Uncovering reasons holding the residents from publishing and presenting is of paramount importance. Providing intercalated and postgraduate degrees, research fellowships, protected research time, mentorship, and rewards might open the path for unlimited creativity.

Qutaiba N. M. Shah Mardan, MBBS
College of Medicine
Sulaiman Alrajhi Colleges
Muhammad Ibn Ali Al Suwaylim Street
P.O. Box 777 Al-Qassim
Al-Bukhariya 51941, Saudi Arabia
E-mail: Qutaiba.shah@gmail.com

REFERENCES

1. Mitwalli HA, Al Ghamdi KM, Moussa NA. Perceptions, attitudes, and practices towards research among resident physicians in training in Saudi Arabia. *East Mediterr Health J.* 2014;20:99–104.
2. Soubhanneyaz AA, Salem KA, Al-Dubai SAR. Perceptions, barriers, and practice of medical research of family medicine residents in Medina, Saudi Arabia. *J Family Community Med.* 2019;26:227–231.
3. Alhaider SA, Alshehri HA, Almedhesh SA. Research training, productivity and challenges among trainees of pediatric residency programs across Saudi Arabia. *Int J Pediatr Adolesc Med.* 2015;2:70–74.
4. AlSayyad A, Al Nashaba S, Al Eid K, et al. Knowledge, attitudes and practices of training doctors in a tertiary care hospital in Bahrain towards health research. *J Bahrain Med Soc.* 2019;31:23–29.

5. Al-Taha M, Al Youha S, Al-halabi B, et al. Barriers and attitudes to research among residents in plastic and reconstructive surgery: a national multicenter cross-sectional study. *J Surg Educ.* 2017;74:1094–1104.
6. Jalali M, Davies PS, Jalali M, et al. The UK plastic surgery trainee. *J Plast Reconstr Aesthet Surg.* 2011;64:1716–1717.
7. Jalali M, Abood A, Flint LA, et al. Skills courses in plastic surgery: impact of enhancing confidence, skills and understanding amongst junior doctors. *J Plast Reconstr Aesthet Surg.* 2011;64:976–978.
8. Opel S, Ghani Y, Branford O. The insider's guide to obtaining a national training number in plastic surgery. *Bull R Coll Surg Engl.* 2014;96:e1–e5.
9. Whitaker IS, Eyre JR, Izadi D, et al. Plastic surgery senior house officers in the UK and Ireland: academic background, publication rates and research plans. *Br J Plast Surg.* 2004;57:139–142.
10. Whitaker IS, Chahal CA, Leon R, et al. Gaining entry into plastic surgical training in the United Kingdom: a comparative study with orthopedics and otolaryngology. *Ann Plast Surg.* 2006;56:696–698.
11. Whitaker IS, Chahal CA, Rhodes ND, et al. Achievement of successful applicants to higher surgical training posts in plastic surgery in the United Kingdom. *Plast Reconstr Surg.* 2006;117:1667–1670.
12. Falk GA, Robb WB, Khan WH, et al. Student-selected components in surgery: providing practical experience and increasing student confidence. *Ir J Med Sci.* 2009;178:267–272.
13. Chan JY, Narasimhalu K, Goh O, et al. Resident research: why some do and others don't. *Singapore Med J.* 2017;58:212–217.
14. Khan H, Khan S, Iqbal A. Knowledge, attitudes and practices around health research: the perspective of physicians-in-training in Pakistan. *BMC Med Educ.* 2009;9:46.
15. Silcox LC, Ashbury TL, VanDenKerkhof EG, et al. Residents' and program directors' attitudes toward research during anesthesiology training: a Canadian perspective. *Anesth Analg.* 2006;102:859–864.
16. Gill S, Levin A, Djurdjev O, et al. Obstacles to residents' conducting research and predictors of publication. *Acad Med.* 2001;76:477.
17. Almarghoub MA, Al-Qattan MM. Publications from Saudi Arabia in plastic surgery in the recent five years. *Plast Reconstr Surg Glob Open.* 2019;7:e2404.
18. Agha R, Fowler A, Whitehurst K, et al. Why apply for an intercalated research degree? *Int J Surg Oncol (N Y).* 2017;2:e27.
19. Mehta K, Sinno S, Thanik V, et al. Matching into integrated plastic surgery: the value of research fellowships. *Plast Reconstr Surg.* 2019;143:640–645.
20. Goldstein AM, Blair AB, Keswani SG, et al; Basic Science Committee of the Society of University Surgeons. A roadmap for aspiring surgeon-scientists in today's healthcare environment. *Ann Surg.* 2019;269:66–72.
21. Barker JC, Rendon J, Janis JE. Medical Student Mentorship in plastic surgery: the mentee's perspective. *Plast Reconstr Surg.* 2016;137:1934–1942.
22. Janis JE, Barker JC. Medical student mentorship in plastic surgery: the mentor's perspective. *Plast Reconstr Surg.* 2016;138:925e–935e.
23. Alghamdi KM, Moussa NA, Alessa DS, et al. Perceptions, attitudes and practices toward research among senior medical students. *Saudi Pharm J.* 2014;22:113–117.
24. Reinders JJ, Kropmans TJ, Cohen-Schotanus J. Extracurricular research experience of medical students and their scientific output after graduation. *Med Educ.* 2005;39:237.